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SYNOPSIS

This book is a comprehensive compilation of scholarly articles that explore innovative approaches, models, and technologies in the fields of education, particularly focusing on character education, science learning, Islamic education, and curriculum development. Through comparative studies between Indonesia and Malaysia, as well as literature reviews on STEM, ethno-STEM, and digitalization, the authors provide diverse insights into how education systems adapt to 21st-century challenges. The articles also delve into pedagogical strategies such as gamification, RADEC model, project-based learning, and the integration of virtual laboratories in physics education, aiming to enhance both cognitive and moral development among students from elementary to high school levels.

Additionally, this volume addresses emerging issues in Islamic education, religious moderation, inclusive learning environments, and the impact of artificial intelligence and information systems on Islamic schools. It highlights the importance of aligning education with cultural values, sustainability, and technological advancements. By offering practical and theoretical perspectives, the book serves as a valuable resource for educators, researchers, and policymakers striving to improve educational quality and relevance in diverse and multicultural settings.

Strategies for Strengthening Character Education in Primary School Children in Indonesia and Malaysia

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Abstract-This study analyzes the strategy of strengthening character education in primary school children in Indonesia and Malaysia. It aims to find effective approaches and reinforcement in the implementation of character education in elementary schools. The focus of the discussion includes character education policies, strategy strengthening, and comparative implementation applied by both countries. This research uses a descriptive qualitative method of literature study approach with analysis techniques: data reduction, data presentation, and conclusion drawing. Researchers have obtained 40 articles and used as material for theory accumulation into 30 articles related to character education and strategy strengthening in both countries. The results and discussion state that Indonesia implements Pancasila-based character education through the Merdeka Curriculum, while Malaysia uses the National Education Philosophy (FPK) with three main pillars: intellectual, spiritual, and physical. The strategy of strengthening character education in both countries involves the integration of character values in the curriculum and school activities.

Keywords: *Character Education, Reinforcement Strategy, Elementary School*

I. INTRODUCTION

Character education, as an integral part of the education system, has a very important role in shaping children's personality and morality from an early age. Character education focuses not only on teaching moral values, but also on developing positive attitudes and behaviors that reflect integrity, responsibility, and social care. [1]. This approach is considered essential to create a generation that not only excels in cognitive aspects, but also has good emotional and social intelligence [2]. Strengthening character education at the primary school level in Indonesia and Malaysia is very urgent, given the challenges of both countries in facing complex problems. [3]. as well as the need

to prepare young people who are able to compete in the global arena while adhering to strong moral values [4].

Education is one of the fundamental aspects of life. Education is a planned effort to pass on cultural values from one generation to the next. The development of education is currently very rapid, both in terms of approaches and goals to be achieved, making it a feature and benefit in an ever-evolving education system. [5]. Education is carried out systematically to educate the nation's children from cognitive, affective and psychomotor aspects. [6].

Quality education not only focuses on mastering the material, but also on building a strong character, so that students can grow into individuals who are responsible, empathetic, and able to make a positive contribution to social life. [7]. Character education in Islam is inseparable from religious education. Moral cultivation in elementary school is very important for future moral development [8]. Character education is a form of habituation of positive values so that children are able to act wisely in the future [9].

Character Education in Indonesia can be referred to the Law of the Republic of Indonesia No. 20 of 2003 concerning (Sisdiknas) that National education serves to develop potential and form dignified character in spiritual strength, intelligence, skills, with the aim of educating the lives of the nation's children. [10]. The study of character strengthening in schools based on PERPRES NO. 87/2017 emphasizes seven main points: *First*, character education is important to form a generation with morals and ready to face global challenges. *Second*, character education should be an integral part of learning. *Third*, collaboration between school and community. *Fourth*, the experience and practice of teachers and principals. *Fifth*, exemplary behavior from educators and parents. *Sixth*, dialogical and participatory approaches. *Seventh*, character education must be integrated in all learning activities. [11].

The Indonesian Ministry of National Education formulated 18 characters values derived from religion, Pancasila, culture, and national education goals to shape the character of students in order to build the nation. These values include: religion, honesty, tolerance, discipline, hard work,

creativity, independence, democracy, curiosity, nationalism, love for the country, respect for achievement, communicative, peace-loving, fond of reading, environmental care, social care, and responsibility. [12].

The Curriculum Development Center at the Malaysian Ministry of Education developed a character education curriculum that reflects the values of Malaysian society. Moral education, focused on the spiritual, humanitarian and social aspects of a diverse society. However, the curriculum was later amended to establish core values that can be accepted and agreed upon by various religious groups, such as Christian, Catholic, Hindu, Buddhist, Confucian, Taoist and others. Character education in Malaysia has been in place since 1988 and has been revised twice since then. The subject is dynamic in nature to stay in tune with the latest moral and ethical developments [9].

The Malaysian government formed a committee that formulated 16 "pure values" to be taught to students, namely kindness, independence, courtesy, respect, compassion, justice, freedom, courage, physical and mental health, honesty, craftsmanship, cooperation, simplicity, gratitude, rationality, and the spirit of gotong royong. These values are sourced from religion, tradition, community customs, and universal aspects, closely related to social interactions in families, friends, communities, and organizations. Moral education in Malaysia is implemented through social interactions at school and outside of school, including direct learning in the classroom. Teachers are required to integrate moral values in subjects, which is burdensome as teachers must also be role models for students. In addition, the memorization method is often used due to the limited capacity and skills of teachers in teaching moral education. [12].

The researcher summarized some examples of cases that contradict the objectives of the National Education System Law. In 2019, an elementary school student was arrested for stealing a cell phone to pay for his school fees. In another case, police arrested a fourth-grade student who stole worship equipment from a temple to play games. [13]. Character formation is influenced by interactions at school, home, or social environment. Education ideally not only develops skills, but also shapes human character, given the importance of character education in the midst of changing times [14]. Parenting or educators have an important role in the individual development of children. [15].

This research is motivated by the lack of comparative studies on character education strategies in primary school children in Indonesia and Malaysia. Although some previous studies have examined the strengthening of character education in each country, none has comprehensively discussed the strategies and approaches applied in both countries. This study aims to fill the gap by analyzing and evaluating the strategy of strengthening character in primary school children, as well as finding the best approach.

II. METHOD

This research uses a descriptive qualitative approach with a literature study method. Data collection was taken from various relevant primary and secondary reference sources to obtain a theoretical basis related to the problem to be studied. The data analysis technique used refers to the Miles and Huberman model, which includes three main stages: data reduction, data presentation, and conclusion drawing [16]. Researchers have obtained 40 articles and used as material for theory accumulation to 30 articles related to character education and strengthening strategies in both countries. The researcher limited the research focus to the Strategy of Strengthening Character Education in Primary School Children in Indonesia and Malaysia.

III. RESULTS AND DISCUSSION

Research Results

The results and discussion present findings on strategies to strengthen character education in primary school children in Indonesia and Malaysia. Each finding is analyzed based on relevant character education theories and policies in both countries. The discussion includes representations between the approaches implemented in Indonesia and Malaysia, as well as the supporting factors and challenges faced by each. The analysis is expected to provide comprehensive insights and practical recommendations for improving character education at the primary school level. The descriptive analysis follows:

Table 1. Representation of articles on Character Education in Indonesia and Malaysia.

Year	Author and Article Title	Research Results
2019	Rahmat Rifal Lubis "Hitority and Dynamics of Character Education in Indonesia"	The legal basis for character education is the 1945 Constitution, the National Education System Law and the 2010 Presidential Instruction. Development includes character empowerment through local wisdom and integration in subjects.
2019	Badrus Zaman "The Urgency of Character Education in Accordance with the Philosophy of the Indonesian Nation"	National Character Education is based on the values of Pancasila and embodies obligations to God, self, family, community, and the environment.
2020	Fazal Akmal Musyyari	Ki Hajar Dewantara-style Character

Year	Author/Title	Summary
	"Annotation of Presidential Regulation No. 87/2017 on Strengthening Character Education"	Education needs to be implemented at all levels of higher education, with the support of the Local Content Curriculum
2020	Agustinus Tanggu Daga "A Comparison of Character Education in the Primary School Curriculum in Malaysia, India and Indonesia"	Both countries recognize the importance of character education and have integrated it in their education programs, although there are similarities and differences in values and implementation strategies.
2023	Rohil Zilfa "Between Tradition and Modernity: A Comparative Analysis of Character Education in Indonesia, England, Japan, and Malaysia"	In Indonesia, the main focus is in schools, while in Malaysia it is through moral subjects.
2023	Arif Rahman Hakim "The Concept of Basic Foundations of Character Education in Indonesia"	Indonesian education is experiencing problems adjusting to a rapidly changing curriculum, while character education is instilled through religious values, positive attitudes, and love for Pancasila.
2024	Anisa Amalia Maisaroh & Sri Untari "Character Education Transformation Through Government Policy in Indonesia	Character education is important to achieve a golden Indonesia 2045, involving collaboration between education, society and stakeholders to
	Towards the Golden Generation 2045"	form a noble generation.
2024	Miftahul Muthoharoh "Project Concept of Strengthening the Pancasila Student Profile and Rahmatan Lil Alamin Student Profile (P5 PPRA) in the Independent Curriculum"	The Pancasila Student Strengthening Project and the Rahmatan Lil Alamin Student Profile aim to form students with 21st competencies, and character based on Pancasila.
2024	Ulfa Nur Azizah "Character Education and Moral Depth from the Perspectives of Lichona and Kohlberg"	Integration of Lichona and Kohlberg's moral concepts. Both theories emphasize the role of the social and cultural environment, and this combined approach is relevant in the 21st century.
2024	Yudistita, Ilham Suwandi & Muchamad Rifki "Character Education for Elementary School Students from an Islamic Perspective"	Education in primary schools requires a holistic approach. Teachers and parents have an important role in educating children, especially in character building and role modeling.
2024	Nonong Amalita, Azwar Ananda, Nurhizrah Gistituati, Rusdinal "A Comparative Study of Character Education in Indonesia, Malaysia, and Japan" Dedeh Rescindang Irnissa, Aa	In Indonesia, character education is integrated in the Pancasila Learner Profile and Merdeka Curriculum, while in Malaysia it is through moral subjects. Character education in Indonesia and

Year	Author and Article Title	Results and Discussion
	Rahmawati, Taufik Muhtarom "A Comparative Study of Character Education in Indonesia and Malaysia"	Malaysia aims to strengthen moral, social and responsibility values. In Indonesia, through the Pancasila Learner Profile, and in Malaysia, through moral subjects.

Table 2: Representation of Character Education Strengthening Strategies in Indonesia and Malaysia.

Year	Author and Article Title	Results and Discussion
2020	Siti Zazak Soraya "Strengthening Character Education to Build National Civilization"	The four strategies that can be applied in character education are value cultivation, modeling, facilitation and skill development.
2022	Ani Siti Anisah, Sapriya, Kama Abdul Hakam, Ernawulan Syaodih. "Model of Social Attitude Competency Development in Elementary School Students"	Teachers and schools shape students' attitudes through internalization of character values with a *scientific* approach, as well as *training, modeling, conditioning, and habituation* methods.
2022	Syahirah Rosli, Siti Firuz Mahmud, Mohd Edyazuan Azni "Integrating the Philosophy of National Education (FPK) in Waking up the Capital of Bersepedu People"	Teachers play an important role in implementing FPK to achieve educational goals, taking into account the challenges of globalization and professionalism.
2023	Ainul Yaqin "Character Building with Habituation, Exemplary and Teaching Approaches"	The teaching process involves two things: the acceptance of values and the exemplary and habituated approach of teaching students through observation of character building effectively.
2024	Agra Dwi Saputra & Analisa Tunafia. "Strengthening Character Education in Elementary School Children"	Strengthening character education in primary schools requires the integration of character values in the curriculum, the role of teachers as role models, supportive school policies, collaboration with parents and communities, and continuous evaluation.

i.

Discussion

b. Character Education Policies in Indonesia and Malaysia

i. Character Education in Indonesia

Character education is actually not a new thing in Indonesia. Since before independence, people have practiced character education in the form of religious or moral education, both in schools and pesantren. This process continued until the early 2000s. Then, on May 2, 2010, in commemoration of National Education Day, the Republic of Indonesia officially planned the implementation of character education in Indonesia. [9]. Character education in Indonesia has received serious attention from the government, which is reflected in the issuance of Permendikbud No. 22 of 2015 concerning the Ministry of Education and Culture Strategic Plan 2015-2019. In addition, attention to character education also comes from various groups, including non-profit institutions such as the Indonesia Heritage Foundation (IHF), which focuses on the development of character education through its various programs. IHF's vision is "Building a Nation of Character". [6].

Character education in Indonesia is supported by several main regulations, namely the Constitution No. 20 of 2003 concerning the National Education System, Presidential Regulation No. 87 of 2017 concerning strengthening character education, and the regulation of the Indonesian Minister of Education, culture, research and technology No. 47 of 2003 concerning Management Standards for Early Childhood Education, Primary Education, and Secondary Education. [17]. Over time the Indonesian Education curriculum has undergone various changes, ranging from the 1947 curriculum to the independent curriculum currently implemented. [18].

The independent curriculum gives schools the flexibility to utilize their capabilities and adapt to the resources available. It also provides freedom for learners to teach material that is considered important and urgent. [18] The main objectives of the Merdeka Curriculum are to

develop creativity and innovation, build independence in the learning process, improve life skills in 21st century abilities, and foster noble character through meaningful learning that is relevant to everyday life [17]. The principle applied in the independent curriculum is the Pancasila Student Profile Strengthening Project (P5), which has six dimensions, namely: 1) faith and devotion to God Almighty and noble character, 2) respect for global diversity, 3) mutual cooperation, 4) independence, 5) critical thinking, and 6) creativity. The Pancasila Student Profile can be realized through four main activities, namely school culture, extracurricular activities, and the Pancasila Student Profile Strengthening Project (P5). [18].

Pancasila as the basic philosophy of Indonesia has an important role, as stated by Soedarsono, namely as the foundation of the state, worldview, identity, soul of the nation, common goals, noble covenants, and principles in the life of society, nation and state. Characters based on Pancasila must reflect the values of the five precepts, namely: divinity, humanity, unity, democracy that respects the law and human rights as well as justice and welfare for the entire nation. [19].

Character education in Indonesia refers to the guidelines of the Ministry of National Education which stipulates 18 main values, such as religiosity, honesty, tolerance, hard work, love for the country, and responsibility. These values are sourced from religion, Pancasila, culture, as well as the goals of National Education to strengthen character in education units. [6].

According to the author, character education in Indonesia aims to form a generation that is superior in character, creative, critical thinking, and has an awareness of diversity and national values. Through collaboration with non-profit institutions such as the Indonesia Heritage Foundation, character education is expected to continue to develop to build a nation of character and high competitiveness.

2. *Character Education in Malaysia*

Character and value education is an important part of the Malaysian Education System. In the colonial era, character education was provided through Bible teaching for Christian students, while non-Christian students followed ethics lessons. After independence, Bible teaching was replaced with Islamic education for Muslim students, while character lessons were introduced for non-Muslim students. In the 1970s, citizenship subjects became compulsory for all non-Muslim students [9].

A fundamental change in Malaysian education came after the publication of the 1979 Cabinet report under the leadership of Dr. Mahatir, then Minister of Education. The report emphasized the importance of character education for non-Muslim students and pushed for it to be integrated into the new primary school curriculum from 1983, while at the secondary school level it started six years later through the implementation of the Curriculum Bersepadu Sekolah Menengah (KBSM). Character education was introduced gradually, starting from grade one at both the primary and secondary school levels. The year 1993 marked the first batch of students in Malaysia to receive character education. In this subject, non-Muslim students were required to study moral education at the same time as Muslim students attended Islamic Religious Education. [9].

The Curriculum Development Center at the Malaysian Ministry of Education then developed a character education curriculum that reflects the prevailing values in Malaysian society. Initially, moral education focused on the spiritual, humanitarian and social aspects of multicultural Malaysia that students need to understand. However, this approach was later changed to the establishment of core values that could be accepted and agreed upon by various religious groups. The committee in charge eventually established sixteen core values, known as "pure values", namely: (1) kindness, (2) independence, (3) ethics (good manners), (4) mutual respect, (5) compassion, (6) justice, (7) freedom, (8) courage, (9) physical and mental hygiene, (10) honesty, (11) hard work, (12) cooperation, (13) simplicity, (14) gratitude, (15) rationality, and (16) community spirit. The teaching method of moral education that emphasizes these pure values is done mainly through *direct teaching*, but the values are also integrated into subjects and daily life. [9].

The subject of moral and ethical education in Malaysia, has an important component that is compulsory at all levels of education, aiming to teach students moral values, ethics, and good behavior in accordance with the standards of social life. Some of the key points of this curriculum are:

b. Curriculum Structure: Moral and ethical education is structured through a syllabus that emphasizes learning core values, such as honesty, respect, responsibility, decency, and fairness. These values are considered fundamental to student character building.

c. Contextualized Learning: Moral and ethical learning often uses a contextual approach, where students are invited to understand the values in the context of everyday life, as well as in the social and cultural realities of Malaysia.

d. Attitude and Behavior Development: in addition to teaching moral values, moral and ethical education also focuses on developing positive attitudes and behaviors, such as communication skills, cooperation, and empathy for others.

e. Evaluation: the subject has an evaluation mechanism, including written exams, projects or assignments related to moral values. Assessment is done with the aim of measuring students' understanding of the values taught.

f. Integration with Subjects: Moral and ethical education is integrated with other subjects in the curriculum to ensure these values are applied in a broader context and not limited to one area of study.

Moral and ethical education in Malaysia is a comprehensive effort to shape young people with positive values. The relationship between teachers and students is expected to create an educational environment that supports the formation of ethics in accordance with the objectives of the Malaysian National Education curriculum. [20].

a. **Implementation of Character Education Strengthening Strategies for Primary School Children in Indonesia and Malaysia**

b. *Character Education Strategy in Indonesia*

Children can learn attitudes and morals through several approaches, namely: (1) *trial and error,* where children learn through social conversations to understand whether their behavior is in accordance with social norms; (2)

direct education, children learn by following the rules that exist in the family, school, and community environment; and (3) exemplary, where children imitate the behavior of adults [21]. Herlambang mentioned that there are four strategies in character education, [22] including:

a. Reinforcing. Strengthening character education is carried out through co-curricular, extracurricular programs and activities, as well as the school environment, with the participation of principals, teachers, staff, and parents. Character education is implemented through integration in subjects, thematic learning, habituation, and synergy between school, family, and community [23].

b. Habituating. Habituation or *conditioning* aims to shape behavior through repeated practice, based on the theory of behaviorism. This method includes *direct methods* to change behavior, cognitive and social development, behavior modification according to Islamic values, and strengthening faith and morals in the school environment. [24].

c. Modeling. Modeling plays a role in improving students' cognitive abilities by providing examples that can facilitate understanding and creativity. Through imitation of teacher behavior, students can develop innovative and creative abilities [25].

d. Teaching. Teaching aims to develop the character and cognitive aspects of students by helping them process information independently, improve critical thinking skills, and solve problems effectively [26].

To strengthen character education in primary schools. *First*, teachers need to increase their capacity through training that focuses on character-based learning methods. *Second*, curriculum development that is flexible and contextualized. Third, collaboration between schools, parents and communities. The implementation of these strategies is expected to increase the effectiveness of character education in primary schools. [27].

Character Education Strategy in Malaysia [1]

In Malaysia, human development in the National Philosophy of Education (FPK) aims to produce individuals who have a strong religious grip, practice noble values in daily life, and have various skills, this development integrates various elements of holistic and balanced human development goals. There are three main aspects that are the focus of FPK including:

a. Intellectual Development. In Malaysian education, this approach is reflected through various programs such as innovation competencies, quizzes, and 21st century teaching. These programs aim to develop students' critical and creative thinking skills, as well as abilities in various fields [28].

b. Spiritual and Emotional Development. Spiritual and emotional development aims to build a balanced character, both intellectually and morally. FPK emphasizes religious and moral values, with programs such as, Sistem Sahsiah Diri Murid (SSDM) and Sahsiah Unggul Murid (SUMUR) expected to nurture students' character. [29].

c. Physical Development. Physical education promotes healthy living habits, improves physical quality, and prepares students for challenges.

These three aspects aim to produce a balanced and beneficial individual. [28]. Character strengthening strategies in Malaysia include: 1) national unity and social harmony, 2) responsibility and respect, 3) caring and hard work. 4) balance of freedom, as well as 5) social stability and law compliance [30].

IV.   CONCLUSION

Character education is very important in Indonesia and Malaysia to form a generation that is moral, ethical, and contributes positively to society. In Indonesia, character education is regulated in Law No. 20 of 2003 and Presidential Regulation No. 87 of 2017, and is implemented through the Merdeka Curriculum and the Strengthening Profile of Pancasila Students (P5) and Profile of Rahmatan Lil Alamin Students (PPRA) Project. The focus is on strengthening religious values, mutual cooperation, independence, and creativity through reinforcement, habituation, role modeling, and teaching in primary schools. In Malaysia, character education is based on the National Education Philosophy (FPK) which integrates intellectual, spiritual, emotional and physical development. The curriculum emphasizes the values of unity, social harmony, justice and responsibility to accommodate the diversity of society. Both countries use similar character education strengthening strategies, including integration in subjects and holistic approaches, to face modern challenges and shape individuals of character who are ready to contribute to society.

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Enhancing Physics Learning with Virtual Labs: Insights from the Last Ten Years

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Abstract—This study analyzes the impact of virtual laboratories on student learning in physics, focusing on how virtual labs contribute to conceptual understanding, engagement, and learning motivation. Virtual laboratories serve as valuable educational tools, especially in schools lacking physical lab facilities. By providing interactive and flexible learning experiences, virtual labs help students grasp complex physics concepts, foster critical thinking, and promote scientific skills such as hypothesis testing and problem-solving. Using a literature review approach, this study gathered and examined data from various academic sources on virtual lab implementation in physics education. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method was employed to identify, screen, and select relevant studies, with 18 journals ultimately included for analysis. Findings indicate that virtual labs have substantial educational benefits, supporting students' conceptual knowledge and motivating them to engage more actively in learning. However, limitations exist, such as dependence on technology and the lack of hands-on experience with physical equipment. Addressing these limitations through appropriate technology use and strategic integration can maximize the effectiveness of virtual labs. Overall, this study highlights the potential of virtual laboratories to enhance physics education by fostering independent exploration and providing versatile learning environments adaptable to various educational contexts.

Keywords—virtual lab, physics

I. INTRODUCTION

Physics is a branch of science that studies the universe and everything that occurs within it. Since the universe we inhabit is filled with mysteries, all that we know today is the result of discoveries made by past scientists. They uncovered these findings through observation, research, and calculations to understand how nature operates and to grasp the fundamental principles that enable the universe to endure.

Over time, knowledge of the universe has indeed aligned with the calculations formulated by past scientists. However, much remains unexplained, as mysteries and unknown phenomena persist in the universe. Consequently, physics began to be taught in schools so that students can understand how nature works—and they might even be the ones to solve these unresolved mysteries in the future. Additionally, physics education [1] enables students to gain conceptual knowledge useful for daily life, while fostering scientific attitudes and broad perspectives. This knowledge starts with small experiments that help them better grasp concepts,

explore ideas, deepen their understanding, and test the theories they have learned.

Laboratory facilities are necessary to support experimental learning, enabling students to better understand physics concepts. [2] Laboratories are considered essential because they aid in physics education, where comprehension of concepts often requires direct observation and experimentation. However, some schools lack adequate laboratory facilities or even have none at all. This limitation sometimes hinders students' ability to truly grasp physics concepts, leading them to think that physics is merely about calculations, when in fact, it encompasses much more. Therefore, the use of technology is crucial as a solution to support practical activities, with one such technology being the virtual laboratory.

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Virtual labs are highly beneficial in addressing the limitations of physical laboratories. [4] Virtual laboratories are not designed to replace real laboratories but rather to assist the learning process and complement the shortcomings of physical labs. Essentially, virtual labs are intended to ease the burden on educators or institutions that lack physical lab facilities. According to [5], a school laboratory is fundamentally an academic support unit that serves as a place to conduct testing, calibration, and production using specific scientific methods to support the educational process.

The implementation of virtual laboratories can greatly aid learning in schools. However, like any technology, virtual labs have their limitations. These drawbacks might still be somewhat manageable by educators or institutions. For instance, students cannot directly experience using physical laboratory equipment, which might ultimately lessen their understanding of laboratory tools. Essentially, [6] conducting

experiments in a physical lab is an important part of education, providing students with hands-on experience. Moreover, virtual labs could lead students to become dependent on internet connections and electronic devices, as they may become overly accustomed to these tools.

II. METHOD

This study uses a literature review method, where we conduct an examination, understanding, and search for information from various previous sources related to the topic we have chosen [7]. The study is carried out by analyzing various articles to obtain comprehensive and in-depth results. Furthermore, [8]mentions that reviewing previous research (literature review) is an essential part of research. A review of existing studies is instrumental in developing theories and identifying the appropriate research fields, guiding future research directions.

The purpose of this study is to analyze the impact of virtual laboratory usage on the learning process and outcomes of students, as well as to examine how virtual labs can increase student interest in learning. This objective serves as a guide in developing a more focused literature review, especially in selecting articles and references that align with the research focus.

The method we chose is the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method. In this approach, we are required to review several related articles and analyze whether those articles are suitable to be used as references[9]The PRISMA process involves four main stages: identification of journals to be included in the meta-analysis, followed by screening or selection of data, eligibility determination to assess the suitability of articles for use, and inclusion, which refers to the integration and reporting of results.

Table 1: Explanation Of Prisma Formulation

No.	Stages	Description
1.	Identification	We identified and selected the topic we used, utilizing the keywords "virtual lab and physics." We then found 200 discussions related to our keywords with the assistance of Scopus and Publish or Perish.
2.	Screening	In this stage, we filtered journals based on year and type. In this process, we only selected articles within a decade range, from 2013 to 2024. We also chose journals of the article type and excluded other types. We conducted this selection on 200 journals and found 89 that were classified as articles.
3.	Eligibility	In this stage, we evaluated and aligned the articles with the research needs. We reviewed the 89 selected articles to determine which were most suitable as a foundation for our article. After further examination, we found 30 articles that were most relevant to our topic. However, of those 30, we only used 18 articles, as they best aligned with our research objectives.
4.	Included	In this stage, we analyzed these 18 articles to align them with our article.

TABLE. 2 INCLUSION AND EXCLUSION CRITERIA

Criteria	Inclusion	Exclusion
Type of literature study	Article	Book, Conference, Note, Review
Timeline	2013-2024	Before 2013

The literature study we chose consisted of articles that were collected and selected based on their titles and abstracts to ensure they met the criteria we established. We obtained 200 journals from Scopus using the Publish or Perish application, then sorted these 200 journals using Excel, selecting only those categorized as articles and discarding those classified as Book, Conference, Note, or Review. We found 89 articles and further analyzed them for relevance to our research objectives, resulting in 18 relevant journals. The remaining journals included 27 related to higher education, 23 inaccessible journals, 3 related to junior high school, and 18 deemed irrelevant for other reasons.
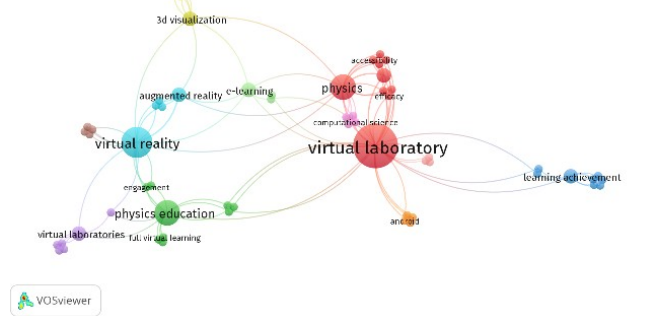
Figure 1: Relationship between each keyword

The figure above illustrates the connections between each keyword frequently appearing in research on virtual laboratories. The first keyword, "virtual laboratory," is the center of various related terms such as "physics," "learning achievement," "3D visualization," and "virtual reality." This connection shows that virtual laboratories are often used in physics education to enhance conceptual knowledge by utilizing 3D simulations and augmented reality. Additionally, the links with "accessibility" and "efficacy" highlight the advantages of virtual laboratories in providing ease of access and effectiveness in learning. The combination of "e-learning" and "android" indicates the adaptation of technology to easily accessible digital platforms, promoting more independent and interactive physics education. The relationship between "engagement" and "physics education" demonstrates that virtual laboratories help foster student engagement in understanding the material more deeply and improving their learning outcomes.

III. RESULTS AND DISCUSSION

Here are the results and discussion that we will outline regarding our literature study, based on the 17 articles we found that meet the criteria. The information below is related to the synthesis of virtual lab articles internationally, which we will explain further. We selected 17 articles that are highly relevant to our analysis needs, and we present the analysis in table form for easier understanding.

Table 3: The Impact Of Virtual Lab Usage

No.	Author Name	Title	Method	Research Findings
1.	[10] Daineko	Augmented and virtual reality	Experimental approach	3D visualization helps them

No.	Author Name	Title	Method	Research Findings
	et all.,	for physics: Experience of Kazakhstan secondary educational institutions		better understand physics concepts
2.	[11] Rahmi et all	Development of a virtual lab in sience-physics	Research and Development (R&D)	The results of using virtual laboratories are valid and practical for use in schools, aligning with curriculum standards and representing a characteristic of 21st-century education.
3.	[12]	The effect of guided inquiry learning model assisted by virtual laboratory to studenta learning achievement in temperature and heat topic in class X of SMAN 1 langsa academic	Pre-test and post-test	This learning model successfully enhances student engagement in the learning process.
4.	[13]	Evaluation of virtual laboratory package on Nigeria secondary school physics concepts	Quantitative-based evaluation	Improving students' achievement in the taught physics concepts
5.	[14]	Guided inquiry model through virtual laboratory to enchane students sience process skills on heat concept	Quantitative and qualitative data	Enhancing skills in hypothesis, practice, and communication
7.	[15]	Improving teaching techniques using virtual phyton : acase study in physics laboratories	This case study focuses on both quantitative and qualitative approaches.	After the experiment, students showed an improvement in their understanding of physics concepts, as evidenced by higher test scores compared to the control group.
8.	[16]	Analysis of high school students' mastery in light wave theory using structured inquiry learning assisted by a virtual laboratory	Quantitative Analysis	Students showed improvement in their conceptual assignments. However, some students still encountered difficulties in certain aspects.
9.	[17]	A comparison of students' approaches to inquiry, conceptual learning, and attitudes in simulation-based and microcomputer-based laboratory	Quasi-experimental	Shows a more positive attitude toward the virtual lab compared to traditional labs
10.	[18]	Effects of guided inquiry virtual and physical lab	Quasi-experimental	Shows a more positive attitude toward the virtual lab compared to traditional labs.
11.	[19]	educational technology of virtual physics laboratory	Research and Development (R&D)	Trials with students demonstrate the effectiveness of the medium for physics learning.
14.	[20]	Moving labs out of labs: teachers' perceived effectiveness of virtual laboratories duting pandemic schools closures	Descriptive Survey-Based	Allows time flexibility and access, enhancing student engagement in deeper concept understanding.
15.	[21]	The experiment editor: supporting inquiry-based learning with virtual lab	Pre-test and post-test	Helps students understand complex scientific concepts through an inquiry-based approach.
16.	[22]	Virtual physics laboratory application based on the android smartphone to improve learning independence and conceptual understanding	Experimental research using an experimental group	Students find this application useful, easy to use, and effective in supporting independent physics learning.
17.	[23]	The physics classroom in an 3D virtual world: a thai highschool theacher needs analysis	Qualitative approach with surveys and interviews	Several challenges, such as limited hardware and unstable internet connections, were also identified.
18.	[24]	Virtual Laboratory as a Step to Maximize Student Skills	Study literature	Virtual lab is able to provide motivation for student learning.

Based on Table 3, the results show that using virtual labs is highly beneficial for physics learning as it provides many

positive impacts on the teaching and learning process. Virtual labs also motivate students to engage more enthusiastically in their studies. Additionally, there are various virtual lab platforms to choose from, such as PhET Simulations, OLabs, ChemCollective, and others [25]

The overall impact of virtual labs on student learning from the data above shows a positive trend. Most research findings indicate that virtual labs help students achieve a deeper understanding of physics concepts [17][21]. By emphasizing student engagement in the learning process and providing an interactive learning experience, virtual labs enable students to explore complex physics concepts independently, fostering critical thinking and other scientific skills such as formulation, hypothesis development, practical application, and communication skills [14][18].

Virtual labs also have a significant impact on students' learning motivation [24], as the engaging features of virtual labs boost curiosity and make students more enthusiastic about their studies. However, the effectiveness of virtual labs also depends on several factors, particularly on how this tool is utilized within the learning process [26]

The results indicate that students' understanding of concepts improves significantly through virtual labs, primarily due to the guided inquiry-based approach. Guided inquiry helps students take on a more active role and fosters an awareness of the importance of the learning process [27] Since physics education emphasizes practical activities, students should choose the right learning model. One effective model for learning scientific concepts is inquiry-based learning, which encourages students to observe natural phenomena and motivates them to experiment [28]

The use of virtual labs is also highly flexible, as it can be implemented anywhere, which was especially beneficial during the pandemic when remote learning became necessary. In a short time, educators were required to confront and adapt to technology to ensure that learning could continue [29]One technology adaptable for virtual labs allows students to conduct experiments without needing to be in a school environment or meet face-to-face with teachers. Virtual labs are expected to give students the opportunity to conduct practical work anywhere [30]. Improved accessibility through technology, such as Android devices or digital media, provides students with the chance to deepen their understanding of the physics concepts being taught [20] [22].

One of the advantages of virtual labs, which is not found in traditional labs, besides being flexible and assisting institutions without laboratory facilities, is that virtual labs help reduce the risk of errors or accidents that can occur during real laboratory work [31]This is especially important in physics, where mistakes in handling electrical equipment can be hazardous to students. The use of virtual labs also helps to save time because teachers do not need to write the steps of the experiment on the board [32] they can directly explain the application and provide live examples for students to follow.

Virtual labs have many advantages that greatly assist in the teaching and learning process, especially in the fields of science and physics. However, like any technology, virtual labs also have their limitations. One of the technical challenges is the occasional instability of internet connections [23]. Additionally, students do not gain hands-on experience with actual laboratory work, such as the skills needed to handle equipment. The use of virtual labs can also limit student interaction with their peers. Furthermore, virtual labs may reduce students' ability to solve unforeseen problems that typically arise in real lab settings [33]

Despite its limitations, virtual labs continue to be utilized because of the substantial benefits they offer students. Potential challenges can be addressed through appropriate adjustments and the strategic use of technology, helping to minimize these issues and maximize the effectiveness of virtual labs. Virtual labs are tools that can be applied across various educational levels and knowledge domains. With proper planning, this technology can sustainably support effective learning processes. Adjustments in virtual lab usage can also help improve problem-solving abilities; according to research [34] virtual labs enable students to find solutions independently, ultimately enhancing their critical thinking skills and fostering innovation in problem-solving.

IV. CONCLUSION

Based on the analysis we conducted, we concluded that the use of laboratories in physics learning has many positive impacts. Virtual laboratories not only improve students' understanding of physics concepts but also engage students actively and increase their learning motivation. There are many virtual lab platforms such as PhET simulations, OLabs, and ChemCollective, which provide many options for both teachers and students to study the material.

Overall, virtual labs offer numerous benefits and contribute to the enhancement of physics learning. However, their success depends on how this tool is utilized in the learning process. Therefore, appropriate adjustments are needed in the implementation of this technology to ensure it is accepted and produces optimal results.

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Analysis the Problem-Based Learning Model in Physics Education: How Did It Work?

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Abstract— **This research is motivated by the conventional methods still employed by teachers in the teaching process, especially in physics education. These methods are not sufficient to facilitate the understanding of complex physics concepts, impacting students' comprehension of the material. The aim of this study is to examine the impact of applying the Problem Based Learning (PBL) model on students' conceptual understanding and skill development, s well as identifying the components that can be combined with the Problem-Based Learning (PBL) model. The method used in this study is a literature review with a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) design, which includes steps such as identification, screening, eligibility, and analysis of the final set of articles. Data collection was conducted using the Scopus database. The search process resulted in 11 articles focused on the PBL model, conceptual understanding, and skill enhancement among students. The research outcomes suggest that the PBL model has a very significant impact on students' conceptual understanding in physics, as well as aiding in the improvement of critical thinking and problem-solving skills.**

Keywords—problem-based learning, critical thinking, understanding of concepts

I. INTRODUCTION

Physics is a branch of Natural Sciences that fundamentally consists of two aspects: product and process. As a product, physics is a collection of knowledge that includes facts, concepts, generalizations, principles, theories, and laws of physics. As a process, physics involves a series of scientific processes used to discover new knowledge in the field of physics[1].

A common problem in physics education is the insufficient understanding of the material by students, resulting in unsatisfactory learning outcomes. This is often due to the use of conventional and non-contextual teaching methods, which make students passive, while future life demands them to be able to solve problems and think critically [2]. Most teachers use conventional teaching methods that are teacher-centered and emphasize rote memorization. This creates a passive learning process and reduces students' conceptual understanding. Therefore, the lecture or conventional method is less suitable for teaching physics because it does not actively involve students, thus limiting their ability to think, work, adopt scientific attitudes, and communicate with teachers and peers [3]. Physics learning should be an interactive activity, where students are anticipated to actively participate in the learning process. In this way, students can acquire knowledge through their active involvement[4]. To master physics concepts, the teacher's role is crucial not only in delivering general material but also in creating an effective learning process. To address these issues, efforts are needed to improve the learning process by implementing engaging, active, and innovative learning models. Selecting the right learning model can enhance conceptual understanding, students' critical thinking and problem-solving abilities.

The learning process is a crucial aspect of education. Teachers need to consider various factors when choosing models and methods to use in the classroom, such as the characteristics of the material, student characteristics, available facilities, and the teaching models and methods. One model that supports active student engagement is Problem Based Learning (PBL), where students are first presented with a problem before the teacher provides an explanation of the physics material. Problem Based Learning, which is student-centered, is essential for fostering a scientific attitude in physics learning. Effective learning occurs when students are actively involved in problem-solving during the learning process [5]. The problem-based learning model is characterized by using real-life problems as the material or concept for students to learn. This approach aims to train and enhance critical thinking and problem-solving skills, as well as to achieve a deeper understanding of essential concepts in physics education [6].

Based on the background presented, the objective of this study is to analyze the impact of implementing the Problem Based Learning (PBL) model on students' conceptual understanding and skill development, as well as to identify the components that can be integrated with the Problem Based Learning model.

II. METHOD

This study employs a literature review method using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) design. PRISMA is a set of evidence-based guidelines designed to assist authors in reporting systematic reviews and meta-analyses. It emphasizes methods that authors can apply to ensure clear and thorough reporting across various research types[7]. The articles used in this study are Scopus-indexed and were retrieved using the Publish or Perish software, which facilitates the search, management, selection, and filtering of scientific articles relevant to the research topic.

The questions addressed in this study are as follows: (1) How does the Problem-Based Learning model affect students' conceptual understanding in physics learning? (2) What skills are developed through the application of the Problem Based Learning model? and (3) What components are integrated into the Problem-Based Learning model?

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta Analyses
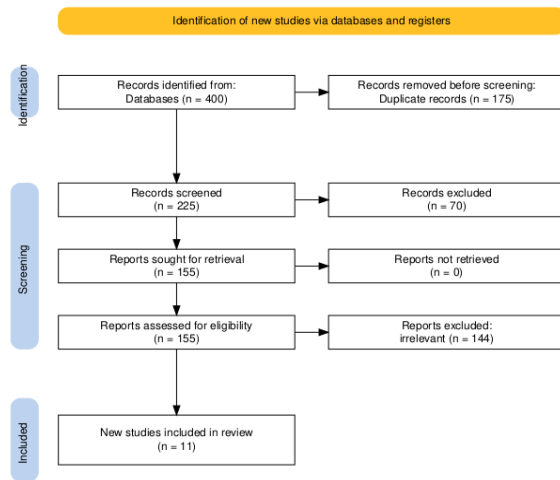
Based on the search results in Scopus using the Publish or Perish software with the keywords *Problem-Based Learning*, *Physics*, *High School*, and *Student*, a total of 400 files were obtained. Of these, 175 files consisting of book chapters and conference papers were excluded, leaving 225 articles. Among these, 70 articles were inaccessible, resulting in 155 remaining articles. Out of the 155 accessible articles, 144 were deemed irrelevant, leaving 11 relevant articles that became the focus of the research analysis.

III. RESULTS AND DISCUSSION

The initial analysis was conducted based on the keyword co-occurrence from the article search results.

Using this method, we identified the frequency with which primary keywords appeared together across various articles selected for the study, uncovering relationships or patterns between key concepts in the published literature. This approach facilitated an understanding of the topic structure and revealed thematic relationships that might not be explicitly evident, providing a solid foundation for a more in-depth exploration of the topics covered in these articles.

Figure 2. keyword Co-occurrence through VOSviewer
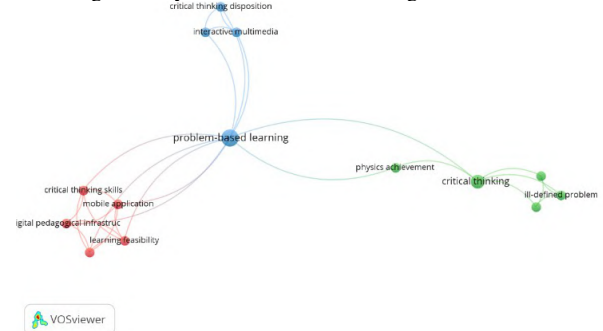
Based on Figure 2, the keyword relationships reveal the connections between topics emerging from this literature review. "Problem Based Learning" is placed at the center, functioning as the main topic that links to various other keywords. "Critical thinking" is directly related to Problem Based Learning and connects to other keywords such as "ill-defined problem" and "physics achievement". This shows that the application of Problem Based Learning model can enhance students' thinking abilities, particularly in handling ill-defined problems and improving physics achievement. In the red cluster, the keywords "critical thinking skills", "mobile application", "digital pedagogical infrastructure", and learning "feasibility" are grouped together, highlighting that the implementation of Problem-Based Learning is associated with the use of technology to enhance critical thinking skills. Additionally, in the blue cluster, *critical thinking disposition* and *interactive multimedia* suggest that the integrating interactive multimedia in Problem-Based Learning influences students' disposition toward critical thinking. Overall, Figure 2 illustrates how Problem-Based Learning not only serves as a means to develop critical thinking skills but also involves the use of technology in education to improve students' conceptual understanding.

The subsequent analysis was based on the metadata, including title, author, publisher, and citation count. By examining these elements, we aimed to gain insights into the distribution of research themes, the influence and expertise of authors, the prominence of specific publishers, and the impact of each article as indicated by citation frequency. This metadata analysis provided a deeper contextual understanding of the literature landscape, helping to identify influential works, prominent contributors, and potential trends in the field.

Table 1. Result of Relevant Article Search

Article Code	Authors	Journal	Citation
A1	A Shishigu A et al [8]	Eurasia Journal of Mathematics, Science and Technology Education	112
A2	Mundilarto et al [9].	Baltic Science Education Journal	43
A3	Parno et al [10].	Science Education Journal	26
A4	Gunawan et al [11].	Education of Gifted Young Scientists Journal	21
A5	F Savall et al [12].	Physical Review Physics Education Research	14
A6	N Erceg et al [13].	Revista Mexicana de Fisica E	11
A7	R. Sujanem and I N Putu Suwindra [14].	Indonesian Science Education Journal	5
A8	A Olatide O and N Govender [15].	Baltic Science Education Journal	5
A9	Suhirman and S Prayogi [16].	Humanities and Social Sciences Letters	2
A10	A Rahmasari and H Kuswanto [17].	Journal of Technology and Science Education	2
A11	N Gumisirizah et al [18].	Physics Education	1

Table 2. Mapping of Researcher Country Origins

Article Code	Country of Origin	Citations
A1	Ethiopia, East Africa	112
A2	Yogyakarta, Indonesia	43
A3	Malang, Indonesia	26
A4	Mataram, Indonesia	21
A5	Spanyol	14
A6	Croatia, Bosnia and Herzegovina	11
A7	Bali, Indonesia	5
A8	South Africa	5
A9	Mataram, Indonesia	2
A10	Yogyakarta, Indonesia	2
A11	Uganda, East Africa	1

Based on table above, there is a variance in the citation counts for Problem-Based Learning research across different countries. A significant difference is observed, with studies from Ethiopia and Uganda, in East Africa, having the highest citation count at 113 citations. Indonesia ranks second with 99 citations, showing a broad representation in Problem-Based Learning research, encompassing areas such as Yogyakarta, Malang, Mataram, and Bali. This indicates a high level of interest in conducting research in this field. Thus, East African countries and Indonesia have a substantial influence compared to other countries. For research findings, please refer to Table 3.

Table 3. Research Findings

Article code	Integration with Problem-Based Learning	Research Findings
A1	Problem Based Learning method and conventional teaching.	Students' problem-solving skills improve by using PBL.
A2	Experimental method and the demonstration method.	The study's results suggest that Problem-Based Learning, when combined with the experimental method, can notably enhance students' critical thinking skills.
A3	Comparing the Problem-Based Learning method integrated with STEM, Problem-Based Learning, and the conventional method.	Problem-Based Learning-STEM can enhance students' scientific literacy more effectively than Problem-Based Learning or the Conventional method.
A4	Problem Based Learning approach was used with the help of interactive multimedia created with Adobe CS3 software, and a basic media approach such as static images and videos without interactivity, only demonstrations.	The study's results demonstrate that the thermodynamics interactive multimedia, designed around problem-based learning, serves as an effective support tool in the learning process, leading to the most significant improvement in students' critical thinking disposition.
A5	Problem Structure of the Teaching-Learning Sequence approach was used.	The results of the study show that Problem-Based Learning with the Teaching-Learning Sequence approach is effective in enhancing students' understanding of quantum physics concepts, particularly atomic spectra.

Article code	Integration with Problem-Based Learning	Research Findings
A6	Experimental approach by presenting student with ill-defined physics problem.	Ill-defined problems have significant potential to develop students' critical thinking skills.
A7	Interactive physics e-module based on problems (Probinphys).	Probinphys e-module in Blended-Problem Based Learning significantly improves students' critical thinking skills.
A8	Polya Problem-Solving, Target-Task Collaborative Learning, and conventional methods.	Students become more understanding in physics lessons.
A9	Problem-Based Learning approach with PHET virtual simulations and expository teaching.	The research findings show that the implementation of Problem Based Learning with PHET virtual simulations significantly enhances students' critical thinking skills compared to the expository method.
A10	Augmented Reality-based Problem-Based Learning approach with Pocketbooks and local wisdom, as well as an approach using PPT media and school textbooks.	Students' skills in mathematical and graphical representation on the topic of elasticity have improved.
A11	Problem Based Learning and Content-Based Learning.	The understanding of concepts, learning outcomes, and student skills have improved in Uganda in the physics topic of simple machines.

The ability of students to understand physics concepts in school influences their learning outcomes. When students can grasp physics concepts well, they will be able to solve problems related to these concepts in their daily lives. In other words, they will be able to handle problems effectively [9].

To face the current challenges, it is necessary to have human resources with skills such as collaboration, communication, critical thinking, and problem-solving. Hese skills can be developed through the learning process [19], [20], [21]. Problem-Based Learning (PBL) is an instructional method that can motivate students in the learning process through concrete problem-solving. This approach involves students in

the learning process by using problems as stimuli, enabling students to play a key role in it [21].

In Article A1, students view physics as the most challenging subject, with the belief that only students with special abilities can understand its concepts. However, the research conducted shows that Problem-Based Learning (PBL) can improve students' problem-solving skills and performance in physics. This is evidenced by the results of a problem-solving inventory test, where the experimental group using PBL achieved a higher average score increase of 50.25, in contrast to the control group, which achieved an average score of only 38.54 on the post-learning test. [8].

In Article A2, alongside learning outcomes, thinking styles also influence success in the learning process, with critical thinking being one key skill[9]. Critical thinking involves analyzing and evaluating, requiring strong analytical skills to improve it [22]. The Problem-Based Learning (PBL) model supports students in gaining comprehensive knowledge and applying it effectively to solve problems [9], aligning with the view that PBL problems should be relevant and applicable to real-life issues students may encounter in the future [23]. A quasi-experimental research design using a pretest-Posttest method was implemented with control (demonstration method) and experimental (PBL model) groups among 10th-grade high school students in Yogyakarta from 2015 to 2016. The study confirmed that PBL implementation positively impacted students' learning outcomes and critical thinking skills, with the experimental group showing an average score increase of 0.49 compared to 0.34 in the control group [9].

In the research presented in Article A3, various approaches are suggested to align with 21st-century learning. One example is STEM (Science, Technology, Engineering, and Mathematics). STEM is an interdisciplinary approach that combines science, technology, and mathematics [24], [25] aimed at advancing societal knowledge and innovation in technology [26]. The research findings show that Problem-Based Learning-STEM achieved the highest scores in enhancing students' scientific literacy [10].

In Article A4, an interactive multimedia approach is used. Interactive multimedia can enhance students' conceptual understanding and motivate them to learn, as it makes complex concepts easier to comprehend by combining text, video, animation, simulation, sound, and images [27]. Research findings confirm that Problem-Based Learning integrated with interactive multimedia can support the learning process, thereby enhancing students' critical thinking disposition [11].

In Article A5, the approach used is Structured Teaching-Learning. The learning process begins with presenting a problem, after which the teacher guides the students, making them aware that they are dealing with

an important and engaging issue. The teacher then asks the students to consider the steps necessary to solve the problem. In this approach, the teacher and students collaboratively plan the sequence of tackling the problem. This helps students gradually understand the issue at hand, fostering a sense of active involvement in the learning process (Becerra-Labra, Gras-Martí, and Torregrosa [28], [29]. This Structured Teaching-Learning approach has been shown to improve understanding of physics concepts, specifically atomic spectra [12]

In Article A6, an approach using ill-defined physics problems is employed to assess students' critical thinking skills. A total of 276 students from various educational levels in Croatia were asked to solve less specific problems. The results show that using these ill-defined problems encouraged diverse ideas from students regarding their understanding of the issues and potential solutions. This approach also motivated students to think critically [13].

In Article A7, a problem-based interactive physics e-module, or "probinphys e-module," is used. This innovative approach integrates technology into education, particularly through blended learning [30]. The probinphys e-module is designed with a Blended Problem Based Learning model, combining face-to-face and online sessions. The problems presented to students are highly complex, real-life, and unstructured, aimed at enhancing students' thinking skills [31], [32]. Research conducted at Senior High School 1 Singajaya demonstrates that this approach significantly improves students' critical thinking skills in physics [14].

In Article A8, the Polya Problem Solving integrated with Target Task Collaborative learning, emphasizing group work and collaboration among students to solve physics problems. The study results indicate that the Polya Problem Solving approach combined with Target Task Collaborative learning, which prioritizes student collaboration and active involvement, effectively improves academic performance among lower-achieving students. This approach encourages interaction and discussion, enabling higher-ability students to assist their peers within the group [15].

In Article A9, it is emphasized that integrating various technologies is essential to adjust to students' learning needs [33] The key to fulfilling these needs is not just the delivery of content, but the management of engaging, motivating, and enjoyable learning experiences [34]. One activity to achieve this is integrating Problem-Based Learning with PHET virtual simulations, which can be accessed through mobile applications [16]. PHET is an online laboratory-based learning medium used to create simulations of physical phenomena [35], making complex concepts easier to understand [36]. The research shows that utilizing PHET virtual simulations significantly enhances critical thinking skills [16].

In Article A10, a new discovery is highlighted with the use of Augmented Reality (AR), which has become increasingly popular in education. AR can transform two-dimensional objects into three-dimensional ones, making them appear more realistic, which helps in explaining complex physics concepts such as material elasticity. The goal is to present physics lessons in the most engaging way to aid in understanding difficult concepts. In this study, Augmented Reality (AR) is combined with local cultural elements, such as the traditional game of *ketepel*, to motivate students and make it easier for them to grasp the concept of elasticity. Through this approach, students are expected to develop their mathematic and graphic visualization skills in physics lessons [17].

In Article A11, the study compares Problem Based Learning (PBL) with Content Based Learning (CBL). In CBL, instruction is more teacher-centered, focusing on content delivery, which often becomes monotonous for students as they passively receive information without active engagement [37]. The study in Article A11 used a sample of 829 students from eight secondary schools in Sheema District, Uganda. These students were divided into two groups, with one group learning through Problem-Based Learning and the other through Content-Based Learning. Student learning outcomes improved, as evidenced by an average score of 57.53 in the Problem-Based Learning group and 51.57 in the Content-Based Learning group [18].

IV. CONCLUSION

Problem-based learning is an approach that requires students to conduct research on a problem through procedures such as presenting students with a problem, grouping them, investigating the issue to find a solution, presenting the research findings, and reflecting on the results [38]. This model emphasizes student-centered learning, where students are expected to actively seek information and decide what they need to learn to support their learning process [9]. Various approaches can be combined Problem-Based Learning, such as the use of STEM, interactive digital media, the Structure of the Teaching-Learning Sequence, ill-defined physics problems, interactive physics e-modules, PHET virtual simulations, Augmented Reality, and other tools that enhance the learning process.

Based on the analysis conducted, Problem-Based Learning has a significant impact on conceptual understanding, especially in physics. Additionally, Problem-Based Learning modules help improve 21st-century skills, including critical thinking and problem-solving abilities.

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Volcanoes and Earthquakes Flipbook: Enhancing Students' Critical Thinking Skills Through Education for Sustainable Development (ESD)-Based Teaching Material

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Abstract—**Critical thinking skills are essential competencies for students to develop in order to succeed in the 21st century. This study aimed to evaluate the effectiveness of an Education for Sustainable Development (ESD)-based flipbook in enhancing the students' critical thinking skills during lessons on volcanic and seismic activity. A quantitative quasi-experimental design was employed, involving a control group (n = 21) and an experimental group (n = 27). The instruments used included critical thinking test items and a student response questionnaire. The results demonstrated a significant improvement in the experimental group, with a mean post-test score of 78.83% (categorized as good) compared to 63.49% (categorized as adequate) in the control group. An independent sample t-test revealed a p-value of 0.001 (< 0.05), indicating statistically significant differences between the two groups. The experimental group's N-Gain score of 0.72 was categorized as high effectiveness, while the control group's N-Gain score of 0.50 was classified as medium effectiveness. Furthermore, 88.2% of students in the experimental group reported positive responses to learning with the ESD-based flipbook. These findings suggest that the use of ESD-based flipbooks significantly enhances critical thinking skills and fosters greater engagement in science education.**

Keywords—*critical thinking, volcano and earthquake flipbook, education for sustainable development*

I. INTRODUCTION

Education is a process that shapes the character, habits, and skills of individuals through teaching and learning activities. Its primary aim is to prepare students for life within society. In 21st-century education, four fundamental skills have been recognized: critical thinking, collaboration, communication, and creativity, often referred to as the 4Cs. Among these, critical thinking is crucial as it equips students to effectively solve complex challenges. Plethora of research highlights the importance of developing and training critical thinking skills [1][2][3].

Science is a discipline that requires critical thinking, using a systematic and structured methodology to explore natural phenomena. Topics in science such as volcanoes and earthquakes are important concepts that need to be mastered, although their abstract and unobservable nature often leads to low student engagement and understanding [4][5]. Nonetheless, understanding these topics is crucial due to their relevance to society [6][7]. Garut, for example, is geographically important due to the presence of active volcanoes such as Mount Papandayan and its proximity to the Australian plate, which poses earthquake risks [8].

Students' critical thinking skills remain notably low. Research indicates that many students still struggle with critical thinking [2][4][9]. One contributing factor is the lack of diversity in learning resources, which leads to lower student engagement and reduced interest in science learning, ultimately resulting in suboptimal learning outcomes [9].

Reference [10] found that students show greater interest in teaching materials that incorporate text, images, and animations in digital formats. This challenge can be addressed through the use of electronic based teaching materials, such as flipbooks. Flipbooks can be effectively integrated with Education for Sustainable Development (ESD), which fosters critical thinking by enabling students to make informed decisions and take responsible actions [11][12]. ESD encourages students to engage with real-world problems, such as environmental degradation and social inequality. This engagement requires them to analyze complex situations, weigh different perspectives, and develop informed solutions [13]. ESD also promotes higher-order thinking skills by challenging students to not only absorb information but also to question its validity and relevance [14].

Implementing ESD-based resources is expected to enhance students' critical thinking skills. This study, therefore, applied an ESD-integrated flipbook on

volcanoes and earthquakes to improve the critical thinking skills of students.

II. METHOD

This study employs a quantitative research methodology with experimental techniques to examine the impact of independent variables (treatment) on dependent variables (outcomes). The research design selected is a quasi-experimental design, as random sampling is not feasible. Specifically, two classes will be utilized: Class VII-A as the experimental group, which will be exposed to a flipbook based on ESD, and Class VII-D as the control group, which will use textbooks not grounded in ESD principles.

Both groups will undergo a pretest prior to the intervention and a posttest following the treatment. The study adopts a non-equivalent control group design, as the two groups are not randomly assigned but are selected based on existing class structures. The sampling technique used is non-probability sampling, specifically purposive sampling, where students from Class VII at a school in Garut Regency will serve as the research population. The inclusion criterion for both groups is that they have not previously studied the topic of volcanoes and earthquakes.

Data will be collected through a pretest-posttest descriptive question instrument to assess improvements in students' critical thinking skills. Additionally, a student questionnaire will be administered to evaluate their perceptions of learning with a flipbook based on ESD.

III. RESULTS AND DISCUSSION

The results of this study were derived from pretest-posttest scores obtained from both the control group, which used textbooks, and the experimental group, which used an ESD-based flipbook. Additionally, the study includes a questionnaire assessing the experimental group students' responses to learning with a flipbook grounded in ESD. The pretest-posttest design was employed to measure the improvement in students' critical thinking skills.

Both the experimental group, which utilized an ESD-based flipbook, and the control group, which used conventional textbooks, completed essay questions before and after the intervention. The pretest and posttest scores were subsequently analyzed to identify any significant differences in the students' critical thinking skills. A summary of the pretest and posttest data, including the calculation of students' critical thinking skills, is presented in Table 1.

TABEL 1. STUDENTS' CRITICAL THINKING SKILLS IN THE EXPERIMENTAL AND CONTROL GROUPS

| Group | Test | Average | | Category |
		Score	Percentage (%)	
Control	Pretest	11.05	26.30	Poor
	Posttest	26.67	63.49	Adequate
Experiment	Pretest	11.33	26.98	Very poor
	Posttest	33.11	78.83	Good

Based on the data presented in Table 1, the initial critical thinking skills of students in the experimental group, which utilized an ESD-based flipbook, showed an average score of 26.98%. After the intervention, the posttest results indicated a significant improvement, with the average score rising to 78.83%. In contrast, the control group, which used conventional textbooks, exhibited an initial average score of 26.30% on the pretest, and a posttest score of 63.49%. These results suggest a notable difference in the improvement of critical thinking skills between the experimental and control groups before and after the treatment.

Flipbooks, as digital textbooks, are electronic versions of traditional textbooks designed for educational purposes and can be accessed on various devices. They combine data, text, sound, and various types of images in a digital format, offering an alternative medium to enhance science education [15]. Flipbook has several advantages, such as integrating text, images, animations, and videos, alongside interactive tools and connections. These features support the development of students' critical thinking skills by enabling them to engage, navigate, and communicate effectively [3].

Critical thinking skills are composed of five key aspects: providing basic clarification, developing basic support, making inference, offering advanced clarifications, and formulating strategy and tactics. A summary of the results for each aspect of students' critical thinking skills is presented in Table 2.

TABEL 2. STUDENTS' CRITICAL THINKING SKILLS IN EACH ASPECT, PRESENTED AS PERCENTAGES

| Critical Thinking Skills | Control Group | | Category | Experiment Group | | Category |
	Pretest	Posttest		Pretest	Posttest	
Basic clarification	22.22	54.94	Poor	23.46	89.51	Very good
Basic support	33.52	61.37	Adequate	43.41	80.04	Good
Inference	14.81	32.10	Very poor	28.39	67.90	Adequate
Advanced clarifications	15.43	51.23	Poor	18.10	81.07	Good
Strategy and tactics	14.20	31.48	Very poor	69.75	69.75	Adequate

Based on the data presented in Table 2, the results indicate the following: First, in terms of providing basic clarification, the control group showed a lack of proficiency, whereas the experimental group performed very well. Second, in terms of developing basic support, the control group demonstrated a moderate level of proficiency, while the experimental group performed well. Third, regarding making inference, the control group showed significant deficiencies, while the experimental group performed

at a moderate level. Fourth, in the aspect of providing advanced calrifications, the control group exhibited a lack of proficiency, while the experimental group showed good performance. Finally, in terms of organizing strategy and tactics, the control group displayed significant deficiencies, while the experimental group performed at a moderate level.

The data in Table 2 also provide evidence of improvements in students' critical thinking skills, both overall and across individual aspects of critical thinking, for both the control and experimental groups. However, the control group showed limited improvement across the various aspects: providing basic clarification remained below expectations, developing basic support improved moderately, making inference was particularly deficient, providing advanced clarifications showed only slight improvement, and organizing strategy and tactics also remained weak. In contrast, the experimental group demonstrated more pronounced improvements: providing basic clarification was rated as very good, developing basic support was good, making inference was very good, providing advanced clarifications was good, and organizing strategy and tactics was rated as moderately good.

The increase in students' critical thinking skills can be attributed to the use of a flipbook based on ESD, which provided students with reflective practices where students assess their learning experiences and the impact of their decisions on sustainability. This reflection helps deepen their understanding of the subject matter and cultivates a habit of questioning assumptions, which is fundamental to critical thinking development [16]. Additionally, the integration of interactive features in flipbook, such as video barcodes and evaluations, made the learning process more engaging, allowing students to better grasp the material. The use of flipbooks significantly improves student learning outcomes, helping students better understand lesson content and mitigate boredom [17].

To quantify the improvement in students' critical thinking skills, the Gain formula was applied to the pretest and posttest results from both the control group (using textbooks) and the experimental group (using an ESD-based flipbook). To assess the effectiveness of an ESD-based flipbook in improving critical thinking skills, the Normalized Gain (N-Gain) formula was used. The results of these calculations, along with the differences in improvement between the groups, are summarized in Table 3.

TABEL 3. IMPROVEMENT OF CRITICAL THINKING SKILLS AND THE EFFECTIVENESS (N-GAIN) OF USING ESD-BASED FLIPBOOKS

| Group | Score | | N-Gain | Category |
	Pretest	Posttest		
Control	11.05	26.67	0.50	Medium
Experiment	11.33	33.11	0.72	High

Table 3 reveals the effectiveness of using an ESD-based flipbook in science education, with an N-Gain

value of 0.50, which falls within the medium effectiveness range. In comparison, the use of textbooks in the control group had a higher N-Gain value of 0.72, indicating high effectiveness. However, the results suggest that ESD-based flipbooks are more effective in enhancing students' critical thinking skills compared to traditional textbooks. Overall, both the control and experimental groups experienced improvements in critical thinking skills, with the experimental group showing a more pronounced increase. This supports the conclusion that ESD-based flipbooks offer distinct advantages over conventional science textbooks.

These findings align with previous studies, which highlight flipbooks as an innovative tool that leverages interactive digital e-books to strengthen students' logical and critical thinking skills [17][18][19]. Additionally, flipbooks enhance the teaching and learning process by incorporating videos, images, animations, and audio, making learning more interactive and engaging, thus fostering the development of critical thinking skills [8][9].

In addition to the use of flipbooks, the integration of ESD also plays a pivotal role in enhancing students' critical thinking skills. Through ESD, students are encouraged to apply critical thinking when formulating problems related to the topics of volcanoes and earthquakes, analyzing the social, economic, and environmental impacts of these disasters, and devising alternative solutions to mitigate or avoid these impacts [20]. ESD enhances student competence by fostering critical thinking, problem-solving, communication skills, teamwork, conflict management, and organizational abilities [21]. Consequently, the use of ESD-based flipbooks significantly contributes to the development of critical thinking skills, as students analyze the interplay between the material they study and its real-world implications, particularly in the context of environmental, social, and economic dimensions.

During lessons using an ESD-based flipbook, students are presented with real-world phenomena, such as natural disasters, that encourage them to analyze the causes, effects, and potential solutions related to these events. This problem-solving approach, embedded in the ESD-based flipbooks, effectively trains students' critical thinking skills, as evidenced by the research of [5] who emphasize the importance of problem-solving, decision-making, and assumption evaluation in the development of critical thinking.

In addition to the academic performance data, student responses to the use of an ESD-based flipbook were collected through a questionnaire distributed to students in the experimental group. The questionnaire aimed to assess students' perceptions of learning with an ESD-based flipbook on the topics of volcanoes and earthquakes. The questionnaire included 10 indicators related to the integration of ESD-based flipbooks into student learning. The results showed that students

found the flipbook to be accessible from anywhere, engaging, and helpful in understanding the material. Students also reported that the flipbook increased their interest in the subject, made learning more enjoyable, and encouraged active participation in the learning process. The detailed results of the student response questionnaire are presented in Table 4.

TABEL 4. QUESTIONNAIRE DATA RESULTS PRESENTED AS PERCENTAGES

No.	Item	Response	Category
1.	Accessible and easy to use in various educational settings.	88	Strongly agree
2.	The design is engaging and attractive.	90	Strongly agree
3.	Includes images that help understand concepts.	92	Strongly agree
4.	Includes learning videos that help understand the content better.	87	Strongly agree
5.	Enhances the learning experience.	89	Strongly agree
6.	Stimulates interest in learning.	90	Strongly agree
7.	Fosters the development of critical thinking skills.	86	Strongly agree
8.	Promotes greater student engagement in the learning process.	86	Strongly agree
9.	An innovative tool for improving the learning experience.	82	Strongly agree
10.	Enhances the quality and effectiveness of learning activities.	92	Strongly agree
	Average	88.2	Strongly agree

The results of the student response questionnaire, presented in Table 4, indicate that learning with an ESD-based flipbook was met with a strongly agree respons from the students. This feedback aligns with the pretest-posttest data, suggesting that students not only demonstrated measurable improvements in critical thinking but also felt a significant difference in their learning experience when comparing the use of textbooks to the use of ESD-based flipbooks.

Flipbooks are designed to be engaging and visually appealing, thereby increasing student involvement, enthusiasm, and interest in learning activities. These types of teaching materials help students understand lesson content by providing real-world examples [3] [22]. Additionally, [23] highlighted that flipbooks utilize a variety of multimedia elements—including text, images, animations, videos, and background music—to create an interactive and enjoyable learning experience. This is particularly important in the context of 21st-century education, where students are expected to be comfortable with a range of technological tools for learning. These results further emphasize the effectiveness and appeal of ESD-based flipbooks in fostering a more engaging and stimulating learning environment for students.

IV. CONCLUSION

Based on the results of this study on the impact of ESD-based flipbooks on students' critical thinking skills, it can be concluded that the integration of ESD-based flipbooks significantly enhances students' critical thinking abilities, both overall and across individual aspects of critical thinking. This conclusion is supported by the post-test results, which indicate that the experimental group, utilizing ESD-based flipbooks, outperformed the control group, which only used traditional textbooks. Furthermore, the ESD-based flipbooks demonstrated high effectiveness in improving students' critical thinking skills in science education, as evidenced by an N-Gain value of 0.72, categorizing the effect as high effectiveness.

Student responses to the use of ESD-based flipbooks were overwhelmingly positive, with an average student response rate of 88.2%. This positive feedback can be attributed to the ease of use of the ESD-based flipbooks, which are accessible anywhere, and the engaging features they offer, including multimedia elements that contribute to the development of students' critical thinking skills.

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The Role of Muslim Scientists in Enhancing Students Interest and Religious Values in Physics Learning

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Abstract— **Learning interest and religious values are essential components in meaningful and holistic physics education. However, a primary challenge in teaching physics lies in students' low interest in the subject, often due to perceptions that physics is difficult and abstract. An innovative approach that integrates the roles of Muslim scientists, such as Ibn al-Haytham, Al-Khwarizmi, and Al-Biruni, into physics education can effectively enhance students' motivation and understanding. This article explores how the contributions of Muslim scientists in science can inspire students by presenting role models relevant to their religious identity while demonstrating that science and religious values can coexist. Using a literature review method, this study finds that integrating religious values into physics learning not only improves students' interest but also fosters deeper moral awareness. Embedding religious values in physics education allows students to connect scientific concepts with the greatness of God's creation, motivating them to learn with a balanced scientific and spiritual enthusiasm. This study recommends developing field studies to evaluate the effectiveness of learning strategies that include historical case studies of Muslim scientists, reflective discussions, and value-based projects to create a more meaningful and relevant physics learning experience in the modern context.**

Keywords— integration, science, Islam, history of physics, learning interest, religious values

I. INTRODUCTION

Student interest in learning is an essential factor in achieving meaningful physics education. Internal factors influencing student learning outcomes include interest and motivation [1]. Intrinsic interest and motivation in physics encourage active student engagement in the learning process, enabling them to understand concepts deeply and contextualize them effectively. Empirical studies show that strong learning interest significantly contributes to students' conceptual understanding and critical thinking skills in physics [2]. Thus, developing teaching strategies that enhance student interest is vital for achieving optimal learning outcomes and establishing a robust foundation for applying physics in broader contexts.

The integration of religious values is also a critical factor in meaningful education, as it shapes students' positive character and morality in an educational context. Incorporating religious values into physics learning can increase students' awareness of their responsibilities toward nature, encouraging them not only to understand theoretical physics concepts but also to apply them with ethics and integrity. Embedding religious values in the science curriculum significantly contributes to improving students' motivation and conceptual understanding [3]. Therefore, incorporating religious values into teaching not only enriches the curriculum but also creates a more holistic and meaningful learning experience.

However, teaching physics often faces significant challenges, particularly students' low interest in the subject. This lack of interest results in inadequate understanding and skills in physics. Students often perceive physics as an abstract subject, leading to low engagement and disappointing learning outcomes [4]. Factors contributing to this low interest include students' perceptions of physics as a challenging subject and unengaging teaching methods.

Furthermore, physics teaching has frequently not integrated religious values, missing the potential to cultivate students' moral and spiritual character through scientific understanding of the universe. Character education's role in embedding spiritual, moral, and ethical values cannot be overlooked in today's global era [5]. Integrating religious values through character education can be incorporated into all subjects, including physics [6].

To enhance students' interest in learning and their religious values, educational strategies are needed to connect physics concepts with elements that are relevant and engaging for students. Physics teaching requires systematic approaches [7]. One promising approach is integrating the roles of Muslim scientists into physics education. The scientific advancements in the West were significantly influenced by the progress achieved in the Islamic world [8]. Muslim scientists like Ibn al-Haytham, known for his contributions to optics, Al-Biruni for mechanics and astronomy, and Jabir Ibn Hayyan for physical chemistry, are examples of figures

who can inspire students through their remarkable scientific achievements [9]. Highlighting their roles not only helps students understand the historical contributions of Muslims to science but also fosters a sense of pride and religious values that can strengthen their motivation to learn.

Integrating religious values into physics learning offers a holistic approach that combines cognitive and affective aspects. Teaching physics becomes not merely about concepts and formulas but also about instilling the awareness that science is a means to understand the greatness of God's creation. By studying the roles of Muslim scientists in physics, students are encouraged to appreciate how science can align with faith. This approach has the potential to develop students' character, making them academically proficient and grounded in ethics and religious values.

This study aims to explore how integrating the roles of Muslim scientists in physics learning can increase students' interest and nurture their religious values. It is expected that the findings of this study will provide a solid foundation for developing relevant integrative teaching strategies in the modern era, inspiring the younger generation through the contributions of Muslim scientists to explore their potential by studying physics in a more meaningful framework.

II. METHOD

This article employs a literature review method, focusing on collecting and analyzing data from various relevant sources such as books, scientific journals, and classical works of Muslim scientists to examine their roles in physics education and their impact on enhancing students' interest and nurturing their religious values. This method was chosen as it allows researchers to gather and analyze a wide range of relevant literature to gain a comprehensive understanding of the studied topic [10].

III. RESULTS AND DISCUSSION

The Role of Learning Interest and Religious Values in Physics Education

High learning interest and the reinforcement of religious values play a vital role in physics education, particularly in shaping students' character and scientific understanding. Strong learning interest motivates students to actively participate in the learning process, enhancing their critical thinking skills and creativity in comprehending complex physics concepts [11]. Additionally, integrating religious values in physics education provides a robust moral and ethical framework, guiding students to understand that science is not merely a tool for solving technical problems but also a means of drawing closer to the Creator and appreciating the universe's beauty. These religious values foster students' awareness of using knowledge

wisely and responsibly [12]. Developing students' learning interest and religious values in physics education not only has the potential to improve academic performance but also builds a generation with moral integrity, capable of facing global challenges with ethical and sustainable perspectives.

Contributions of Muslim Scientists to the Development of Physics

Muslim scientists like Ibn al-Haytham, Al-Khwarizmi, Al-Biruni, and Nasir al-Din al-Tusi significantly contributed to the development of science, especially physics, with their experimental approaches and foundational theories that influenced modern science. Ibn al-Haytham, through Kitab al-Manazir, laid the foundation for optics and the scientific method [13], while Al-Khwarizmi introduced algebra, an essential tool in physics calculations [14]. Al-Biruni conducted precise measurements of Earth's radius and developed theories on planetary rotation [15], and Nasir al-Din al-Tusi advanced the Tusi Couple, which influenced heliocentric theories [16]. Their works, translated into Latin, became critical foundations for the development of Western science and enriched the understanding of nature through accurate empirical methods.

Historical Connections in Physics Education: Inspiring Motivation

The contributions of Muslim scientists to science provide students with a strong historical connection to physics education. When students realize that scientists from the same religious background as theirs made significant discoveries, they feel a deeper sense of pride and enthusiasm for physics. This realization creates intrinsic motivation by presenting tangible examples of success relevant to their identity, fostering the belief that they too can contribute to science. This historical understanding not only increases students' interest in learning but also inspires them to emulate the scientific spirit and actively participate in continuing the rich intellectual legacy [17].

The Role of Muslim Scientists in Enhancing Religious Values

The role of Muslim scientists in enhancing religious values focuses on their contributions in linking science with spiritual beliefs, inspiring students to associate science with religious values. Figures like Ibn al-Haytham, Al-Khwarizmi, and Al-Biruni pursued science with the view that knowledge is a means of understanding God's greatness, making scientific endeavors a form of worship and appreciation of His creation [18]. By studying their dedication and contributions, students gain not only deeper scientific understanding but also develop religious values, such as

awareness of God's greatness, gratitude, and moral responsibility in applying knowledge constructively.

Transforming Students' Perception of Physics Through Religious Integration

The achievements of Muslim scientists help transform students' perception of physics from being merely abstract to being closely connected with religious values and Islamic history. By observing how these scientists pursued knowledge within the frameworks of ethics, spirituality, and a noble purpose to understand God's creation, students can associate physics with moral and religious principles. This integration eliminates the perception of science and religion as separate entities. Instead, it demonstrates that science can be a means of drawing closer to God and appreciating the marvels of the universe [19]. Consequently, students not only acquire scientific knowledge but also view physics as a path to holistic self-development, enriching both their intellect and spirituality.

Introducing Muslim Scientists to Reshape Students' Views on Physics

Introducing Muslim scientists in physics reshapes students' views, making physics more relatable and inspiring. Students no longer see physics as a challenging and abstract subject but as a cultural heritage rooted in Islamic history and imbued with religious values. Recognizing that physics can be used to understand God's creation and improve lives [20], students feel more emotionally connected and motivated, perceiving physics as a meaningful and beneficial discipline.

Embedding Religious Values to Enhance Learning Motivation

Embedding religious values in physics education enhances student motivation by giving spiritual meaning to academic pursuits. When students perceive physics as a way to understand God's greatness, their intrinsic motivation grows, turning learning into a meaningful act of worship. Additionally, understanding that knowledge can be used for social and environmental good deepens their commitment, aligning academic goals with moral missions [21]. This correlation demonstrates that spiritual development through religious values strengthens students' motivation to learn physics more deeply and sustainably.

The Emotional Engagement Fostered by the Legacy of Muslim Scientists

The exemplary contributions of Muslim scientists foster emotional engagement in students by instilling a sense of pride in Islamic history within science [22]. This pride creates an emotional bond that deepens their interest, making them feel more connected to physics as part of their cultural and intellectual heritage. Learning motivation increases as students begin to see physics as a way to continue a proud scientific tradition, inspiring them to study diligently and draw inspiration from the roles of Muslim scientists in exploring natural phenomena. This underscores that when students are introduced to Muslim scientists, they not only learn physics but also understand how faith-driven work ethics influence scientific advancements. This inspires students to see science as part of their religious understanding, enhancing their interest and appreciation of science alongside stronger spiritual values [23].

Integrating Religious Values in the Physics Curriculum

Integrating the history of Muslim scientists into physics lessons significantly contributes to enhancing students' religious values. By introducing Muslim scientists, students are encouraged to understand that science and religion harmoniously coexist within Islamic civilization. Muslim scientists not only pursued knowledge for scientific progress but also to draw closer to Allah and comprehend His greatness through the marvels of nature [24]. This approach teaches students that mastering physics is inseparable from spiritual goals, such as recognizing the signs of the Creator's greatness. When students realize that the physics studied by these figures was part of an effort to understand God's creation, they are motivated to see physics as a means of increasing faith and devotion. Additionally, values like perseverance, honesty in research, and moral responsibility in applying knowledge also become relevant examples in shaping students' religious character [25].

Educational Strategies for Science-Religion Integration

Teaching that integrates science and religion (Islam) provides more meaningful contexts for students by demonstrating that scientific knowledge is inseparable from spiritual and moral values. This perspective redefines science as not merely technical knowledge but as a means of understanding the signs of God's greatness in His creation. This helps students see the relevance of science lessons in their lives, increasing their motivation to learn while fostering reflective and ethical attitudes in applying knowledge [26].

Integrating religious values into the physics curriculum can be realized by including the history of Muslim scientists and the concept of scientific ethics within the Islamic context. The curriculum can be designed so that physics phenomena are understood not only scientifically but also in relation to religious

concepts, such as marveling at the order of nature as an appreciation of God's creation.

Educational practices that integrate religious values and science can be implemented through several relevant strategies. First, teachers can use case studies of Muslim scientists like Ibn al-Haytham, illustrating how scientific knowledge aligns with Islamic values. This approach introduces not only physics concepts but also inspiring examples of integrating science with spirituality [27]. Second, reflective discussions can encourage students to contemplate how the natural laws studied in science reflect God's greatness, thereby strengthening their understanding of monotheism. Third, project-based learning that connects physics applications to daily life and religious values can be implemented, such as exploring natural phenomena as signs of Allah's power.

These strategies aim to create meaningful learning experiences, foster deeper interest in science, and strengthen students' religious values. Reflection sessions and discussions after studying specific physics concepts are also essential to enable students to connect scientific understanding with ethics and spirituality, reinforcing religious values while deepening their motivation to study science.

Challenges and Future Research Opportunities

An integrative approach that connects physics with religious values holds significant potential to enhance students' learning motivation, deepen conceptual understanding, and strengthen religious character. By understanding physics as a discipline with academic, spiritual, and social significance, students perceive learning as a holistic and relevant experience. However, implementing this approach faces several significant challenges, including limited comprehensive teaching materials, difficulties in measuring the attainment of religious values, and the diverse backgrounds of students that necessitate an inclusive approach. Additionally, teachers require specialized training to effectively integrate religious values without diminishing the scientific substance of physics, ensuring that the learning process maintains the accuracy and depth of scientific content.

Opportunities for further research in integrating religious values and science offer a wide scope for exploration, particularly in the areas of educational psychology and the impact of religiosity on science learning. More in-depth studies can be conducted to understand how religious values integrated into physics lessons influence intrinsic motivation, learning interest, and students' perceptions of the relevance of science in their lives. Research recommendations include developing experimental or field studies to evaluate the effectiveness of teaching approaches that incorporate the contributions of Muslim scientists in enhancing students' learning interest and religious values. Such studies can provide empirical evidence of the relationship between teaching the history of Muslim scientists and the formation of religious character, as well as help identify the most effective pedagogical approaches for integrating religious dimensions without compromising the scientific rigor of physics.

IV. CONCLUSION

This study demonstrates that integrating the roles of Muslim scientists into physics education can enhance students' learning interest and religious values. By teaching the historical contributions of Muslim scientists, students not only gain physics knowledge but are also inspired to emulate their scientific spirit within a religious context. This approach enables students to view physics as a discipline that is intertwined with spiritual values, linking scientific understanding to the belief that science serves as a means to comprehend the greatness of God's creation. Integrating religious values into physics education provides students with a holistic and meaningful learning experience.

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Design and Impact of Local Wisdom-Based STEM Modules in Indonesia: A Literature Review

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Abstract—**This study aims to review various designs of STEM-based learning modules integrated with local wisdom in Indonesia and to evaluate their impact on students' skills and understanding. This research uses a literature review approach with four main stages: determining the study topic, searching and selecting literature, analyzing and synthesizing literature, and organizing the analysis results. The literature review findings show that the design of STEM modules based on local wisdom leverages local cultural contexts as an integrated part of presenting science materials. The local wisdom incorporated in the modules includes traditional musical instruments, agricultural activities, and local building structures. Furthermore, the literature review results indicate that the use of modules based on local wisdom can enhance various student skills, such as critical thinking, science literacy, and communication. Additionally, these modules help build relevance between the science concepts learned and local wisdom, as well as increase students' appreciation and love for local cultural heritage. The positive impact of these modules suggests that STEM modules based on local wisdom can improve the quality of science learning relevant to the local cultural context of students.**

Keywords—Module, STEM, local wisdom, science learning

I. INTRODUCTION

Learning Natural Sciences (IPA) has an important role in improving students' understanding of scientific concepts related to nature and the surrounding environment. [1][2]. Science learning aims to teach students how to understand and explain various natural phenomena using a systematic approach and based on scientific evidence. In the process of learning science, students are trained to develop and apply scientific methods that involve the process of observation, investigation, independent search, and drawing conclusions from various investigative processes.

Science learning not only trains 21st century skills, but also builds oriented to the development of scientific attitudes, curiosity, and openness to change. [3]. This is very important so that students are not only fixated on ideas that they already know, but also want to learn and solve real-world problems. Science learning that is related to everyday life is expected to make students more sensitive to environmental problems and have the ability to think scientifically in facing future challenges. One way to link science learning with everyday life can be done by developing modules that are more contextual.

Learning modules are teaching tools that are systematically designed to support the teaching and learning process and are organized in the form of self-study materials. [4]. This module presents the subject matter coherently, complete with learning objectives, learning activities, and evaluations designed to help students understand the material and become more involved. In science learning, learning modules have a role in helping students understand scientific condopts in a more structured way [5]. The use of modules can make science material described in more detail, ranging from basic concepts to applications in everyday life. In its development, modules in science learning are modified in various aspects including through the integration of STEM approaches and local wisdom, or known as STEM modules based on local wisdom. The use of STEM modules based on local wisdom in science learning makes students not only gain scientific knowledge but also learn to link scientific ideas with the values and culture that exist in the surrounding environment. [6]. Furthermore, local wisdom-based modules encourage students to see natural phenomena and science from a more contextualized perspective that can make science learning more meaningful.

Several studies have shown that the implementation of local wisdom-based STEM learning modules in schools has different design characteristics, with various challenges and obstacles. [7][8]. These

challenges include teachers' readiness to understand and implement the module, the availability of adequate supporting facilities, and teachers' and students' understanding of local wisdom values found in their respective regions. These three aspects often become obstacles in maximizing the effectiveness of STEM learning that is relevant to the local culture and environment. Furthermore, the characteristics of different modules with diverse local wisdom are also an interesting part of local wisdom-based STEM modules that need to be studied systematically.

Based on some of these studies, it shows that STEM modules based on local wisdom in Indonesia have diversity in design, local wisdom characteristics, and challenges. Thus, it is necessary to review the literature to obtain a picture of the design of STEM modules based on local wisdom that can be used in science learning. Therefore, this study focuses on examining the design of STEM modules based on local wisdom in Indonesia, as well as the impact of using STEM modules based on local wisdom on science learning.

II. METHOD

This research uses a literature study through four main stages, namely determining the topic, theme, and focus of the study, searching and selecting relevant literature, analyzing and synthesizing the literature, and organizing the results of the analysis in the form of literature study findings. [9]. The topic chosen in this study focuses on the design of local wisdom-based STEM modules and their impact in science learning. The article search process uses various sources, such as google scholar, springer, and various other journal accesses that have relevance to the theme. The articles that have been collected are selected to ensure that the articles analyzed have good credibility. The selection was based on the year of publication, relevance to topics related to local wisdom-based STEM modules, and completeness of journal identification. The analysis and synthesis process was carried out using an analysis table matrix consisting of title, author's name, year, and analysis results in the form of design and impact of local wisdom-based STEM modules. In the final stage, the results of the analysis and synthesis were organized in the form of writing.

III. RESULTS AND DISCUSSION

In this section, the results of the literature study on STEM Module Design based on Local Wisdom in Indonesia and its impact on science learning are presented. The discussion consists of two main parts, namely a discussion of the form of STEM Module Design based on local wisdom that tries to describe various forms of STEM modules based on local wisdom. The second part describes the results of the study on the impact or results of using STEM Modules based on local wisdom on science learning.

Design form of STEM module based on Local Wisdom

Based on the literature review on ten articles that have been determined ccording to the topic, a description of the design of STEM modules based on local wisdom is obtained. The diversity of this module design is determined by he module development procces, differences in local wisdom, and the procces of use in learning. The following Table 1 describes the design of local wisdom-based STEM modules that science learning procces

Table 1. Local Wisdom-based STEM Module Design and Impact on Science Learning

Module name	Module design	Local Wisdom	Impact/ Outcome
[10]	Modern bioteknologi module	Manggo Cultivation	This module received very positive student responses, so this module is considered effective and can be used as an interesting and useful teaching material.
[11]	Teksbooks and worksheet	Traditional Musical Instruments	This module received positive responses from students, namely 78.83% in the small class test (good criteria) and 83.00% in the limited class test (very good criteria).
[12]	STEM module in motion material	Local Wisdom Gitar	Improved students' science literacy, with the highest improvement in the ability to interpret scientific data and evidence **(1.68)**. Overall, the improvement of students' science literacy was in the **moderate category**. So, this module is quite effective in helping students understand science concepts in a real context.
[8]	STEM module with	Beduk Instrumen	Students' creative thinking

Ref	Module	Local Wisdom	Results
	with Beduk Local Wisdom		skills improved significantly with an N-gain of 0.92, which was categorized as high.
[13]	Canva-assisted module	Gondang Sambilan Instrument	The Ethno-STEM-based e-module assisted by Canva and integrated with traditional musical instrument Gordang Sambilan provided a significant increase in students' communication skills in physics learning with a score of 83.11%. This E-Module was rated highly valid with a score of 89%, and its practicality scored 88.27%.
[14]	STEM module with picture illustrations	Palembang Limas House	This module supports mathematics learning on flat building materials in elementary schools and is designed with picture illustrations and concise but clear material, aiming to attract students' attention, foster learning motivation, and facilitate understanding of flat building materials.
[15]	Development of STEM-based Physics learning	**Timba Laor** coastal communities Maluku	This learning tool, which was developed using the **Plomp** model. The final product of this

Ref	Module	Local Wisdom	Results
	tools		research is a **STEM-based physics learning tool** integrated with Timba Laor local wisdom, which successfully improves students' understanding of physics through a contextual approach and local culture.
[16]	*Guided inquiry-based teaching e-modules*	Batik craftssmen Kudus	Improve students' critical thinking skills in chemistry, and students gave a positive response to this e-module with a score of 85%,
[17]	Digital Microscope Module	Bornea forest (leaves)	Improve science process skills in all aspects of KPS with presentations between 31.25%-64.58%.
[18]	Modules as thematic teaching materials	Sago seeding, birds of paradise and Kaswari birds typical of Merauke	This teaching material is suitable to be applied in the learning process, because it improves student learning outcomes.

Based on the literature review on ten scientific articles that have the topic of STEMmodules integrated with the local wisdom, it shows that there are various forms ofmodules designed to stregthen students' understanding through cultural approaches and local contexts. These modules incorporate aspects of Indonesian local wisdom to facilitate more relevant and engaging elearning for students. For example, a biotechnology module integrates teh culture of Manggo Cultivation as a scientific context. [10]. Furthermore, the analysis shows that there are modules that link physics lessons with traditional musical instruments [11], such as Guitar [12], Beduk [8], and Gondang Sambilan [13]. This shows that physics modules can be more interesting through the integration of local wisdom in the form of traditional musical instruments from various regions in Indonesia.

The module design will make students more interested in physics concepts. In addition, there are also STEM modules that discuss physics concepts that use the local wisdom of Timba Laor as a tradition that is integrated in the module [15]. The use of STEM modules integrated with various local wisdom traditions not only supports the understanding of science concepts, but can also foster love and appreciation for Indonesian local culture.

The forms of STEM modules developed based on the results of the analysis in the research conducted have differences and diversity of forms. The forms of STEM modules developed consist of, package books designed to present material in depth [11]student worksheets as a tool for STEM learning based on local wisdom [11], e-modules based on Canva application [13], and digital module based on guided inquiry [16]. The results of the literature study also show the uniqueness of the module presentation, such as the STEM module that raises the tradition of the Palembang Limas House [14]. In the module, image visualization is used to reinforce the concept through various shapes in Palembang Limas houses. In another aspect, the results of the literature study showed that the STEM module involving the drum musical instrument had a visualization design of various types of images and icons that were attractive to students [8]. In another design, the STEM module that integrates Kudus batik craftsmen has a design display that emphasizes the different colors and patterns of batik motifs that are diverse and attractive to students [8] [16]. Thus, the integration of local wisdom in this STEM module makes the module more diverse and interesting from the visualization and appearance aspects.

The results of the literature study also showed the use of sago culture, typical Merauke birds, and Kalimantan forests. The context of local wisdom can be utilized in the form of STEM modules that function as thematic teaching materials in accordance with the characteristics of regional local wisdom. [17]. The existence of this module can help students learn and understand abstract science concepts and can apply them in everyday life. Thus, the results of the literature study show that local wisdom-based STEM modules have a variety of designs according to the concept of science, local wisdom, and its form. In general, the module was developed with the main purpose of presenting science concepts linked to relevant local wisdom.

THE IMPACT OF USING LOCAL WISDOM-BASED STEM MODULES

The results of the literature study on STEM-based learning modules with local wisdom integration showed significant positive impacts on various aspects of students' skills and understanding. The module that raises mango cultivation as a context of biotechnology can increase students' involvement and interest in the material by giving positive responses during the learning process [10]. Furthermore, STEM modules that integrate traditional musical instruments, such as those using guitar and drum, can improve students' science literacy and creative thinking skills with good effectiveness [12][8]. Furthermore, a Canva-assisted STEM module that highlights the traditional musical instrument "Gordang Sambilan" has an impact on improving students' communication skills in learning physics concepts [11][13].

Another literature study on STEM modules that incorporate illustrations of Palembang Limas Houses has an impact on students in understanding the material more clearly, increasing learning motivation, and facilitating understanding through a visual approach that is close to the surrounding culture of students [14]. In another STEM module that raised the local wisdom of Timba Laor from the Maluku coastal community had an impact on improving students' understanding of physics concepts contextually [15]. In another module in the form of e-modules based on guided inquiry with the local wisdom of batik craftsmen in Kudus, it provides good effectiveness in honing students' critical thinking skills [16].

The digital microscope-based STEM module that raises local wisdom about the diversity of Kalimantan forests also has a significant impact on improving students' science process skills [17]. Meanwhile, STEM modules in the form of thematic teaching materials with local wisdom of sago and birds typical of Merauke can improve learning outcomes and increase students' love for cultural heritage [18]. Based on the results of the literature study as a whole, STEM modules based on local wisdom can help students understand science concepts, support the development of critical thinking skills, creativity, communication, and increase students' appreciation of local culture in Indonesia.

IV. CONCLUSION

The results of the literature study show that STEM modules based on local wisdom have a variety of design forms, this is based on the type of local wisdom integrated in the module. In addition, the difference in design form is also influenced by differences in the presentation of material and local wisdom in the module content associated with the science concept. The results of the literature study show that the use of STEM modules based on local wisdom in science learning has an impact on improving understanding of science concepts, helping to develop various skills in students, and being a means of increasing appreciation and love for Indonesian local culture.

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Abstract—This research aims to conduct a literature study on the implementation of ethno STEM in science learning. The focus of the study includes the form of projects on the implementation of ethno STEM and its impact on science learning. This research uses a literature study with four main stages, namely determining the topic of study, namely about ethno-STEM projects and their impact on learning, searching and selecting literature databases, analyzing and synthesizing literature, and organizing the results of analysis and synthesis in the form of writing. The results of the literature study show that the implementation of ethno STEM in Indonesia generally uses projects that link science concepts with various traditions, cultures, and processes that are unique to a region. Examples of projects that are widely applied include the manufacture of environmentally friendly products such as natural fabric dyes and herbal soaps, traditional games to understand physics concepts, and miniature buildings that are in accordance with local physical characteristics. The form of ethno STEM projects has an orientation on making products by utilizing goods around students, and paying attention to environmental aspects. Thus, the ethno STEM projects developed have products that are environmentally friendly, have aesthetic value, and are beneficial to the community. Furthermore, the literature study shows that the impact of ethno STEM implementation not only improves aspects of science knowledge and understanding, but develops various skills in students, such as critical thinking skills, creativity, and science literacy.

Keywords— Implementation, Ethno-STEM, Science Learning

I. INTRODUCTION

Science learning in schools is designed to develop students' understanding of the scientific concepts underlying natural phenomena and to train critical, logical, and analytical thinking skills [1]. Science subjects include various fields of science such as physics, biology, chemistry, and earth science which all play an important role in understanding and solving environmental and social problems in the modern era. By learning science, students are expected not only to understand the theory, but also to be able to apply scientific knowledge in everyday life, especially in contexts that are relevant to the environment around students.

Under these conditions, innovative approaches such as *ethno-STEM* (culture-based *Science, Technology, Engineering, Mathematics*) become an alternative in developing science learning that is relevant to local culture and presents the development of various skills. In its learning design, ethno-STEM can connect scientific concepts and local wisdom with various projects developed during the learning process [2]. Ethno-STEM can enable students to learn science with a context that is closer to their daily lives. Thus, learning science becomes more meaningful and can increase their understanding as well as their love for local culture.

The application of *ethno-STEM* in science learning can present a learning process that is contextual, meaningful, and relevant to students' lives through the integration of local cultural elements into the concepts of science, technology, engineering, and mathematics [3].This approach is able to bridge the gap between scientific theory and daily experience, and create learning that makes it easier for students to understand science concepts through cultural contexts that are close to students' lives. The implementation of *ethno-STEM* is important because it allows students to understand science not only conceptually, but also through experiences and local wisdom that contains social and environmental values [4]. In addition to learning about scientific phenomena, students also develop an understanding of the application of science to solve problems in society. This approach supports the development of 21st century skills, such as critical, creative, and collaborative thinking that will be a provision in facing global challenges, as well as increasing students' love for local culture [5]. Thus, the implementation of *ethno-STEM* in science learning is an important part in producing students who have broad knowledge and are able to apply scientific skills to the local cultural environment.

Although there have been many studies on the implementation of ethno-STEM in Indonesia, there has not been any mapping specifically related to the form of ethno-STEM projects that describe the types of

projects in learning. In addition, no one has specifically studied the impact of ethno-STEM projects on various aspects, such as understanding and skills. Based on this, this research conducted a literature study to examine the implementation of ethno-STEM learning in Indonesia with a focus on the form of ethno-STEM projects in science learning and their impact.

II. METHOD

The research conducted a study on the implementation of ethno-STEM in science learning by using a literature study with 4 main stages, namely determining the topic of study, namely the ethno-STEM project and its impact on learning, searching and selecting literature databases, analyzing and synthesizing literature, and organizing the results of analysis and synthesis in the form of writing [6]. The topic chosen in this research focuses on the implementation of ethno-STEM in science learning with the main study of the form of the project and its impact on science learning. The article search process uses various sources such as google scholar and various other journals that have relevance to the topic and theme of the study. Article selection is carried out based on several things, namely the year of publication with a limit of the last ten years, the contents of the article have compatibility with the topic of study, and the article has complete journal identification. The analysis and synthesis process uses a matrix table that examines the contents of the article in the form of abstracts, introductions, methods, and results as a whole. The results of the analysis and synthesis are organized in the form of complete writing.

III. RESULTS AND DISCUSSION

This section presents the results and discussion of the results of the literature review on the implementation of ethno-STEM in science learning with a focus on the project and the impact on learning. The discussion consists of two main parts, namely the form of ethno-STEM implementation in science learning and the second part discusses the impact of ethno-STEM implementation on science learning, especially for students.

Ethno-STEM Implementation in Science Learning

Based on the analysis and synthesis of ten articles that have been determined according to the topic, the implementation of ethno-STEM in science learning and the impact on learning are obtained, as presented in Table 1 which describes the implementation of ethno-STEM in science learning in the form of projects and results.

Table 1: Implementation of Ethno-Stem in Science Learning and Impact on Students

No.	Author Name/Year	Ethno-STEM project	Impact/Outcome
1.	[7]	Bag model comfortable sling strap (has little pressure)	The results showed that the implementation of ethno-STEM-based science learning is said to be effective.
2.	[8]	Traditional Game of Lompek Kodok	The increase in students' critical thinking skills with an N-Gain of 0.75 which indicates that the class is in the category of critical thinking high.
3.	[9]	Make herbal soaps with various scents.	Based on the results of this project, students' critical thinking skills include good criteria with the highest achievement in the aspect of providing simple explanations. Meanwhile, students' creative thinking skills include good criteria, with the highest achievement in the flexibility aspect.
4.	[10]	Making shrimp crackers and Samier crackers from cassava.	The Ethno-STEM approach in science learning, particularly through the making of shrimp crackers and cassava samier, is an effective method to link scientific knowledge with local culture. This approach increases learner engagement while strengthening understanding of natural science concepts in a deeper and more relevant way.
5.	[11]	Explaining energy transformation through the making of hand-written batik in the sidoarjo hand-written batik industry area	The use of the Ethno-STEM integrated inquiry model significantly improves students' science literacy skills.
6.	[12]	Students pay attention to life around Tempe Lake.	The impact of the implementation of ethno-STEM project-based learning (PjBL) in this study is very significant. First, there was an increase in

No.	Ref	Project	Results
			students' higher order thinking skills (HOTS), especially in analytical and creative aspects, with the majority of students in the medium category. Secondly, this study succeeded in reducing students' misconceptions related to physics concepts, which can be seen from the decrease in the error rate in answering questions.
7.	[13]	Gadang, Katidiang, and Kombuk house designs	The impact of implementing ethno-STEAM project-based learning model. The results showed that learning with this model was interesting for students and successfully improved students' numeracy literacy skills.
8.	[14]	Make environmentally friendly fabric dyes by utilizing materials around us.	Student responses to the learning tools provided showed the highest percentage in the good to very good category.
9.	[15]	Making 'Waelia' as an implementation of ethno STEM-based colloidal chemistry	Thus, student skills of 98.1% and student skills of 94.09% show that students and students really understand the implementation of colloidal system material through making 'Waelia' drinks.
10.	[16]	Baingkaan or balala-samaan game	The implementation of ethno-STEM learning through traditional South Kalimantan games provides interactive, creative and innovative learning for students,

Based on a literature review on 10 scientific articles that examine the implementation of ethno STEM, in general, the form of projects developed is based on culture and tradition. The ethno-STEM approach in science learning involves the integration of local cultural elements in teaching science, technology, engineering and math concepts. A literature review of various studies shows that the implementation of ethno-STEM in science learning is packaged contextually and interestingly, such as on the concept of parabolic motion packaged through ethno-STEM projects with the Traditional Game Lompek Kodok [8]. By using this game, students are invited to understand the concept of motion through direct experience that strengthens critical thinking skills. In another form of implementation, the development of ethno STEM uses a project to make a bag model with a comfortable sling strap on the concept of pressure [7].

Another literature study describes herbal soap making as an ethno-STEM project that directs students to utilize local ingredients in soap making [9]. This project integrates creative and analytical thinking skills, especially in understanding biology concepts related to plants and their health used in making herbal soap. Thus, this ethno-STEM-based learning not only improves scientific skills, but also introduces environmental conservation values through environmentally friendly products. The implementation of ethno-STEM in science learning is also found in the project of making written batik which is associated with the concept of energy transformation [11]. Through this project, students learn about energy transfer in the batik making process, so that the understanding of physics concepts in energy becomes more concrete. The use of this inquiry-based ethno-STEM approach proved effective in improving students' science literacy, with a significant increase in scores on the post-test, showing positive learning outcomes in terms of scientific skills and understanding of energy concepts.

Another studies show that a project-based ethno-STEM approach around Tempe Lake involved students in making miniature floating houses to learn physics concepts such as gravity and buoyancy [12]. The learning design can reduce misconceptions and hone students' higher-order thinking skills (HOTS). Another form of project in ethno STEM implementation is the design of Gadang, Katidiang, and Kombuk houses [13]. The project trains students to apply science and mathematics concepts in designing house designs that still pay attention to engineering and aesthetic aspects. Other ethno-STEM projects took the form of making environmentally friendly fabric dyes by utilizing materials around, making 'Waelia' as an implementation of ethno-STEM-based colloidal chemistry, and the Baingkaan or balala-samaan game [14][15]. In general, Ethno-STEM projects developed in several studies that have been conducted emphasize the manufacture of products that utilize goods around students. In addition, Ethno-STEM projects also develop products that are environmentally friendly and pay attention to the aesthetic aspects of their products.

The Impact of Ethno-STEM Implementation on Science Learning

The results of the literature study also show that the implementation of ethno-STEM in science learning provides benefits in various aspects, such as improving understanding of science concepts, critical thinking skills, creative skills, and science literacy. By integrating local culture in the context of science learning, students get a more relevant and meaningful learning experience, which helps them connect scientific concepts with everyday life. This approach also enriches the learning process with cultural values and local wisdom, which not only improves academic achievement, but also gives students an appreciation of their local culture.

One of the positive impacts of ethno-STEM implementation is the improvement of students' critical and analytical thinking skills in ethno STEM learning with the traditional game Lompek Kodok as a tool to understand the concept of parabolic motion [8]. The results showed that this approach can improve students' critical thinking skills with a high N-Gain value. A similar impact was found in a study integrating traditional South Kalimantan games to teach parabolic motion [16]. The project not only made learning more interactive but also improved students' analytical skills through deeper concept understanding [16].

In addition to critical thinking, the ethno-STEM approach also impacts creative thinking skills. For example, the project of making herbal soap based on local culture [9]. The project activities not only introduce students to the concepts of biology and chemistry, but also encourage students to think creatively in developing products that are environmentally friendly and relevant to the needs of the community. This study showed that students were more skillful in applying science knowledge to solve real problems, and considering sustainability and cultural aspects. Another impact of the implementation of ethno-STEM in science learning is the improvement of students' science literacy. The ethno-STEM inquiry model applied in batik making in Sidoarjo [11]. Her research showed an increase in science literacy with higher scores. Students not only understand the concept of energy transformation, but can also relate it to the batik making process that connects scientific knowledge with local cultural activities [11].

Overall, the impact of ethno-STEM implementation in science learning has a positive impact on students. This approach makes students more involved in the learning process through culture-based projects that are relevant to everyday life. Cognitively, students experience increased understanding of scientific concepts, critical and creative skills, and increased love for local cultural values. Ethno-STEM not only improves academic learning outcomes, but also provides more contextualized learning and helps create a more engaging and sustainable learning process.

IV. CONCLUSION

The implementation of ethno STEM in Indonesia generally uses projects that link science concepts with various traditions, cultures, and processes that are unique to a region. The form of ethno STEM projects has an orientation on making products by utilizing goods around students, and paying attention to environmental aspects. Thus, the ethno STEM project developed has products that are environmentally friendly, have aesthetic value, and are beneficial to the community. Furthermore, the literature study shows that the impact of ethno STEM implementation not only improves aspects of science knowledge and understanding, but develops various skills in students, such as critical thinking skills, creativity, and science literacy.

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Gamification in Physics Education: Trends, Impacts, and Insights from the Last Decade

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Abstract— **Deepening knowledge in physics is one of the skills least mastered in classrooms, whether by students or college students. Science is a subject that constantly evolves, requiring high-level thinking skills to understand and deepen its concepts, especially in today's era. To facilitate this understanding, students are introduced to the concept of gamification. The use of gamification in education, particularly in physics, has attracted researchers to develop contributions and create more effective learning methods. Physics gamification is aimed at making it easier for students to understand physics concepts, allowing them to directly manipulate and interact with these concepts. This system enables students to observe concepts in real-time and receive immediate feedback on their work. Evaluation results indicate that physics gamification not only improves knowledge but also sustains high learning motivation. Therefore, we conducted a systematic literature review of scientific articles published in the Scopus database from 2015 to 2024.**

Keywords— *Gamification, Physics, Education, Motivation, Learning*

I. INTRODUCTION

Lately, gamification, which relies on the use of game-based elements, has been rapidly developing. The goal of gamification is to motivate learning, enhance education, and also solve problems that are considered difficult in the learning process)[1],[2]. It is important to understand that the idea of incorporating games into learning is not new. Many individuals have been using digital games to facilitate learning in formal environments since the 1960s [3], [4]. However, the term "gamification" was only officially recognized a few years ago, after which it gained widespread popularity [5], [6]. Gamification refers to the use of game design elements in non-game contexts [7]. The use of gamification has had a significant impact across various fields, including transportation [8], with the most notable impact being in the field of education [9]. Generally, research on the application of gamification in education has focused on investigating how gamification affects students' attitudes, which in turn motivates them to engage more actively in learning [10]. The benefits of gamification in education include fostering motivation within students and improving their academic performance [11], enhancing the motivation behind the development of the learning process [12], and promoting healthy competition [13]. Games can deepen knowledge and facilitate understanding of lessons because the learning process that incorporates gamification can create an active, enjoyable, and engaging learning environment [14]. Games are an effective teaching method that is both challenging and motivating, encouraging students to take responsibility for their own learning [15] However, this requires well-designed and systematic games with a framework that ensures effective outcomes [16].

One of the common problems encountered in physics education is that students often perceive physics as difficult and uninteresting. Many students struggle to understand the scientific process, such as the application of the scientific method, which requires continuous practice. Therefore, to enhance motivation in learning physics, students need to make connections between concepts and physics formulas. There are many ways to motivate students to increase their interest in learning physics, such as by incorporating engaging activities, like using modern technology (computers, the internet, or mobile phones), which are enjoyable and contribute to achieving good learning outcomes. Thus, the role of gamification in physics education is essential to improve students' learning motivation.

II. METHOD

In order to generate more specific and comprehensive knowledge regarding gamification in physics education, I am conducting a Literature Review, also known as a Systematic Literature Review (SLR). SLR employs a systematic and structured method to identify, filter, and gather all relevant research material that aligns with the established research questions. SLR is a highly recognized and well-organized methodology, widely used in research [17] The methodology chosen is the PRISMA model,

which involves several stages, including the criteria for eligibility, the development and presentation of information sources, the process of literature screening, and the synthesis of data based on pre-established literature [18], [19].

Review Process

In the search for relevant articles, the keywords used in the metadata search were "gamification in physics learning." The article search was conducted using the Pop software with the Scopus database, and the metadata was obtained from Scopus on November 1, 2024. The Scopus database search was limited to the past 10 years, from 2015 to 2024.

Data Extraction and Analysis

We obtained 112 sources, but these included articles, conference papers, conference reviews, letters, and reviews. We selected only the articles, resulting in 39 articles. After further filtering, we focused on those that discussed gamification in physics education. Although there were many relevant articles, only 7 were accessible and directly related to physics education. We then analyzed each of these articles individually.

To examine the content of the articles we analyzed, the following questions were used:

1. How has research on gamification in physics education developed?

2. What resources are used in the implementation of gamification in physics education?

3. What are the impacts of gamification in education on student learning outcomes and motivation?

III. RESULTS AND DISCUSSION

This section presents the results of the literature review on gamification in physics education. The discussion is divided into three main topics: the development of research on gamification in physics education, the resources used in implementing gamification in physics education, and the impact of gamification on student learning outcomes and motivation.

Tabel 1. Metadata Analysis Results of Selected Articles

Article Code	Year	County	Author	Number of Citation	Keywords
A1	2019	Brazil	J. Rose	0 times	Gamification, Physics Education, Active Learning, Normalization Benefits.
A2	2020	Indonesia	S. saprudin	times	Optical... Gamification (OG), Random Model, Serial Model, Concept Mastery.
A3	2020	Poland	D. Dziob	44 times	Assessment Methods, Board Games, Collaborative Testing, School Gamification.
A4	2021	Philippines	D. C Del Mundo	3 times	Innovation, ICT, Integration, Multimedia, Learning.
A5	2022	USA	S. Balci	99 times	Bagdes, Leaderboards, Gamification, Motivation.
A6	2024	Jepang	T. Katanosaka	1 times	Gafication, Interactive Learning, Physics.
A7	2024	Mexico	A.S Calderon	0 time	STEM Education, Gamification, Escape Room, Physics.

Tabel 2. Substantial Analysis Result of Selected

Article Code	Method	Research Subject	Data Collection Tools	Physics Material	Key Findings
A1	Quasi-Experiment	High School Student	Questionnaire and test	Geometric Optics (Principles of geometric optics, light reflection, refraction, optical phenomena, image formation, and plane mirror).	High school students are motivated by the use of gamification in physics learning.
A2	Quasi	High	Multip	Waves and	Students

					amificatio n.
	- Experiment	School and Undergraduate Student	le- choice simulation (MCQ) and quiz	Optics (Interference, Diffraction).	experience improvements in understanding the material.
A3	Experiment	High School Student	Survey and quiz	Waves and Vibrations and Optics.	Students are motivated in physics learning.
A4	Quasi- Eksperiment	Junior High School Students	Pre- test and Post- test	Conduction, Convection, and Radiation

Students do not feel bored in physics. | Students do not feel bored in physics learning because of gamification. |
| A5 | Eksperiment | Student | Questionnaire, Pre- test, and Post- test

Mechanics | Mechanics and Motion. | Although gamification was used, there was no significant improvement in understanding mechanics concepts, but they felt motivated. |
| A6 | Quasi- Experiment | Senior High School Students | Pre- test and Post- test | Projectile Motion, Conservation Law, Torque Moment Students enjoyed learning more when using | Students enjoyed learning more when using gamification rather than conventional methods. |
| A7 | Experiment | Senior High School Students Pre-test and | Pre- test and Post- test | Electrical Circuits, Conductivity | Students were enthusiastic about learning and highly motivated to learn through g |

Based on the articles we have selected, which focus on the analysis of the use of gamification in physics education over the past decade, recent years have seen a significant increase in research on gamification in education. This trend has reinforced gamification as a rare but emerging phenomenon [7]. Gamification is defined as the use of game design elements in non-game contexts to motivate learning, enhance engagement, and improve service quality [5]. There are several key elements of gamification, including goals, relevant rules, quick feedback, rewards, intrinsic motivation, error detection in the process, happiness, storytelling, levels, abstraction from reality, competition, problem-solving, collaboration, and sacrifice. However, not all elements of gamification need to be present in every activity. It can be understood that its use can range from a few elements to many. To ensure effective use, it is essential to understand the function of each element in order to interact appropriately with each activity [20].

Based on the table above and the selected articles, there are 7 countries that have implemented gamification in physics education: Brazil in 2020, Indonesia in 2019, Poland in 2020, the Philippines in 2021, the USA in 2022, Japan in 2024, and Mexico in 2024. The most cited articles come from the USA. Although the findings in the development of physics education were not significantly transformative, gamification still managed to motivate students. It is also evident that articles from Poland were frequently cited as references, since Poland is known for having one of the best education systems. In Poland, the use of gamification in physics education showed positive effects, including improved understanding and a more enjoyable learning experience. In general, countries that have implemented gamification in physics education have seen significant increases in student motivation, with learners reporting that they enjoyed the process and found the material easier to understand. The participants in these studies included both students and university students. All the countries used a quasi-experimental method, which is more suitable for physics education.

Development of Research on Gamification in Physics Education:

In article A1, the research on gamification in physics education was designed as an interactive learning strategy to increase student motivation and enthusiasm for learning. The study showed positive results in secondary school physics education by utilizing gamification. The method employed was a quasi-experiment, dividing students into two groups: one using traditional methods and the other using gamification. The results indicated that the group using gamification showed a greater improvement in understanding compared to the traditional group.

Elements such as immediate feedback, tiered challenges, and storytelling were used to create a learning environment similar to that of a game, which helped motivate the students individually [7].

In article A2, the research on gamification in physics education has evolved by implementing information technology to foster an active and engaging learning approach. For example, Optical Gamification (OG) in the topics of interference and diffraction demonstrates how gamification elements, such as level systems and evaluations, can enhance students' understanding of physics concepts. The study concluded that both random and serial models are equally effective in improving conceptual knowledge of physics, even though the methods of accessing them differ. The design of physics learning applications based on ICT is expected to become easier in the future [21].

In article A3, research on gamification in physics education has developed through testing the effectiveness of the assessment process using a board game to enhance students' understanding in physics classes. This study was conducted with high school students in Poland, with 131 students participating. They were divided into two groups: the experimental group and the control group. The experimental group used a board game-based assessment method after completing topics on waves, vibrations, and optics, while the control group used traditional tests. The results showed that gamification, specifically using the board game, offered numerous benefits, including higher scores compared to traditional learning. In terms of motivation, students in the experimental group showed better engagement due to the interactive nature of the learning process, and they demonstrated superior retention and understanding, as they retained the material better after one week compared to the control group, who followed conventional learning methods [11].

In article A4, research on gamification in physics education has progressed through the use of a game known as Project G.O.A.L. The benefit of this study is to enhance students' academic knowledge of physics concepts such as conduction, convection, and radiation, by implementing game-based activities that can be conducted online during the COVID-19 pandemic. By using gamification, students showed greater enthusiasm in learning physics [22].

In article A5, research on gamification in physics education has developed, as evidenced by the use of elements such as badges and leaderboards, which are sometimes employed to increase student motivation and participation. However, the results of the study showed that the use of gamification did not always lead to significant changes in conceptual understanding or material comprehension. In two experiments related to online physics tutoring, the use of badges and leaderboards did not show rapid improvement in understanding, but students provided positive feedback

regarding the motivational boost they experienced [23].

In article A6, research on gamification in physics education has progressed, showing the use of a system that encourages participation through interactive simulations. In this study, the researchers refined PhyGame, a gamification system that includes elements such as points, badges, and leaderboards, aimed at fostering motivation in physics learning [24]. Examining gamification in education, particularly in science, can enhance students' knowledge and learning motivation [25].

In article A7, research on gamification in physics education has progressed by focusing on the use of escape rooms as an effective gamification method for learning through immersive experiences. The use of escape rooms can enhance motivation in physics education [26]. Gamification through escape rooms can meet the expectations of students who dislike traditional learning methods [19].

Resources Used in Implementing Gamification in Physics Education:

In article A1, two resources are used in implementing gamification in physics education: Learning Management System (LMS) as a tool for managing student grades [27], and Kahoot, which is used for online gamified assessments in physics education. Kahoot allows for the automatic tracking of students' correct answers, displaying their scores and rankings [28].

In article A2, the resource used in implementing gamification in physics education is the use of online resources, specifically mobile gamification, which helps boost motivation and ensures learning objectives are met. It is considered a reliable application for physics education [29].

In article A3, the resources used in implementing gamification in physics education include offline components. These offline components are designed to integrate collaborative and interactive learning in physics. The Board Game used for assessment in this gamification requires a circular track to visualize the movement of students' scores based on their answers. The questions incorporate elements such as charades or word guessing related to physics phenomena and famous physicists, ranging from multiple-choice questions to experimental problems. Offline evaluation tools and questionnaires are also used. After the game, students are required to fill out a self-assessment questionnaire based on the Likert scale to evaluate the lessons they have learned. The questionnaire is also used to assess the impact of the method used in the game on test anxiety, team contribution, and short-term knowledge retention [11].

In article A4, two resources are used in implementing gamification in physics education. The first is an offline resource, where this gamification relates to simulations that help facilitate independent

learning by illustrating physics concepts without needing an internet connection [22]. The second resource is online, which includes PhET and Boardworks Software. These tools serve as gamification resources to create more effective learning simulations, allowing students to interact with simulations to better understand physics concepts. They can be accessed via computers and require an internet connection for use. These tools are especially useful for practicing physics concepts through visual representations, making them beneficial for distance learning. In addition to PhET and Boardworks Software, Google Forms is also used to check students' understanding after using Gamification G.O.A.L., providing a more immediate, effective, and efficient way to assess comprehension [30].

In article A5, the resources used in implementing gamification in physics education include online resources, where researchers utilize gamification tools such as badges and leaderboards, which are commonly used in online learning. These tools are employed to measure the extent of students' understanding of physics material and to motivate students in their learning [23].

In article A6, the resources used in implementing gamification in physics education include online resources. PhyGame is an online system used for interactive physics learning, offering features such as points, badges, and leaderboards that can be accessed online (Katanosaka et al., 2024). Another tool used is PhET Interactive Simulation, which provides interactive simulations for physics learning and requires online access e [15].

In article A7, two resources are used in implementing gamification in physics education: both offline and online. The gamification tool, escape room, can be used both online and offline. In the gamification strategy, offline tools such as physical puzzles are also used [31].

The impact of gamification in learning on student learning outcomes and motivation

The article A1 discusses how gamification can fundamentally improve student motivation and learning outcomes, using elements such as challenges, grades, direct feedback, and rewards to create a learning environment that makes studying more engaging and motivating. The study in the article shows a significant improvement in learning outcomes compared to traditional teaching methods. In this literature, two groups of high school students were involved. The first group used gamification in their learning on topics related to Geometrical Optics (Geometrical Optics principles, light reflection, light refraction, optical phenomena, image formation, and plane mirrors). The second group did not use gamification, instead following traditional learning methods, but covered the same material as the first group. The final results showed that students who learned with gamification performed better than those using traditional methods, with a shift from (g = 0.11) to (g = 0.38), according to the Hake test, reflecting a "normalized gain" (9.43). This first article emphasizes the balance between student challenges and skills (the "flow" theory) (McGonigal, 2011), as well as intrinsic motivation elements such as autonomy and competition. Gamification in education requires careful planning and foundational knowledge from instructors to manage what can and cannot be done during physics learning, along with challenges that maximize student participation and learning outcomes [32].

In Article A2, the motivation for learning through gamification in physics education aims to enhance students' motivation by varying learning activities to be more engaging and by creating a more lively classroom atmosphere. In this article, Optical Gamification (OG) is used as a tool to generate student interest in topics such as Waves and Optics (Interference, Diffraction), which are often perceived as difficult and hard to understand. The model employed, which includes both serial and random approaches, significantly influences student enthusiasm. Essentially, the serial model, with its clear and easy-to-understand steps, motivates students to solve problems step by step, whereas the random model introduces variation and rewards, which can engage students who often become bored with repetitive routines [33].

The results of student learning in this article suggest that a properly implemented gamification approach can deepen students' understanding of physics concepts. Students who learn through the OG gamification model show positive effects as they gain a better grasp of the concepts. This process involves problem-solving and interaction within the gamified structure. The model used affects student learning outcomes: the serial model facilitates a more detailed understanding of the concepts, while the random model helps students explore topics that require a more interactive, and even different, approach [33].

In Article A3, the motivation for learning through gamification in physics education has a positive impact on both student motivation and learning outcomes. Many high school students using a gamified assessment method showed a significant increase in motivation, a reduction in pre-exam stress, and an improvement in participation during learning activities [21]. High school students were more motivated to study physics, particularly topics such as Waves, Vibrations, and Optics, through gamification. Gamification created a competitive classroom environment that encouraged collaboration among students, fulfilling one of the intrinsic elements of gamification, which in turn strengthened their motivation to learn physics (Dicheva, 2015).

High school students who used gamification for assessments achieved better learning results compared to those who did not use gamification in their studies.

Before gamification, the students were given a test, and after engaging in gamified learning, they were tested again with the same questions. The results showed an improvement in knowledge, especially when compared to the group that used traditional learning methods. This demonstrates that gamification can deepen high school students' understanding of physics and strengthen their knowledge and comprehension, even over a short period [11].

In Article A4, the motivation for learning through gamification in physics education, specifically on topics such as Conduction, Convection, and Radiation, has a positive impact. The use of gamification through the Project G.O.A.L. method minimizes boredom and enhances motivation among high school students in learning physics. The key concept highlighted in this gamification approach is heat transfer. High school students were more engaged in the learning process due to the interactive and engaging classroom activities, which were far more stimulating than traditional learning methods that did not involve games. Students felt more relaxed and involved when multimedia devices were used as an additional learning tool, particularly in physics [22].

In terms of learning outcomes, there were several steps taken. First, the students were given questions related to Conduction, Convection, and Radiation. They were then divided into two groups: one group learned through gamification, and the other group learned through traditional methods. Afterward, both groups were given the same questions again. Comparing the pre-test and post-test results showed a noticeable improvement for the group that learned through gamification. The students who used gamification scored higher on the posttest than those who used traditional learning methods. This demonstrates that learning is more effective when gamification is involved, as it helps to enhance and develop high school students' understanding of physics concepts, especially Conduction, Convection, and Radiation.

In Article A5, the motivation for learning through gamification in physics education, specifically in the topics of Mechanics and Motion, shows that gamification does not instantly improve understanding and knowledge. However, elements used in the physics lessons, such as badges and leaderboards, can have a positive impact. According to student comments, they enjoyed using gamification in physics, especially when the lessons were conducted online. This approach has a positive effect by motivating students to stay more focused during the learning process. Students who engaged in gamified learning were much happier because badges, as a marker of their learning progress, helped them track how much they had developed and also motivated them to reach the end of the learning process. Furthermore, leaderboards encouraged students to persist, as they kept trying until they succeeded, boosting their self-confidence.

In terms of learning outcomes, the application of badges and leaderboards did not significantly affect students' academic performance. There was no rapid progress in either of the two experiments, despite the support provided by gamification. However, students did benefit in terms of interactivity and motivation for learning. The study concluded that, academically, gamification had a minor effect, but it effectively motivated students to continue learning using gamification tools like badges [34], [35].

In article A7, the use of gamification through the escape room approach can significantly enhance motivation in learning, especially in physics. This article discusses how the material being studied is Electric Circuits and Conductivity. The increased learning motivation is due to the interactive escape room, which helps make the classroom atmosphere more active and enthusiastic in understanding science concepts. The benefits of gamification are noticeable after its implementation in learning, where the activities become less boring, and students actively contribute to the learning process.

Participants who learned through gamification (escape room) gave positive feedback about it, as they felt more creative and excited, which increased their interest in learning physics. The improvement in learning outcomes is not just about understanding science concepts, but also about learning the historical figures who contributed to the development of science itself. Many participants felt motivated after learning with gamification because they gained new knowledge, which is essential for the development of 21st-century skills.

There is also a positive impact on teamwork. Students who used gamification in learning are required to work together as a team to solve the problems within the set time limit. This helps students develop time management skills, improve communication among team members, and, most importantly, foster critical thinking.

Feedback from participants and teachers showed that students recommend using gamification frequently, as it motivates them, which is reflected in their better understanding of concepts and the history of the physics material. Meanwhile, teachers can assess their students directly, as the level of interactivity in class is evident. Teachers also believe that gamification is an innovative and effective tool that should be applied in every physics or science class, as it can significantly increase student motivation and participation in learning.

IV. CONCLUSION

The results from the analyzed articles show that the use of gamification in physics education has a positive impact on both students and university students in various countries, as it leads to improvements in learning outcomes and motivates deeper understanding of physics concepts. Students and university students,

when learning through gamification, are required to engage in more active, interactive, and innovative learning. Many students and university students have stated that learning with gamification is much more enjoyable and easier to understand compared to traditional methods. This can be seen in the significant improvements in both scores and understanding for those who used gamification, while those who used traditional methods still showed little development.

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RADEC as an Innovation Model for Islamic Education Learning Management

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Abstract-This study analyzes the literature on the RADEC (Read, Answer, Discuss, Explain, Create) learning model by offering an innovative approach in Islamic Religious Education aimed at deepening students' understanding and appreciation of religious teachings in the midst of various challenges faced due to globalization. The research used a Systematic Literature Review approach with the stages of determining themes, searching, selecting literature, analyzing and interpreting, preparing drafts, and disseminating results. The research used 20 articles from a selection of 30 studies on three issues, namely, application, development, and challenges. The results of this study show that; the RADEC method encourages students to actively participate through a gradual process that includes reading, answering, discussing, explaining, and creating. Although this model has great potential in shaping students' character and morality, challenges such as teachers' lack of understanding, lack of teaching materials, and students' resistance to new methods need to be overcome. Therefore, training for teachers, development of digital-based teaching materials, and implementation of interactive approaches such as gamification are essential. With the support of parents, it is hoped that the implementation of RADEC can create a dynamic learning atmosphere, producing students who are not only academically smart, but also have a strong character and are able to practice Islamic values in everyday life.

Keywords-innovation, Islamic religious education, radec

I. INTRODUCTION

Islamic Religious Education (PAI) plays a very important role in shaping the character and morality of the younger generation. In the midst of the rapid development of the times and the complex challenges of globalization, PAI learning methods need to be adapted to be more relevant and effective. One innovation that has emerged in this context is the RADEC (*Read*, *Answer*, *Discuss*, *Explain*, *Create*) learning model. This model offers a more interactive and participatory approach, which is expected to increase students' understanding and appreciation of Islamic teachings.

The RADEC model is designed to overcome some of the challenges often faced in PAI learning, such as lack of student interest, monotonous teaching methods, and lack of student involvement in the learning process. In an ideal educational context, students are not only required to understand the theory, but also be able to apply religious values in daily life. Therefore, RADEC integrates various learning elements that encourage students to actively participate and think critically [1].

One of the main challenges is the need to change the *mindset of* teachers who are used to traditional teaching methods. Teachers need to be trained to understand the RADEC model and how to implement it in their daily learning. In addition, as RADEC takes longer to complete one topic, a good time management strategy is needed so that all materials can be delivered effectively. Another challenge is also the changing curriculum in Indonesia which requires teachers to adjust the learning process to fit the demands of the curriculum which emphasizes the development of student skills that are more responsive to the latest developments [2].

In addition, the RADEC model requires an active role from all students. In large classes or with students of diverse learning abilities, there may be challenges in ensuring every student can follow and participate well. A possible solution is to group students based on their level of understanding so that discussions can take place more effectively.

The learning process in the RADEC model begins with the *"Read"* stage, where students are invited to read texts or sources relevant to the material being studied. This stage is important to build students' knowledge base. Next, at the *"Answer"* stage, students are asked to answer questions related to the reading. This not only trains analytical skills, but also encourages students to think critically.

After that, the *"Discuss"* stage provides an opportunity for students to discuss and share opinions about the material they have read. This group discussion can enrich students' perspectives and improve their communication skills. The *"Explain"* stage involves students explaining their understanding to their classmates, which can strengthen their mastery of the material. Finally, the *"Create"* stage encourages students to create something relevant to the learning, such as a project, presentation or artwork that reflects Islamic values.

The application of the RADEC model in PAI learning is expected to create a more dynamic and enjoyable learning atmosphere. By actively involving students in every stage of learning, it is expected that they will not only be recipients of information, but also processors and disseminators of Islamic values [3]. This is very important to build students' character and personality in accordance with Islamic teachings.

Islamic Religious Education requires a method that can accommodate the diversity of students' understanding in interpreting religious teachings. The RADEC model, with its gradual approach, provides opportunities for students to internalize Islamic values through a continuous process [4]. For example, in learning about morals, students are not only invited to understand the concept of good and bad behavior, but also invited to discuss the application of morals in real life. This can have a positive impact on students in shaping character in accordance with Islamic values.

In addition, the RADEC model is also in line with the education curriculum that emphasizes the development of 21st century competencies, such as critical thinking, creativity, collaboration, and communication skills. Therefore, RADEC not only acts as a PAI learning method, but also as a tool to prepare students to face challenges in the modern era [5].

Overall, RADEC as an innovation in Islamic Education learning model provides a comprehensive and integrated approach. By integrating cognitive, affective and psychomotor aspects, this model is expected to produce young people who are not only academically intelligent, but also have a strong character and are able to practice Islamic values in their daily lives [6]. Through proper implementation, RADEC has the potential to be an effective solution in improving the quality of religious education in Indonesia.

This not only helps them understand religious values intellectually, but also be able to internalize and apply them in real life [7]. It is also important for educators to continue to develop and adapt this model to the needs of students, and to involve various parties in supporting the successful implementation of RADEC. Thus, Islamic Religious Education can become more meaningful and relevant, and be able to equip students with skills and values that are useful throughout their lives.

II. METHOD

Systematic Literature Review (SLR) is used in this study with the aim of obtaining a description and data about a variable that is analyzed explicitly, accountable and can be accounted for [8].

The data sources in this research come from scientific papers, such as journal articles, books, notes, and various reports relevant to the problem to be solved. Literature review is carried out in stages 1) Classification and Determination of approach, 2) Article search, 3) Article selection, 4) Data analysis and interpretation, 5) Draft article, and 6) Dissemination of results. At the initial stage, the focus of the study was determined on the theme of RADEC in Islamic learning which includes three things, namely application, development, and challenges.

The results of searching for articles on various pages (*google scholar*, sinta, and other sources) obtained 30 articles which were then selected based on the criteria of publication year and article *indexing*. The results of *screening* and selection obtained 20 articles that became the material for literature review. The articles that have been selected are followed up by analyzing and interpreting the data so that a conclusion is obtained about the theme studied.

III. RESULTS AND DISCUSSION

The results and discussion of this research are based on a systematic review of the literature, with the main focus on three themes, namely the implementation of RADEC, the development of critical thinking skills, and challenges in the implementation of RADEC. The following is an explanation of the three themes.

Application of RADEC to Enhance Understanding and Meaningfulness

In the context of Islamic Religious Education, understanding is not just knowing information, but also a deep interpretation of religious teachings. The RADEC model, with its step-by-step approach, allows students to better understand and make meaning of the material studied. Based on the literature review, the *"Read"* and *"Answer"* stages help students gain initial understanding, which is then deepened through discussion and explanation.

This gradual learning is very suitable for Islamic Religious Education materials that take time to understand and apply. For example, in morals lessons, students not only learn about the concepts of good and bad behavior, but also discuss how to apply these concepts in real life [9]. The *"Create"* stage gives students the opportunity to translate their understanding into relevant real work, which is expected to help them interpret Islamic values more deeply.

Table 1. Representation of articles on RADEC Implementation

Year	Author and Article Title	Research Results
2024	Ayla Paska Hanbali, I. Isrokatun, Ali Ismail "The Influence Of Read, Answer, Discuss, Explain, You Create (Radaec) Learning On Cognitive Abilities And Communication Skilss"	"The application of RADEC Learning has a positive impact on students' cognitive abilities and communication skills."
2024	Hany Handayani,	"The implementation

Year	Author and Article Title	Research Results
	Ihsan Rizali "Educational Innovation in Primary Schools: The Radec Model and Its Effect on Students' Science Problem Solving Ability 5"	of the learning process using the RADEC learning model is effective in improving problem solving of grade 5 elementary school students."
2020	Ahmad, R. & Sari, D. "Application of Radec Model to Improve Students' Mathematics Concept Understanding"	"Application of RADEC Model to Improve Students' Mathematics Concept Understanding"
2021	Budi, A. & Lestari, I. "Effectiveness of Radec Method in Science Learning in Elementary School"	"The RADEC method is effective in improving students' understanding and meaning of science materials."
2022	Citra, F. & Jaya, M. "Implementation of Radec to Improve Students' Critical Thinking Skills"	"RADEC implementation improves students' critical thinking skills and collaboration in discussions."

Based on Table 1, overall, the application of the RADEC learning model is proven to have a significant impact on various aspects of students' abilities, including cognitive abilities, communication skills, problem-solving abilities, concept understanding, and critical thinking skills. This model not only encourages students to be active in the learning process, but also helps them to develop skills that are essential for their daily and future lives.

Thus, RADEC can be considered as one of the innovative strategies in learning that can be applied across different levels of education and disciplines. Educators are expected to adopt and adapt this model in their learning practices to achieve better results in education.

Development of Critical Thinking Skills in the Context of Religion

Islamic Religious Education does not only teach about rituals and doctrines, but also develops students' critical thinking skills to understand the meaning of Islamic teachings in a social context [10]. The literature review shows that the RADEC model encourages the development of students' critical thinking skills, especially at the *"Answer"* and *"Discuss"* stages [11]. Students are encouraged to analyze and evaluate information, which helps them build a more critical and reflective understanding.

Critical thinking is very important in Islamic Religious Education, because students are not only expected to memorize or follow the teachings, but also to understand the reasons behind the teachings [12]. With the ability to think critically, students are expected to face the complex challenges of life and make decisions that are in line with Islamic values [13]. The following article represents the development of critical thinking skills in a religious context.

Table 2. Development of Critical Thinking Skills in the Context of Religion

Engineering and Development	Author and Article Title
Critical Discussion and Q&A Methods Use group discussions to encourage students to ask questions and think critically about the material.	Ahmad, R., & Sari, D. (2021).
Project-based Learning with a Focus on Moral Issues Students engage in projects that require them to explore and discuss moral issues in a religious context.	Budi, A., & Lestari, I. (2022)
Personal Reflection and Group Discussion Students conduct personal reflections on religious teachings and discuss them in groups to deepen understanding.	Budi, A., & Lestari, I. (2022)
Use of Interactive Technology and Learning Videos Utilize technology to present interesting and interactive learning materials that stimulate critical thinking.	Dwi, Y., & Rahmawati, S. (2024).

Table 2 shows that techniques and development of critical thinking skills in the context of religion include critical discussion methods that encourage students to ask questions and analyze arguments, project-based learning that focuses on moral issues to understand various perspectives, personal reflection followed by group discussions to deepen understanding of religious teachings, and the use of interactive technology and engaging learning videos to stimulate critical thinking.

By applying these techniques, students are expected to better improve their critical thinking skills,

which will help them in understanding and applying religious teachings in their daily lives.

Challenges of RADEC Implementation in PAI Learning

Although RADEC has various advantages, its application in Islamic Religious Education also has its own challenges. Based on the literature review, one of the main challenges is teachers' readiness to change their teaching methods. Many teachers are accustomed to teaching methods.

Table 3. Challenges of RADEC Implementation in PAI Learning

Challenge	Innovations that can be implemented	Author
Lack of Teacher Understanding of RADEC	Training and workshops for teachers on RADEC concepts and applications.	Suhadi, A. (2021). *Improving Teacher Competence in the Implementation of RADEC in Schools*. Journal of Islamic Education.
Lack of Resources and Learning Materials	Development of digital-based teaching materials that can be widely accessed.	Rahman, M. (2020). *PAI Learning Innovation with Digital Media*. Journal of Educational Technology.
Student Resistance to New Methods	Using interactive and engaging learning approaches, such as gamification.	Hasanah, L. (2022). *Gamification in Islamic Education Learning: Increasing Student Interest*. Journal of Education and Culture.
Time Limitations in Learning Implementatio n	Integration of PAI learning with other subjects for time efficiency.	Nurhayati, R. (2021). *Integration of PAI Curriculum in Interdisciplinary Learning*. Journal of Multidisciplinar y Education.
Lack of Support from Parents	Organize seminars and workshops for parents on the importance of religious education.	Yulianti, S. (2021). *The Role of Parents in*

Challenge	Innovations that can be implemented	Author
		Supporting Islamic Education Learning. Journal of Educational Research.

Based on Table 3 above, the challenges in implementing the Regional Action Plan (RADEC) in Islamic Religious Education (PAI) learning include several aspects, one of which is teachers' lack of understanding of RADEC concepts and applications. This can hinder the effectiveness of learning and the implementation of the expected curriculum. To overcome this challenge, training and workshops for teachers are needed so that they understand well the principles of RADEC and are able to apply them in the learning process [14]. These efforts will improve teachers' competencies and have a positive impact on the quality of education [15].

In addition, the lack of resources and learning materials is also an obstacle in the implementation of RADEC. The development of digital-based teaching materials that can be widely accessed is one of the innovations that can be applied to overcome this problem [16]. By utilizing technology, learning materials can be presented in an interesting and interactive way, so that students are more motivated to learn. In addition, the use of digital media also allows easier access for students, especially in the increasingly common condition of online learning [17].

Other challenges include student resistance to new learning methods and lack of support from parents [18]. To overcome this, interactive and engaging learning approaches, such as gamification, can be applied to increase student interest [19]. In addition, holding seminars and workshops for parents on the importance of religious education can also help create stronger support for students in their learning process [20]. With collaboration between teachers, students, and parents, the implementation of RADEC in PAI learning is expected to run more effectively and achieve the desired goals.

IV. CONCLUSION

The RADEC (*Read, Answer, Discuss, Explain, Create*) learning model offers an innovative approach that can improve the effectiveness of Islamic Religious Education (PAI) amidst the challenges of globalization and the times. By integrating interactive and participatory elements, RADEC not only encourages students to understand religious teachings, but also to apply those values in their daily lives, thus shaping their character and morality. However, its implementation is not free from challenges, such as teachers' lack of understanding of RADEC, the lack of relevant teaching materials, and students' resistance to new methods.

Therefore, it is important for schools to conduct training for teachers and develop engaging digital-based teaching materials, as well as implement interactive approaches such as gamification to increase student interest. With the support of parents through seminars and workshops, it is expected that the learning process can be strengthened. Overall, the implementation of the RADEC model in PAI learning is expected to create a more dynamic and enjoyable learning environment, produce students who are not only academically smart, but also have a solid character, and equip them with skills and values that are useful throughout life.

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Building Character through Gamification-based Learning: A Literature Review

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Abstract—Character education has become an important focus in the education system to form individuals who are not only intellectually and academically smart but also have strong morals and character. This research aims to review gamification-based learning approach as one of the methods that can be used to strengthen character education in elementary schools. Through literature review method from various sources, this research identifies and analyzes relevant literature on the effectiveness of gamification in improving student engagement, motivation, and character development. The results showed that gamification can not only motivate students' enthusiasm for learning but also strengthen educational character values, such as cooperation, responsibility, independence, and resilience. This finding indicates that the application of gamification in education has great potential in creating an interactive learning environment and supporting student character building in the digital era. Thus, gamification learning can build students' character education.

Keywords— character education, gamification, digital age

I. INTRODUCTION

Education today is faced with the challenge of producing human resources that not only have intellectual abilities, but also have strong character and morals. Indeed, in every individual, character has been inherent and exists since birth, but this potential still needs to be fostered and developed early on, both through family socialization and school education [1]. So that a child needs to be educated and get guidance on how to behave and have a good attitude, especially in his daily life[2]. Therefore, the role of education is considered capable of fostering good character and habituation. This has also been regulated in Basic Law number 20 of 2003 concerning the national education system in chapter 1 article 1 which states that "education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and country" where character education is one of the goals that need to be

achieved in the learning process. Character education as a conscious effort in learning to develop the potential of individuals who have strong personalities, morals, and have a positive and constructive influence on their environment[3].

Such as the cultivation of values that include knowledge, awareness or willingness, and action in applying these values to God Almighty, self, others, the environment, and the nation [4]. So character education is considered to play a very important role in shaping the next generation of the nation who are not only intellectually intelligent, but also have noble character and good morals [5]. ikewise, various previous studies have supported the importance of character education in the formation of individuals with integrity. This is based on the rampant cases that occurred in 2020 to 2023, children as victims and perpetrators of sexual violence, bullying, brawls, physical and psychological violence which continue to increase [6]. Seeing so many problems that occur in Indonesia, it is a whip for the world of education, especially basic education as a solid foundation for shaping the character of students [7].

Various solutions have been carried out and developed, especially by the government, which is in the implementation of an education curriculum based on basic standards and competencies directed at the formation of skills and character [8]. Learning in elementary schools should focus on learners with the support of teacher-student relationships that strengthen character through affirmation, visualization, and persuasive language. This process is planned, implemented, and evaluated continuously in every learning session[9].

However, in the face of changes in the digital era, the traditional approach to character education has its own challenges, so that the cultivation of character in students is less achieved. Therefore, innovation in

education, especially a teacher, needs to continue to update and develop competencies to be able to keep up with technological developments, learning strategies and methods so that learning objectives can be achieved perfectly. Then, there is the relevance of integrating innovative approaches, such as gamification in the learning process to overcome this challenge. This approach aims to increase students' enjoyment and participation in the learning process. In addition, gamified learning media also serves to attract students' interest and motivate them to stay passionate in learning continuously [10]. In previous research, learning with the application of game elements in a non-game context, or gamification, is able to increase student motivation and engagement in the learning process [11]. Gamification can be considered as an effective strategy to improve the quality of education amidst the demands of the digital era [12].

So this research looks at an approach that combines aspects of gamification and character education in a systematic and sustainable manner. By integrating gamification technology in character education, it is expected that a more interactive and meaningful learning environment will be created, which is able to shape students into individuals who are not only intelligent, but also have strong character and moral values.

Thus, the purpose of this research is to find out how gamification is able to build character in elementary school children, as well as analyze the impacts that arise in the process. This research is expected to provide new insights and become a reference for educators in developing learning strategies that are more effective and relevant in the modern era.

II. METHOD

This research examines character education in gamification learning through literature review with four stages, namely 1) determining the topic of study and problem formulation, namely how gamification learning can build character education, 2) searching and selecting literature related to the topic, 3) analyzing and synthesizing data, then organizing the writing. [13]. Furthermore, the author will take these four steps to draw conclusions that become the core of the topic that has been chosen.

This research focuses on the topic of character education built through gamification learning. The selection of articles is based on a number of criteria, namely the year of publication, the suitability of the content to the topic under study, as well as the completeness of journal identification obtained from various sources, such as google scholar and other journals relevant to the research topic. With the literature study approach, it is expected to make a significant contribution to the development of a better basic education curriculum. Gathering information through literature studies is considered effective for collecting various data that will later be used by the author to enrich or unify his writing.

III. RESULTS AND DISCUSSION

This section presents the results and discussion of the literature review on how gamification learning can strengthen character education. The discussion consists of 3 main parts, the first part contains a discussion of character education developed in elementary schools through literature review. The second section contains a discussion of the results of the literature review regarding the implementation of gamification learning. And the third section contains the results of research on the impact of gamification learning on character education.

Research Result
Gamification in Education

Articles that represent the implementation of gamified learning in education can be seen in the table below.

Table. 1 Representation of articles on the Implementation of Gamified Learning in Education

No.	Author / Year	Article Title	Research Results
1.	[14]	Gamification in Primary School Learning	Gamification in learning effectively supports psychosocial development, encourages student activity and triggers positive emotions.
2.	[15]	Gamification in Education: Increasing Student Motivation and Engagement	Gamification in education improves student motivation and character through responsibility, cooperation, and healthy competition, encouraging positive behavior and social skills.
3.	[16]	Gamification In Education	Gamification effectively increases student motivation and engagement, creating a positive attitude and an interactive learning environment that supports better understanding and learning outcomes.
4.	[12]	The Role of Gamification in Enhancing the	Gamification can be seen as an effective strategy in improving

No.	Author / Year	Article Title	Research Results
		Educational Experience In the Digital Age	the quality of education as well as shaping student character in accordance with the needs of the digital era.
5.	[17]	Gamification in Education	Gamification supports self-directed learning and encourages long-term engagement, making it an effective tool to enhance the overall learning experience. However, it needs an appropriate strategy in its implementation
6.	[18]	Effectiveness of Gamification in Math Learning	There is an increase in learning outcomes before and after the use of gamification (Kahoot! and Quizizz), so it can be concluded that gamification is effective in learning mathematics.

Gamification Learning for Learner Character Building

Table. 2 Representation of the article on Gamification Learning for Learner Character Building

No.	Author / Year	Article Title	Research Results
1.	[19]	Teacher Creativity in Building Curiosity Character through Gamification Method	gamification method in learning is effective in improving students' curiosity character. By utilizing game elements, gamification can create a more interesting learning environment, encourage student engagement, and help achieve educational goals that are adaptive to technological developments
2.	[10]	The Use of Gamification in the Learning Process	Playing and interacting in a fun atmosphere can foster a positive attitude towards learning. When learning is presented in the form of games, students become more engaged, enthusiastic and motivated to explore new concepts.
3.	[20]	Application of Gamification to Improve Motivation and Collaboration in Elementary School Students	Gamification creates challenges that encourage cooperation between students by dividing team-based tasks. Students are encouraged to collaborate and communicate effectively, to improve social skills.
4.	[21]	Literature Review: Gamification in Primary Education	Game-based learning is effective in increasing student engagement, learning motivation, peer collaboration, memory, and creating a positive and personalized learning environment.
5.	[22]	Formation of Student Character Education Through the Game "Obak Sodor"	The game "Obak sodor" can teach students about responsibility through the rules and roles that must be followed during the game. Students learn to take responsibility for their actions and understand the consequences of decisions taken in a group context.

The impact of implementing gamification in learning on character education can cover several important aspects, especially in the affective aspects of students, including:

1. Cooperation and Collaboration: With the element of healthy competition and game-based challenges, students are taught the importance of working together and building synergy within a team to achieve a common goal. This develops the character of mutual respect, working in groups, and learning to communicate effectively.

2. Responsibility and Commitment: Gamification encourages students to take responsibility for assigned tasks and commit to completing each stage of learning. Students learn to manage time, complete challenges, and maintain consistency.

3. Confidence: The increase in formative assessment scores after the implementation of gamification showed that students became more confident in their abilities. The achievements gained from completing in-game tasks helped them develop confidence and courage to try new things.

4. Ability to Deal with Failure: Gamification teaches that failure is part of the learning process. Students are taught to stay motivated and try again after failing, building resilient character and resilience..

5. Leadership and Initiative: In gamification activities, students are often given the opportunity to lead groups or take initiative in solving challenges. This develops leadership skills and proactive character.

Through the integration of gamification in character education, character education values such as cooperation, responsibility, confidence, resilience, and leadership can grow in line with increased interest and involvement in the learning process. Gamification learning succeeds in creating an interactive and meaningful learning atmosphere, in accordance with the needs of education in the digital era. However, in its application, the selection of gamification types must adjust the characteristics of learners who have been identified and adapted to the characters to be built in the learning process.

Obstacles and Solutions in Implementing Gamification for Student Character Development

Implementing gamification in learning for student character development faces several challenges or obstacles. First, many teachers do not understand the concept of gamification and how to integrate it in teaching and learning activities. Second, limited technology and infrastructure, such as computers, mobile devices, and internet access, are barriers, especially in remote schools. Thirdly, overly competitive gamification can make students focus only on points or rankings rather than on the learning itself, and the game element can be a distraction so that students are more interested in the game aspects rather than the subject matter. Fourth, a tight curriculum and time constraints are also an obstacle, as gamification integration requires additional planning. Finally, differences in student characters mean that not all students respond well to gamification. These challenges point to the importance of teacher preparedness, infrastructure support, and customization of methods that consider student diversity.

Despite the obstacles, there are several solutions to the challenges of implementing gamification in education, which can be done by the following steps. 1) teacher training and development is essential so that they understand the basic principles of gamification and are able to implement it effectively, thus becoming more confident and skillful in using game elements in learning. 2) utilization of simple and inexpensive gamification can be an option, such as by awarding badges, point systems, or paper-based challenges, to reduce reliance on advanced technology. 3) gamification designs that focus on collaboration and character development can avoid excessive competition, for example by using shared missions or team challenges to encourage students to learn to work together. 4) gradual integration of gamification can help teachers tailor its implementation to the time and needs of the curriculum, starting with specific topics or specific times of the week. 5) a personalized gamification approach can give students the flexibility to choose challenges or activities that suit their interests and learning styles. With these steps, gamification can be an effective tool to develop students' character traits, such as cooperation, confidence, and perseverance, while keeping the focus on educational objectives.

Discussion

Character Education

The word "character" comes from the Greek words charassein and kharax, which mean tools for making or to engrave, i.e. "to carve". The term was later reused in French in the 14th century as caracter, then entered English as character, before finally being adapted into Indonesian as "character" [7].

Character is a way of thinking and behaving that characterizes each individual who is reflected in everyday life, and how he works together in the family, community, education, and nation and state.[24]. So this character will underlie a person's personality, perspective, thinking, attitudes, morals and behavior. So that character education can be applied from an early age, with a character that is maintained from childhood, children can grow and develop with a good and strong character [2]. Therefore it is important to build character and various strong values in elementary school children, this is based on:

1. Primary school education at the age of 4-7 years is a critical period for their socio-moral development [25], so at the elementary school level a child needs guidance and direction of his character.

2. Social skill development, where good attitudes are based on character values that help children form positive attitudes and skills needed to interact according to the values prevailing in society. Such as the ability to empathize, responsibility, cooperation, and respect for others[26].

3. A positive learning environment, where a conducive learning atmosphere discourages undesirable behavior, encourages active participation,

independence and discipline that supports children's academic and social development[27].

4. Character education as a filter for negative actions taken by students [28].

There are five character values that need to be strengthened in character education in schools, these values include religiosity, nationalism, integrity, independence, and mutual cooperation. Where each of these values does not stand alone or develop separately, but interacts with each other, grows dynamically, and together forms personal wholeness [29].

Other characters developed in education include honesty, responsibility, cooperation, self-confidence, politeness, discipline, creativity, ethics, and morals, so that students can grow into virtuous individuals [30]. So that these character values can be built in education through the learning process from an early age with the right strategies and techniques. therefore character education becomes an important foundation in the formation of students' personalities.

Gamified Learning

Gamification is an approach to learning by using elements in a game or video game with the aim of motivating students in learning activities [15]. By utilizing game elements such as providing challenges, rewards, competition and achievement satisfaction, where through this gamification technique can foster interest, enthusiasm, and learner involvement through challenges, competence, rewards and satisfaction in learning activities.

According to various articles discussing the results of gamification-based learning implementation in the field of education, the application of gamification has a significant positive impact on students' learning development. Gamification can strengthen character values as it teaches students to follow rules, cooperate, take responsibility and accept results or feedback in a constructive way. This can be seen in increased student interest and engagement in the learning process. In addition, gamification also helps to increase students' confidence, boost their motivation, and ensure that learning objectives are achieved more effectively. The implementation of this method shows that an interactive and engaging approach can create a more enjoyable and productive learning atmosphere.

In implementing gamification learning, of course, there are several things that need to be considered, so that gamification learning can be implemented effectively and efficiently and have a positive impact on the development of students' characters [14]. The steps in implementing gamification learning are :

1. Recognizing students' characteristics, where the teacher needs to understand the students' profile, including previous experience, gender, and

motivation level, which may affect their interest in the game [14].

2. Determining learning objectives, learning objectives should include cognitive and affective aspects, so that they do not only focus on academic results but also on students' emotional and social development[15].

3. Identify appropriate games, i.e. the teacher must choose the type of game that is in accordance with the characteristics of the students and the learning objectives that have been set [14].

4. Developing content, Learning content should be organized by considering the skills and competencies to be promoted, as well as the game elements to be used [16].

5. Adaptation and collaboration, i.e. teachers must be able to maintain student motivation and interest by adapting learning experiences and games according to each student's needs and preferences [15].

IV. CONCLUSION

This study concludes that gamification approaches to learning have a significant positive impact on character education in elementary schools. Gamification elements, such as challenges, rewards and competitions, can increase student motivation and engagement, as well as strengthen character values such as cooperation, responsibility and resilience. In addition, gamification also plays a role in creating an interactive, fun, meaningful and new learning experience for learners. These findings support the importance of integrating gamification as an innovative method in character education to address learning challenges in the digital era.

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The Effect of STEAM Learning through Props on Future Self-Readiness at the Elementary School Level: A Literature Study

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Abstract— The STEAM (Science, Technology, Engineering, Arts, and Mathematics) learning approach is increasingly recognized as an effective method in preparing students to face future demands. This research aims to examine the effect of STEAM learning supported by the use of teaching aids on learners' self-readiness at the elementary school level, by conducting a literature study from various academic sources. The study reviews the role of teaching aids in generating interactive and enjoyable learning experiences and their impact on the development of 21st century skills such as critical thinking, collaboration and problem solving. The literature findings show that the integration of teaching aids in STEAM learning not only improves the understanding of science and technology concepts, but also strengthens learners' motivation and participation in the learning process. In addition, this approach has proven effective in fostering students' self-confidence and independence, which are important components in their future readiness. Thus, the implementation of props-based STEAM is recommended as an innovative educational strategy for elementary schools.

Keywords— STEAM learning, teaching aids, primary school, future readiness, 21st century skills.

I. INTRODUCTION

STEAM (Science, Technology, Engineering, Arts and Mathematics) learning is becoming increasingly important in 21st century education. This approach is also not only concerned with the dominance of the material, but also with the expansion of critical thinking skills, creativity, and problem-solving abilities that are needed to face future challenges [1]. In the context of primary education, the use of teaching aids in STEAM learning can increase student effectiveness and engagement. The STEAM method can reliably motivate students to actively participate in an effective learning process in the classroom [2].

The development of technology and the dynamics of modern society demand a holistic and relevant learning approach for students, especially at the primary school level [1]. STEAM learning, which integrates the concepts of Science, Technology, Engineering, Art, and Mathematics, makes one solution to meet these needs. Through this method, students are encouraged to think critically, analyze information, and develop collaborative and creative skills that are indispensable in the 21st century [3].

The implementation of STEAM learning through teaching aids in elementary schools focuses not only on mastering academic materials, but also on developing students' readiness to face future challenges. By engaging students in experiments and creative projects, they learn to formulate arguments, estimate and assess learning outcomes [2]. This learning process creates an environment that facilitates the exploration of individual and group abilities, and increases student motivation and engagement in learning [4].

This literature study aims to analyze the effect of STEAM learning through teaching aids on students' future self-readiness at the primary school level. By exploring various studies on the implementation of STEAM in primary schools, it is hoped that a more comprehensive understanding of the benefits and challenges of this approach in the context of education can be obtained.

II. METHOD

This research method applies the literature study method. In this process, the search for scientific articles is carried out using various sources, such as Google Scholar, and other journals that are closely related to the research topics and themes. This approach was chosen to explore and analyze various literatures related to the topic of the Effect of STEAM Learning through Props on the Readiness of Learners in the future at the Elementary School level. The literature review in writing this article is carried out through four steps, namely 1) selection of the topic to be reviewed, namely the effect of STEAM learning through teaching aids for future readiness at the elementary school level, 2) search and selection of articles related to the topic that has been determined, 3) analysis and synthesis of the literature, 4) organization of writing [5]. Therefore, these four steps will be the author's conclusion which is the core of the chosen topic.

With this literature study method, it is expected to make a significant contribution to the development of a better basic education curriculum. Gathering information through literature study is considered effective in gathering a lot of information. Then it will be used by the author to complete or combine his writing.

III. RESULTS AND DISCUSSION

This section presents the results and discussion of the literature review on the Effect of STEAM Learning Through Props for Future Self-Readiness at the Elementary School Level. The discussion consists of 2 main parts. namely, the first part contains a discussion of STEAM learning on future self-readiness at the elementary school level. The second section contains a discussion of the results of the literature review on the Impact of STEAM Learning Implementation with Props.

STEAM LEARNING ON FUTURE SELF-READINESS AT ELEMENTARY SCHOOL LEVEL

Based on several studies, the application of STEAM learning through props has a strong influence on students' future self-readiness. The following are some of the results of the literature review on STEAM learning on future self-readiness at the elementary school level as shown in Table 1.

Tablel 1. Results of the Literature Review: STEAM Instruction on Future Readiness at the Elementary School Level.

Author Name/Year	Title of Research	Research Results
[6]	Design Thinking Gives STEAM to Teaching: A Framework That Breaks Disciplinary Boundaries	By using a design thinking framework, teachers can facilitate more engaging and relevant learning experiences.
[7]	Analysis of Science Technology Engineering Mathematics (STEM) Implementation in Science Learning	STEM integration in learning has a positive influence on student learning outcomes and can be a reference for further implementation in education.
[8]	Introduction of STEAM Learning Methods to Primary School Students in Grades 1 to 3	STEAM methods should actively engage students with practical and relevant approaches. Without expensive equipment, education can be linked to industry and the surrounding
		community. If learners feel they can contribute, their motivation and enthusiasm will grow naturally.
[2]	Implementation of STEAM Learning in Low Grades in Elementary Schools	STEAM learning in the lower grades of primary school is contextualized, inviting students to make sense of everyday events and explore their abilities to produce unique work. Through group work, students develop collaboration, responsibility, problem solving and a better understanding of the material.
[9]	STEAM-enabled Learning Media with Augmented Reality Utilization	STEAM programs are an effort to develop essential skills for the 21st century. In today's fast-paced, collaborative work environment, STEAM helps prepare learners for future success.
[10]	Application of STEM Approach to Improve Critical Thinking Skills of Learners	In STEAM learning, learners acquire new information from observations and develop new ideas by understanding experiments and answering questions according to their abilities and knowledge.
[11]	STEAM Learning as Innovative Learning	Through the utilization of more practical learning tools such as videos and worksheets, students can be better prepared to face future challenges.

From the results of the literature review above, it can be interpreted that STEAM-based learning has a strong influence on student learning outcomes. With an active and practical approach, STEAM learning can connect education with the industrial world and the surrounding community, without the need for expensive equipment. STEAM learning also helps develop 21st century skills, such as collaboration, problem solving and creativity. In addition, the use of

practical learning tools prepares learners for future challenges.

IMPACT OF STEAM LEARNING IMPLEMENTATION WITH PROPS

This STEAM learning tool serves as a medium that supports students' exploration and experimentation [12]. Props in STEAM (Science, Technology, Engineering, Arts, Mathematics) learning play an important role in enriching the learning experience and supporting the understanding of abstract concepts in a more concrete and visual way [13]. Teaching aids are not just tools, but also bridges that allow students to connect theory with practice [14]. The results showed that the implementation of STEAM learning with teaching aids had a positive impact on several aspects, including:

Improved Learning Motivation

Learning with concrete props makes students more interested and motivated to learn [15]. Students feel enthusiastic because they can directly see the concepts being studied in the form of props, for example in science and technology lessons [16].

Deeper Understanding of Concepts

Teaching aids help students to better understand abstract concepts, such as the basic principles of physics or mathematics [17]. With direct experience through props, students more easily internalize concepts and relate them to real-world situations [18].

Development of Critical Thinking Skills and Creativity

In the STEAM learning process, students are encouraged to think critically in solving problems and develop creativity to come up with innovative solutions. Props facilitate this process by providing objects that can be analyzed and modified [19].

Improved Social and Collaboration Skills

Project-based STEAM learning often involves group work, where students learn to communicate, discuss and cooperate [20]. Project-based STEAM learning often involves group work, where students learn to communicate, discuss and cooperate [21].

Based on the results of the above review, it shows that the use of teaching aids in STEAM learning provides various significant benefits. Teaching aids in STEAM learning can increase student motivation to learn in a more interesting and practical way, deepen concept understanding by visualizing abstract material, and encourage the development of critical thinking skills and creativity through exploration and analysis. In addition, project-based learning with teaching aids also plays a role in improving learners' social and collaboration skills, which are essential for future personal and professional development. Thus, props in STEAM learning not only support academic aspects, but also essential life skills.

IV. CONCLUSION

STEAM (Science, Technology, Engineering, Arts, Mathematics) learning at the elementary level has a positive impact on preparing students for the future. This approach enhances 21st century skills, such as collaboration, problem solving, creativity and critical thinking, in an active and contextualized way. STEAM learning helps students understand concepts through hands-on experience, increasing their motivation and ability to take on more complex challenges.

The use of props in STEAM learning helps students understand abstract concepts in a more concrete and visual way. It increases learning motivation, deepens concept understanding and stimulates critical thinking skills and creativity. In addition, project-based learning involving props also enhances students' social and collaboration skills, which are important for their future personal and professional development.

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A COMPARATIVE STUDY OF EXTRACURRICULAR EDUCATION IN INDONESIA-MALAYSIA

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Abstract-Extracurricular activities are additional activities outside the curriculum that provide opportunities for students to develop skills, talents, and character values that are important in everyday life. In the context of education, extracurricular activities in Indonesia and Malaysia are similar in their objectives, but different in their implementation approaches. This research uses the Systematic Literature Review (SLR) method to analyze and compare extracurricular activities in primary schools in Indonesia and Malaysia. The results show that although both countries have similar types and objectives of extracurricular activities, the policy approach, implementation, and focus of skill development are different. In Indonesia, these activities emphasize strengthening cultural values and nationalism, while in Malaysia the focus is on developing physical health and active participation in sports activities. The findings are expected to provide insights for the development of more effective education policies in supporting students' character growth through extracurricular activities.

Keywords-Education, *Extracurricular*

I. INTRODUCTION

Education encompasses more than just academic learning in the classroom. In addition to understanding concepts from various subjects, students also need to develop life skills, character traits and interests that can support their success in society. A holistic approach to education emphasizes the importance of extracurricular activities, which act as complements and reinforcements to formal learning at school. [3]. Extracurricular activities are a place for students to channel their talents and interests, which vary according to individual potential. By participating in these activities, students have the opportunity to improve self-competence through continuous training and experience.

Extracurricular activities are defined as activities carried out outside the formal curriculum with the aim of developing students' interests and talents. At various levels of education, from elementary school to college, these activities play a crucial role in instilling positive values, social skills and morals. Not only that, extracurricular activities also encourage the development of resilience, so that students can face challenges independently and develop themselves comprehensively. These activities help students to become intellectually, spiritually, emotionally and physically balanced individuals.

In Indonesia and Malaysia, extracurricular activities are considered as one of the important components in the education process. Despite the difference in terms - "extracurricular" in Indonesia and "curriculum activities" in Malaysia - both aim to improve students' life skills and character, which cannot be achieved through classroom learning alone. The governments of both countries encourage the implementation of various types of extracurricular activities in schools, such as sports, arts and religious activities, which can enrich students' learning experiences and facilitate the development of students' full potential.

This research aims to conduct a comparative study on the implementation of extracurricular activities in primary schools in Indonesia and Malaysia. Using the *Systematic Literature Review* (SLR) method, this research will analyze relevant *literature* to get an in-depth picture of the contribution of extracurricular activities in student character building in both countries. This research is expected to contribute to the development of educational policies that support students' active involvement in extracurricular activities.

II. METHODS

The method used in this research is SLR (Literature Review Study) SLR is a summary of various scientific journals that have been reviewed. The purpose of the SLR research methodology is to identify, review and evaluate scientific journals that are in accordance with the research topic (namely character education in vocational higher education) as a basis for making theory or policy.[4] Where the author searches, reads, and understands relevant papers, selects clear data sources, conducts in-depth identification, outlines literature on extracurricular primary school education in Indonesia and co-curriculum activities in Malaysian lower schools. Researchers searched for journals available on Google Scholar with the keywords

Education, extracurricular, curriculum activities in the last 10 years with the exception of articles on education in primary schools.

III. RESULTS AND DISCUSSION

Extracurricular activities are activities carried out as a forum for developing the potential of students which can have a positive impact on strengthening character education. [5] Students' skills and creativity must be developed in accordance with the talents and interests of students implemented in extracurricular education in elementary schools in Indonesia and low school curriculum activities in Malaysia where students' interests and talents are highly considered so that students can easily show and develop their potential in their fields of interest. [6]

Activities outside the intracurricular and co-curricular in Indonesia are known as extracurricular while the term used in Malaysia is Aktiviti Kokurikulum. Both are the same, an activity carried out outside of class learning that is guided and supervised by the education unit. The purpose of extracurricular activities is to foster students' interest in certain activities that cannot be achieved through conventional classroom learning.[1] Extracurricular activities also help learners learn various life skills, leadership, and social and human relations. The curriculum utilizes diverse intracurricular learning to provide learners with sufficient time to learn concepts and reinforce student skills. At the beginning of the school year, extracurricular, intracurricular and elective activities are organized. Each extracurricular coach provides a program and objectives for the learners for the year as it is expected that a delegation of students can participate in competitions.

Primary school extracurricular policies in Indonesia and Malaysia

Law No. 20 of 2003 concerning the National Education System Article 3 The purpose of national education is to develop the potential of students in order to Become a person who believes and is devoted to God Almighty and has noble character, Healthy, knowledgeable, capable, creative, independent, Become a democratic citizen Responsible.[7] Extracurricular activities are one way to realize the goals of national education to make students capable, creative and independent.

Regulation of the Minister of Education and Culture (**Permendikbud**) Number 62 of 2014 "Extracurricular activities are organized with the aim of developing the potential, talents, interests, abilities, personality, cooperation, and independence of students optimally in order to support the achievement of national education goals".[8]

Extracurricular activities mean activities that are concerned outside the curriculum or outside the lesson

plan structure.[1] Extracurricular activities are activities that are carried out outside of learning hours according to the wishes of students in choosing the extracurricular activities they will study. "Extracurricular activities are activities that fall outside the realm of the normal curriculum performed by students of school or university education. Extracurricular activities exist at all levels of education, from 4th-6th, junior high/middle school, high school, college and university education". Extracurricular activities are activities that school students do outside of standard curriculum learning hours. [1]

Whereas from the Education Act 1996 (Akta 550) says that "Education in Malaysia is a continuous effort towards further developing the potential of the individual as a whole and combined to produce a balanced and harmonious person in terms of intellect, spirit, emotion, and body, based on trust and obedience to God. This endeavor is aimed at producing Malaysian citizens who are knowledgeable, skilled, noble, responsible, and have the ability to achieve self-welfare and contribute to the harmony and prosperity of the family, community, and country.*" [9]

Extracurricular activities implemented by the Ministry of Education in schools are an extension of the classroom teaching process. These activities aim to enrich the knowledge and experience of students' intelligence, interests, talents, physical and spiritual to develop students' leadership abilities and improve aesthetic values, identity and positive social values. Extracurricular activities aim to get all learners involved in various activities through uniformed teams, associations/clubs as well as sports and games to improve their identity and develop quality human resources.[10] Co-curriculum is a planned individual and group activity that is an extension of the teaching and learning process in the classroom that provides an opportunity to add, strengthen and practice the knowledge, skills and values learned in class. From the legislation policy and also the Act of Education, it can be said that extracurricular activities are a place to increase the potential, talents and interests of students to achieve the goals expected by students.

Implementation of Primary School Extracurricular Activities in Indonesia and Malaysia

Extracurricular implementation in elementary schools is carried out by (1) school culture, divided into routine activities that students carry out continuously and consistently, (2) checking body hygiene (nails, ears), hair, and others every day, (3) praying at the beginning and end of lessons, (4) applying 5S (smile, greet, greet, polite, polite) to all school residents, (5) shaking hands with the picket teacher every morning or others.[11] Primary school education is a basic educational institution where learning is also fundamental to the implementation of extracurricular

activities that are encouraged for students to emphasize student self-confidence.

Extracurricular activities are carried out containing elements of character education so that students can easily apply them in their daily lives. Generally, the mandatory extracurricular activities that students participate in are scouts. Scouts train discipline, hard work, see the leadership potential that exists in students. Other extracurricular activities include music, karate, drum band, pencak silat, chess and so on. [11] The implementation of extracurricular activities depends on the regulations of each school, usually one meeting a week.

Co-curriculum activities can be carried out individually, in groups, or in large groups. Therefore, the safety aspect of carrying out co-curricular activities is a very important element and needs to be focused on. Risk management aspects should always be emphasized according to the goals and objectives of the activity. Schools need to use the expertise of validly recognized certified trainers or teachers who have the skills and know how to handle these activities games and curriculum. [12] In other words, extracurricular activities play an important role in the educational process. Involving students and the community as the younger generation in extracurricular activities can realize mutual cooperation, unity and a sense of national unity, and instill good values directly and indirectly when participating in these activities.

Types of extracurricular activities in Indonesian primary schools

The types of extracurricular activities in Indonesia and Malaysia do not have much difference, both have extracurricular activity programs to improve students' abilities, interests and talents in their respective fields. Students are given the freedom to choose extracurricular activities without coercion but with encouragement and motivation from every important aspect of their lives such as teachers, parents and people around them.

No.	Types of extracurricular activities in Indonesia-Malaysia		
	Indonesia	*Malaysia*	*Reference*
1	Scout	mixer	[13] [14]
3.	Sports	Sports	[15] [9]
4.	Religion	Qur'anic Education	[16] [17]
5.	Art	Art Club	[18] [6]

Each extracurricular activity has its own learning objectives, such as scouting activities, which are an alternative to education that occurs outside the classroom for the formation of character values, especially the value of Indonesian character values. Indonesian character value education is education that is applied based on Indonesian culture which aims to provide reinforcement in the development of learner

behavior in order to shape the personality of learners to become whole human beings. [19] In extracurricular scout activities, there are learning objectives, namely developing students' soft skills and forming students into active and independent individuals.

In Malaysia, the term scouting is called pengakap which aims to form extracurricular open-minded individuals, namely individuals who have a modern, creative and innovative mindset and are skilled in applying extracurricular knowledge and skills effectively and responsibly in solving problems and making decisions, based on attitudes and values so that students are able to face challenges in everyday life, in line with the development of science and technology and the challenges of the 21st century.[14] In the startup, students are taught to practice leadership, cooperation, and volunteer spirit through interesting activities at school. This movement was chosen for a compulsory cocurriculum program in lower schools in Malaysia.

Education units provide various extracurricular sports activities to channel learners' talents, interests, personality hobbies and creativity. These activities can be used as a tool to discover the talents of learners and design professionally to become a place of actualization and character development.[15] There are various extracurricular sports including extracurricular soccer, volleyball, basketball etc. In this extracurricular activity, students are able to find and improve their talents in the field of sports which can be used as a tool to detect the talents of students and design professionally so that it can become a vehicle in producing talents, forming character, and a place for the actualization of students.

The Malaysian Ministry of Education (KPM) has now launched the 1 Murid 1 Sukan (1M1S) policy where it is mandatory for every student to participate in at least one sukan activity at school. Each student will be actively involved in school sports activities throughout the year. The inclusion of students in this activity is very important as a foundation to support the aspiration of a healthy, dynamic and united Malaysia as suggested by Yang Amat Berbahagia Prime Minister of Malaysia. [9] Sukan is the term for extracurricular Sports activities in Malaysia, sukan is an activity to enhance quality life and a healthy lifestyle way of life the whole integration is mental, social, emotional, physical, intellectual and Rohani components.

Religious self-development activities, especially those related to improving the recitation of the Qur'an and Islamic art, are carried out because they can motivate students to show their talents and interests. Basically, the purpose of religious extracurricular activities is to explore the potential of students in the religious field. In Indonesia, there are religious extracurricular activities [10] "Keberkesanan Iqra' Sebagai Kaedah Pembelajaran Membaca al-Qur'an" aims to see the effectiveness of the Iqra' method as a method of learning to read the Qur'an in schools in Malaysia. The study has been conducted in 27 schools in several public schools under the Ministry of

Education Malaysia and 6 private religious schools. These activities provide learners with the opportunity to enhance the skills they already have. For example, in the religious field there are various extracurricular activities, such as murrotal, tilawah and tambourine. These extracurricular activities teach students to read the Qur'an with tajweed and with the rhythm of the song, so that students learn to read the Qur'an and recite it beautifully.

In lower schools in Malaysia, it is known as extracurricular Quran education. Quran Education subjects continued to be implemented in schools when the Rahman Talib Report became the Education Act of 1961 where schools were obliged to organize religious subjects if they had at least 15 Muslim students. The pattern of learning continued to change when it became part of the school curriculum. Quran skills classes are one of the co-curricular activities implemented in SMKA and KAA nationwide. However, the schools concerned are obliged to implement three hours a week for each level according to the stipulated lesson hours. Therefore, its status as a co-curricular activity, so the learning process is carried out outside the official school schedule.[17]

Impact on students in extracurricular education

Extracurricular activities are extra activities in schools usually carried out outside of lesson hours. This activity aims to make students more aware of deepening and developing what interests and talents students can be fostered for student character development.[21] Student character building is carried out by learning outside of school hours or called extracurricular activities to be one of the positive impacts of extracurricular activities in elementary schools students become more active, independent and disciplined in carrying out daily life. In addition to shaping the character, another impact of extracurricular activities is to foster the creativity of each individual and interact between individuals or groups so that self-adjustment can be achieved quickly.

Extracurricular activities are able to improve the abilities and creativity of students in accordance with the interests, potential, and talents of students and can also train students' sense of social responsibility and create a relaxed, encouraging, and fun environment for students that supports the development of students.[5] So that students can develop according to their respective interests and talents and there is no coercion in it.

Cocurriculum activities provide opportunities for students to build physical strength, improve mental abilities and help stabilize moods. Through cocurriculum activities at school, students are able to develop several important aspects, namely intellectual and personality. Co-curricular activities also need to have elements of knowledge, noble values and new skills that students will acquire through experience during the exercise. This is important because co-curricular activities are an extension of the teaching and

learning process that takes place in the classroom which serves to strengthen and become a forum for students to practice the knowledge they have learned." [22].[22] Cocurriculum activities are made to develop aspects of life such as intellectual and personality aspects which are the impact of the learning activities of the lower school cocurriculum activities in Malaysia. Activities outside of intracurricular and cocurricular in Indonesia are known as extracurricular while the term used in Malaysia is Aktiviti Kokurikulum. Both are the same, an activity carried out outside of class learning that is guided and supervised by the education unit. The purpose of extracurricular activities is to foster learners' interest in certain activities that cannot be achieved through conventional classroom learning. Extracurricular activities also help learners learn various life skills, leadership, and social and human relations.

IV. CONCLUSIONS

Extracurricular is a group activity whose planned activities are an extension of the teaching and learning process in class which provides an opportunity to add, strengthen and practice the knowledge, skills and values learned in class. [1] In education, it not only covers general knowledge but also strengthens soft skills, as well as the interests and talents of each student that must be developed.

This comparative study reveals the important role of extracurricular education in character building and life skills development of students in Indonesia and Malaysia. Despite having a similar main goal of developing students' non-academic aspects, the implementation approaches in the two countries show significant differences, reflecting their respective cultural characteristics and educational policies.

In Indonesia, extracurricular education is focused on strengthening national values, religiosity and culture. This is reflected in activities such as scouting, traditional arts, and religious extracurriculars that are directed at instilling values of togetherness, independence, and patriotism. The extracurricular policy in Indonesia, as stipulated in Law No. 20/2003 on the National Education System and Minister of Education and Culture Regulation No. 62/2014, provides flexibility for schools to manage these activities according to local potential and needs. This approach allows students to better recognize and love their own cultural identity, so that character education integrated with local culture becomes more relevant and contextual.

In contrast, in Malaysia, the approach to extracurricular education, or "aktiviti kokurikulum," is more structured and standardized with a focus on fostering students' physical, mental and emotional balance. This policy is manifested in the national program "1 Murid 1 Sukan," which emphasizes the importance of every student's participation in at least one sport. Co-curricular activities in Malaysia also emphasize safety and strict risk management, and involve trained professionals. This indicates that

Malaysia tends to put more emphasis on physical education and health as the basis for shaping students' character, which is supported by government policy in the 1996 Education Act.

The results also show that both countries face challenges in implementing extracurricular education. In Indonesia, limited budgets and facilities in some schools are an obstacle in developing more varied and innovative activities. Meanwhile, in Malaysia, the main obstacle is maintaining students' interest in the required co-curriculum programs, which sometimes do not match students' interests. Nonetheless, both have great potential to develop extracurricular education that is more integrated with 21st century skills, such as critical thinking, digital skills and collaboration.

As a recommendation, both Indonesia and Malaysia need to strengthen budget support for extracurricular programs in primary schools and promote innovation in activities that are relevant to the needs of the modern world. Developing programs that blend local culture with global skills will have a greater positive impact on students. Thus, extracurricular education can further contribute to the formation of a generation that is not only of good character but also ready to face future global challenges.

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Implementation of Moderation In Islamic Organizations In Indonesia

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Abstract-This research analyzes the literature on the Implementation of Moderation in Different Islamic Organizations by offering an innovative approach in a persuasive manner regarding religious moderation to increase the sense of moderation in living life. The research uses a Systematic Literature Review approach with the stages of determining themes, searching, selecting literature, analyzing and interpreting, preparing drafts, and disseminating results. The research used 15 articles from a selection of 30 studies on four things, namely, implementation, challenges, innovation, and evaluation. Although various Islamic organizations, such as Nahdlatul Ulama and Muhammadiyah, play an important role in promoting religious moderation through education, interfaith dialogue, and social activities, there are still narratives of extremism. Therefore, innovations in education and communication approaches, as well as inter-organizational collaboration, are needed to strengthen moderation. Systematic evaluation of these programs is also important to measure their effectiveness and impact on social harmony, so as to create a more harmonious and respectful society in the midst of diversity.

Keywords-implementation, moderation and organizational differences

I. INTRODUCTION

Indonesian society is known as a pluralistic and diverse society. This plurality is reflected in various differences, both horizontally such as ethnicity, language, and customs, as well as vertically in spiritual relationships. Plurality is an inseparable part of the history and reality of Indonesian society, like the colors of a rainbow that add beauty. This diversity is harmony and beauty in itself, not chaos. Diversity cannot be denied or avoided; it will always exist as part of sunnatullah or God-ordained laws of nature. [1].

According to Yenny Wahid In Indonesia, about 7.7 percent of the total population of more than 200 million people are exposed to extremism and radicalism. Most of them understand the concept of jihad literally as war. They even support and justify radical actions and movements, including providing financial assistance, materials, and carrying out attacks on places of worship. In fact, jihad has a broader meaning, as mentioned in several traditions. Jihad can be a pilgrimage, trying to seek the pleasure of Allah SWT, restraining lust, or speaking the truth before the ruler. Among the various forms of jihad, restraining and controlling the passions within oneself is often considered more difficult than facing a real enemy in battle. [2].

The challenge is the different approaches in implementing the values of moderation, where some Islamic organizations emphasize education and da'wah, while others tend to focus on political or social advocacy. Meanwhile, the support of the government and religious leaders is essential to create consistency in implementing the values of religious moderation in various Islamic organizations, so that these organizations can support each other and strengthen moderate attitudes among Muslims at large. [3].

Considering these challenges, the study of religious moderation among Islamic organizations becomes very important to understand how moderate Islamic values can be strengthened and maintained amid the diversity of Islamic organizations in Indonesia. It is hoped that, with consistent and purposeful implementation of religious moderation, Islamic organizations in Indonesia can become the main pillar in maintaining harmony and togetherness in a diverse society.

Therefore, religious moderation is an important concept in maintaining social harmony in diverse societies, including in Indonesia, which has the largest Muslim population in the world and a diversity of Islamic organizations with diverse characteristics. Islamic organizations in Indonesia, such as Nahdlatul Ulama (NU), Muhammadiyah, and various other organizations, have a strategic role in guiding their members to practice Islam in a peaceful, inclusive, and tolerant manner. However, on the ground, there are various challenges in implementing the principle of religious moderation, especially when there are different interpretations between organizations regarding social, political and religious issues. These differences sometimes lead to friction, both between Islamic organizations and among community members who identify with a particular organization, which can potentially lead to social disharmony.

Religious moderation is increasingly important in the era of globalization and amid the complex social challenges facing society. The emergence of polarization and extremism in some communities emphasizes the need to understand and promote moderation, especially among the younger generation. As agents of change and future leaders, students have a strategic role in building an inclusive and harmonious society. [4].

Although most Islamic organizations in Indonesia support the principle of religious moderation, the reality on the ground shows that harsh and exclusive narratives are still found, especially through social media or certain groups within the organization. This factor has the potential to create a less tolerant view and narrow the understanding of Islam as a religion that should be rahmatan lil 'alamin. This is reinforced in the Journal *of Islamic Social Studies*, which shows that some members of Islamic organizations have difficulty in understanding the boundaries between firm beliefs and moderate attitudes that can accept differences, which are sometimes exacerbated by the influence of digital content that leads to radicalism.

II.METHOD

The systematic literature review (SLR) method is used in this study to obtain a description and data on the variables under study in an explicit, structured, and accountable manner, namely conducting a study of various reference works and previous studies that have similarities. This method aims to obtain a theoretical basis relevant to the problem being studied through a review of books or other sources. The main objective is to find a more in-depth discussion of a topic or issue that is in accordance with the topic discussed in the article.

The data sources in this study come from scientific papers, such as journal articles, books, notes, and various reports relevant to the problem to be solved. The literature review was carried out in stages 1) Classification and Determination of approach, 2) article search, 3) Article selection, 4) data analysis and interpretation, 5) draft article, and 6) dissemination of results. At the initial stage, the focus of the study was determined on the theme of Implementation of Tolerance Attitudes towards Religious Diversity which includes three things, namely implementation, challenges, innovation, and evaluation. [5].

In the implementation process, article searches were conducted through various sources such as Google Scholar, Sinta, and other sources, which resulted in 30 initial articles. These articles were then filtered based on the criteria of year of publication and indexation. After the screening and selection process, 15 articles were obtained which were used as literature review materials. These selected articles were further analyzed, and the data were interpreted to get an overview and conclusions on the themes discussed.

III.RESULTS AND DISCUSSION

The results and discussion of this research are based on a systematic *literature review*, with the main focus on four themes, namely implementation, challenges, innovation, and evaluation. The following is an explanation of the four research focuses.

Implementation of Moderation in Different Islamic Organizations

The implementation of moderation in various Islamic organizations shows the diversity of approaches and strategies used to promote the values of moderation and interfaith harmony. Each organization has different characteristics and contexts, which influence the way they implement moderation. The implementation of moderation in various Islamic organizations includes various important aspects that can be discussed. First, the basics of moderation in Islam refer to the teachings of the Qur'an and hadith that emphasize the importance of moderation, such as respecting differences and establishing good relations between fellow Muslims. In addition, the history of the Prophet Muhammad is a clear example of how moderation was implemented in the Muslim community in Medina. Second, education and outreach play an important role, with organizations such as Nahdlatul Ulama (NU) and Muhammadiyah developing curricula that include values of moderation, dialogue and interfaith harmony. Training of preachers is also conducted to ensure moderate and tolerant preaching.

Furthermore, interfaith dialog is an important tool in building understanding and mutual respect. Interfaith dialogue forums and joint activities, such as social services, strengthen interfaith relations. Social and humanitarian activities are also a focus, where Islamic organizations actively provide assistance to the community regardless of religious background and run community empowerment programs with the principle of inclusiveness.

In the realm of advocacy and public policy, Islamic organizations support moderation policies that promote harmony and fight discrimination, and keep an eye on extremism that can undermine harmony. The role of youth is equally important, empowering them through dialogue, social action and creative activities such as art, music and media to spread the message of moderation. Media and technology become strategic tools, where moderation campaigns are conducted through social media, and educational content is created to raise public awareness.

Finally, the different approaches among these organizations also attract attention. For example, NU tends to use a traditional and cultural approach, while Muhammadiyah emphasizes a rational and modern approach. The focus of activities also varies, with some emphasizing education and dialogue, while others are more inclined towards social activities or advocacy. All these efforts show the commitment of

Islamic organizations in promoting moderation as a fundamental value in social life.

The implementation of moderation in various Islamic organizations reflects the diversity of approaches. Each organization strives to create a society of mutual respect and peaceful coexistence, despite differences in religious beliefs and practices. Moderation is an important value in maintaining social stability and harmony in society, and each organization has a unique role in promoting these values.

Table.1 Representation of articles on the Implementation of Religious Moderation

Year	Author and Article Title	Research Results
2022	Ahmad, Rudi Stai, Suryadi Email, Cianjur Implementation of religious moderation in Islamic religious education	Implementation of *mainstreaming* in the formation of moderate attitudes and behaviors supported by moderate religious understanding.
2021	Sumarto, Sumarto Implementation of the Religious Moderation Program of the Ministry of Religious Affairs	The application of bias makes religious moderation a character of the life of the nation and state.
2021	Muhamad Syaikhul Alim, Achmad Munib ACTUALIZATION OF RELIGIOUS MODERATION EDUCATION IN MADRASAH	Optimizing habituation and madrasah culture are applied as strategies to internalize Islamic moderation character values, as well as developing programs that strengthen Islamic moderation.
2020	Ridwan Yulianto IMPLEMENTATION OF MADRASA CULTURE IN BUILDING RELIGIOUS MODERATION	The implementation of religious moderation education based on madrasa culture becomes the basis for behavior, tradition, and daily habits practiced in the madrasa environment.

Year	Author and Article Title	Research Results
		[6].
2021	Edelweisia Cristiana IMPLEMENTATION OF RELIGIOUS MODERATION IN PREVENTING RADICALISM	The implementation of religious moderation is a concrete form of love for God and fellow human beings, which aims to realize a peaceful life.

Based on Table 1 above, the Implementation of Religious Moderation from 2020 to 2022 emphasizes the importance of implementing religious moderation in education and social life to form moderate attitudes. This approach is carried out through the integration of moderate religious understanding, the development of national character, and the application of madrasah culture as a means of internalizing moderate values. Religious moderation is also seen as a form of love for God and fellow humans, which plays a role in preventing radicalism and supporting the creation of a peaceful life.

Challenges in Implementing an Attitude of Moderation towards Religious Diversity

The implementation of an attitude of moderation towards religious diversity in Indonesia has a number of challenges that need to be overcome to create a peaceful and harmonious society. [7]. Some of the main challenges in implementing this attitude of tolerance include:

1. Lack of Understanding and Moderation Education

Not all educational institutions effectively instill moderation. There are still many schools that do not have programs or materials that teach religious moderation. Teachers who have not been trained in moderation education and the lack of a specific curriculum are the main obstacles. The lack of moderation education leaves the younger generation without a deep understanding of the importance of respecting religious differences, which can lead to intolerant actions.

2. Differences in Interpretation of Religious Teachings

Every religion has groups or individuals who may take religious teachings to extremes, either too textual or too liberal. These differences in interpretation sometimes lead to exclusive attitudes and rejection of other religious groups. This causes the distance between religious communities to widen and builds a mindset that considers its own religion to be more correct or superior to other religions, which hinders the creation of tolerance.

3. Social and Environmental Influences

In some communities, especially those that are religiously homogenous, stereotypical attitudes and prejudices against other religions are still strong. Social environments that are closed to differences tend to inhibit acceptance and moderation. The influence of this environment can shape moderation and even discriminatory attitudes, which worsen interfaith relations in society.

4. Social Media and the Spread of Hoaxes or Hate Speeches

Social media is often a place where fake news, hoaxes, or religious-based hate speech is spread. The spread of this information is often uncontrolled and can quickly lead to tensions between religious communities. Negative information that is easily spread worsens perceptions of other religions and undermines efforts to create moderation. Low digital literacy makes people easily influenced by extremist content.

5. Lack of Role of Religious Leaders in Spreading the Message of Moderation

While there are many religious figures who advocate moderation, there are still religious figures who propagate exclusive views. These different views can cause extremism to develop among their followers. Religious figures who are exclusive can influence their followers to be the same, making it difficult to create a harmonious atmosphere in the midst of religious diversity.

6. Fanaticism

Fanaticism is an attitude that reflects excessive attachment to a particular belief, group or ideology. This attitude makes a person or group often lose the ability to think critically and objectively, making it difficult to accept different views. Fanaticism is characterized by excessive loyalty and a tendency to reject other points of view, despite evidence to support them. As a result, fanaticism can trigger extremism or even aggressive behavior towards people who hold different views, which can lead to conflict and damage harmony in society.

Challenges in the implementation of moderation towards religious diversity include the lack of moderation education, differences in religious interpretation, the influence of the social environment, lack of policy consistency, the negative influence of social media, the diverse roles of religious leaders, and interfaith prejudice. All these challenges show that moderation towards religious diversity needs to be supported by cooperation from various parties, including government, education, media and society, to create an environment of mutual respect.

Table 2.Representation of Articles on Challenges in Implementing Tolerance of Religious Diversity

Challenge	Implementation of Moderation Attitude	Author
diversity of ethnicity, religion, race and customs spread across many islands.	understanding of tawhid, justice and equality, brotherhood, harmony, and the example of the Prophet Muhammad.	Alwazir Abdusshomad 2024 Implementation of Islamic Values in Tolerance Education (Literature Study on Unifying Efforts in Indonesian Pluralist Society)
The phenomena of stereotyping, prejudice, and discrimination are often	Understanding the importance of building awareness and tolerance in cultural diversity in maintaining social harmony and inclusiveness.	Barella, Yusawinur Fergina, Ana Achruh, Andi Hifza, Hifza 2023 Multiculturalism in Islamic Education: Building Awareness and Tolerance in Cultural Diversity
Islam, Protestantism, Catholicism, Hinduism, Buddhism, Confucianism.	recognize each other, respect each other, and cooperate in virtue despite different religions and ethnicities. difference	Basid, Abdul Krisyardi, Gardean Danendra Nurhidayati, Aulia Putri Farisandi Paramasatya Shalsabella, Meesha D Zuhroh, Siti Aminatuz Implementation of Tolerance towards Religious Diversity
Multicultural Society	promoting an understanding of religion that moderation, interfaith tolerance, and harmony	Nasri, Ulyan Tabibuddin, M. 2023 The Paradigm of Religious Moderation: Revitalizing the Function of Islamic

Challenge	Implementation of Moderation Attitude	Author
	in an increasingly diverse society	Education in a Multicultural Context Perspective of Imam al-Ghazali's Thought

Based on table 2, it can be concluded by me that to build a strong attitude of moderation in Indonesia, cooperation from various parties is needed, with effective character education, inclusive religious education, as well as government and community support, so that Indonesia can become an example in maintaining harmony and appreciating diversity as a national asset.[8]

This research plays an important role in developing a more inclusive and equitable Islamic education program. The findings of this study provide useful advice for policy makers, teachers, students and the wider community on the importance of building awareness and moderation towards cultural diversity in order to maintain social harmony and inclusiveness.[9]

Imam al-Ghazali's view of moderation in religion, which emphasizes balanced understanding, tolerance, and rejection of extremism, is highly relevant in the current situation filled with religious and cultural diversity.[10]

Religious differences should not be the cause of divisions that end in putting each other down, demeaning, or mixing up beliefs between religions. [10]

Innovation of Moderation in Different Islamic Organizations

The innovation of moderation in various Islamic organizations is an important step to create harmony and mutual respect among different groups. [9]. Innovation in promoting moderation can be explained through several important aspects.

1. Moderation education and training is the first step, by developing an inclusive curriculum that includes the values of moderation and respect for differences in madrasas, pesantren, and other Islamic educational institutions. In addition, training for moderation leaders is organized to equip them with the understanding and skills to implement moderation in leadership.

2. Inter-religious and intercultural dialogue is an important tool in building harmony. Discussion forums involving various Islamic and non-Islamic organizations help discuss moderation issues and strengthen understanding between groups. Joint cultural events are also a time to celebrate differences and strengthen interfaith relations.

3. Joint social activities such as humanitarian projects involving various organizations can demonstrate the spirit of collaboration in helping the community regardless of religious background. In addition, joint environmental activities symbolize cooperation on global issues such as environmental conservation.

4. The use of technology and social media offers great opportunities through awareness campaigns on the importance of moderation. These campaigns can be in the form of videos, articles or infographics that are widely disseminated. Online discussion platforms can also be built to provide a space for sharing ideas and experiences on moderation between organizations.

5. Innovation in communication approaches is key. Open and empathy-based communication is taught to encourage productive dialogue, so that members of the organization can listen to and understand each other's perspectives, reduce prejudice, and strengthen relationships.

Finally, inter-organizational collaboration is a strategic element in promoting moderation. Tolerance alliances between different Islamic organizations can be realized through organizing joint events and sharing resources. In addition, inter-organizational exchange programs provide opportunities to learn from each other's best practices in implementing moderation. All these measures support the creation of a harmonious and inclusive environment.

The innovation of moderation in Islamic organizations is essential for creating a harmonious and respectful society. By implementing innovative strategies and approaches, organizations can contribute to building interfaith harmony and overcoming differences.

One example is that during the time of the madhhab scholars, moderation became an important innovation that allowed for differences of opinion among scholars without dividing Muslims. Each school, such as Hanafi, Maliki, Shafi'i and Hanbali, has its own way of understanding the Quran and Hadith. However, the scholars still emphasized the importance of respecting different views. They developed the method of ijtihad, which allows each school to express their views according to different contexts and backgrounds, but still within the framework of Islamic law.

For example, Imam Shafi'i taught his students not to underestimate the views of other schools of thought and encouraged them to consider various arguments before deciding the law. This innovation shows how the scholars of the time promoted moderation through ijtihad, discussion, and respect for different views. In this way, differences between madhhabs are not a source of conflict, but rather a wealth of knowledge in Islam.

Evaluation of Moderation in Different Islamic Organizations

Evaluation of moderation in Islamic organizations is the process of assessing how moderation is implemented, practiced, and internalized in these organizations. This evaluation is important to understand the effectiveness of programs, activities, and initiatives aimed at promoting moderation among members of the organization and the wider community. [11]. Evaluation of moderation attitudes in various Islamic organizations can be done through several key aspects.

1. Moderation indicators include the organization's involvement in interfaith dialogue, which is measured by the number of events, level of member participation, and impact on interfaith relations. In addition, education and training programs that teach moderation values are evaluated through curriculum, teaching materials, and participant engagement. The organization's contribution to social and humanitarian activities is also an important indicator, including its impact on interfaith harmony.

2. The social impact of the organization's moderation initiatives is evaluated through its effects on society, such as the reduction of interfaith conflict and increased harmony. Specific case studies are also analyzed to see the organization's success in promoting moderation and its impact on the community.

3. Challenges and obstacles in implementing moderation are also a concern. The challenges faced by organizations may be internal resistance, differences in understanding, or external influences. The strategies used to overcome these obstacles are analyzed to evaluate their effectiveness.

4. Comparisons between different organizations are made to analyze the approach, effectiveness, and results of their respective moderation programs. This comparison can provide insights into best practices as well as areas for improvement. In addition, collaboration between organizations is

evaluated to see how cooperation can increase the effectiveness of moderation programs and strengthen their impact. All these aspects provide a comprehensive picture of the implementation and success of moderation in Islamic organizations.

Evaluation of moderation in various Islamic organizations is an important step to understand the effectiveness of the efforts that have been made and to formulate better strategies for the future. By conducting comprehensive evaluations, organizations can improve existing programs, overcome challenges, and better contribute to the creation of a harmonious and tolerant society. [13].

IV. CONCLUSION

Religious moderation must be maintained together, both by individuals and institutions, as well as by society and the state. Moderate religious groups need to be more active in speaking out and not let themselves become the silent majority. Every element of the nation must believe that Indonesia has strong social capital to strengthen religious moderation, namely local cultural values, diversity of customs, traditions of deliberation, and a culture of mutual cooperation that has been passed down for generations. This social capital must continue to be nurtured to create a harmonious life in cultural, ethnic and religious diversity. By working together, Indonesia can become a world example in practicing religious moderation. In addition, the state also needs to be present to facilitate the creation of public spaces that support interfaith interactions. [14].

Although various Islamic organizations, such as Nahdlatul Ulama and Muhammadiyah, play an important role in promoting religious moderation through education, interfaith dialogue, and social activities, there are still narratives of extremism emerging on the ground. Therefore, innovations in education and communication approaches, as well as inter-organizational collaboration, are needed to strengthen moderation. Systematic evaluation of these programs is also important to measure their effectiveness and impact on social harmony, so as to create a more harmonious and respectful society in the midst of diversity.

provide benefits and positive contributions to the development of Islamic Religious Education.

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Life Skills Learning at Nusantara Islamic Boarding School

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Abstract-This research analyzes the literature on the integration of life skills learning in Islamic boarding schools in the archipelago which is very important to prepare students to face the challenges of globalization and digitalization. The research used a Systematic Literature Review approach with the stages of determining themes, searching, selecting literature, analyzing and interpreting, preparing drafts, and disseminating results. The focus of the study is on 3 things, namely concept, implementation and impact. The results of this study show that; By developing social, emotional, and practical skills, santri are not only able to adapt to changing times, but also have a strong character and independence. Although there are challenges in its implementation, such as limited resources and resistance to change, life skills education can make pesantren a center for quality skills development. This will help pesantren graduates compete and contribute positively in modern society. With support from all parties, the integration of life skills education in line with Islamic values is expected to produce a generation of santri who are independent, responsible, and able to have a positive impact on their communities.

Keywords-life skills, pesantren, archipelago

I. INTRODUCTION

Pesantren in the archipelago have long been a center of education and character development that focuses on instilling religious and moral values. However, in facing the challenges of globalization, the digital era, and rapid social change, the skills taught in pesantren need to be improved to meet the needs of santri in the modern world. Life skills are becoming increasingly important to equip santri in living an independent, productive life, and are relevant to the demands of the times. Without the development of applicable life skills, pesantren graduates often experience difficulties in adapting to the work environment and the wider community. [1].

The education system in most pesantren still dominantly focuses on traditional religious knowledge without paying maximum attention to aspects of life skills, such as self-management, communication skills, financial literacy, and critical thinking skills. [2]. In fact, these abilities are needed for santri to be able to participate actively and productively in modern society. According to [3], the pesantren curriculum that minimally integrates life skills causes limitations for santri in practicing Islamic values in diverse and dynamic daily life.

In addition, there are other challenges in implementing life skills learning in pesantren. Limited facilities, lack of competent educators in life skills, and limited support from the pesantren management are the main obstacles in developing a sustainable life skills program. [4]. Students in pesantren with traditional approaches show lower levels of independence and life skills than students in pesantren that have integrated *life skills* education.

In addition, technological developments and the digital era pose additional challenges for pesantren graduates. The lack of understanding of basic technology and digital literacy makes santri lag behind in the skills needed in the digital era. Digital literacy as part of life skills is increasingly urgent to be integrated into the pesantren curriculum so that santri have the ability to adapt to technological change. [5]. *Life skills* that include digital literacy, communication skills, and an understanding of the digital economy are essential skills that will help santri compete in a competitive global environment.

On the other hand, pesantren have great potential to develop life skills education based on Islamic values, making it different from other formal education approaches. Pesantren can develop life skills programs that are in line with religious values, such as Islamic entrepreneurship, sharia-compliant financial management, and character development based on Islamic teachings. This will not only help santri become more independent individuals, but also make them agents of change who bring Islamic values to their daily life practices. [6].

Thus, there is an urgent need to integrate life skills education in the curriculum of pesantren in the archipelago. Learning *life skills* in pesantren will not only increase the ability of santri to be independent and adaptive, but will also provide them with practical skills that are relevant to the world of work and social life. Through further research and support from various parties, the development of *life skills* in pesantren is expected to address the gaps in the current curriculum,

so that pesantren graduates can have high competitiveness and contribute positively in society.

II. METHOD

This research uses the *Systematic Literature Review* approach method with the stages of determining themes, searching, selecting, namely activities that examine various reference works and the results of previous similar research. This method aims to obtain a theoretical basis for the problem being studied by reading various books or sources. [7]. The main objective is to find a more in-depth discussion of a topic or issue that is in accordance with the topic discussed in the article.

The data sources in this study come from scientific papers, such as journal articles, books, notes, and various reports relevant to the problem to be solved. Literature review is carried out in stages 1) Classification and Determination of approach, 2) Article search, 3) Article selection, 4) Data analysis and interpretation, 5) Draft article, and 6) Dissemination of results. At the initial stage, the focus of the study was determined on the theme of *LIFE SKILLS* Learning in Islamic boarding schools in the archipelago which includes three things, namely concept, implementation and impact.

III. RESULTS AND DISCUSSION

The results and discussion of this research are based on a systematic review of the literature, focusing on three main themes, namely the concept of *life skills* learning in Islamic boarding schools, the implementation of *life skills* learning in Islamic boarding schools, and the impact of *life skills* learning in Islamic boarding schools. The following is an explanation of these three aspects.

The Concept of *Life Skills* Learning in Islamic Boarding *Schools*

According to [8]*life skills* are skills needed for work in addition to academic skills. Furthermore, *life skills* can also be referred to as the abilities, capabilities, and skills needed by a person to live a life with pleasure and happiness. These skills include all aspects of human attitudes and behavior as provisions for running their lives. In other literature, it is mentioned that *life skills* education can be interpreted as education that provides basic provisions and training carried out correctly to students about life values that are needed and useful for the development of students' lives. Thus, *life skills* education must be able to reflect real life in the teaching process so that students acquire life skills in the midst of society. [9].

Life skills education is actually not a new thing for pesantren, because this type of education has long been a mainstay for pesantren. Pesantren as a traditional Islamic educational institution in Indonesia does not only focus on religious education, but also emphasizes the development of *life skills* for its students. [10].

Table 1. Concept of Life Skills Learning in Islamic Boarding Schools

Year	Author and Article Title	Research Results
2022	Arif Rahman Hakim Life Skill Education as an Effort to Create Santri Independence at Pondok Pesantren Al Urwatul Wutsqo Bulurejo Diwek Jombang	The concept of life skills at Pondok Pesantren Al Urwatul Wutsqo Bulurejo Diwek Jombang includes determining life skills education programs tailored to the needs of students. The division of responsibilities for each unit is coordinated directly to ensure smooth implementation. In addition, an assessment of the students' abilities is carried out as well as the preparation of a report on life skills activities. This report contains information about the achievement of targets, obstacles faced by students, and various other relevant aspects.
2024	Rahmawati, Laila Life Skills-Based Education for Islamic Boarding School Students	Life skills education at Al Buruj Ngabul Jepara Islamic boarding school has the concept of life skills education in religious education program activities, khidmah and teaching practices, muhadharah, and studying books and general activities through extracurricular activities that hone skills that are carried out simply because

Year	Author and Article Title	Research Results
		pesantren emphasize the informal system.
2021	Ahmad Paruqi Hasiholan Life Skill Education for Santri at An-Nursali Binja Orphanage Boarding School	The concept of *life skills* in Islamic boarding schools includes an educational approach that not only focuses on spiritual and academic aspects, but also trains students to have practical skills needed in everyday life.

The concept of *life skills* learning in pesantren is very important to equip students with various skills needed to face the challenges of life in the future. In the concept of *life skills* learning in pesantren, there are several main aspects that are emphasized including:

1. Personal *skills* include the ability to recognize oneself, respect oneself, and develop one's potential. In pesantren, students are taught to understand their strengths and weaknesses, as well as build self-confidence and personal responsibility. Through this learning, students are expected to realize the potential that exists within themselves and be able to develop it optimally.
2. *Social skills* include communication skills, cooperating, empathizing, and building good relationships with others. In a pesantren environment that emphasizes the values of togetherness and solidarity, santri are trained to be able to interact effectively, respect differences, and build harmonious relationships with fellow santri, kyai, and the surrounding community. These social skills are very important to prepare santri in living a plural and diverse social life.
3. *Academic skills* which include critical thinking skills, problem solving, decision making, and lifelong learning. In pesantren, santri are equipped with the ability to analyze problems in depth, find the right solution, and continue to explore knowledge on an ongoing basis. These academic skills are not only obtained through formal learning in the classroom, but also through real experiences in daily life in pesantren.
4. *Vocational* skills include skills in agriculture, animal husbandry, handicrafts, information technology, and entrepreneurship. In pesantren, santri are given skills training according to their interests and talents, so that they have the provision to find a job or open an independent business after graduating from the pesantren. Not infrequently, pesantren also develop business units such as agriculture, animal husbandry, or home industries that involve active participation from the santri.

Life skills learning in pesantren is not only done through formal activities in the classroom, but also through direct experience in daily life in pesantren. Santri are involved in practical activities, such as farming, animal husbandry, processing agricultural products, and other productive activities. In addition, the pesantren also facilitates santri to be involved in social community activities, such as social services, community service, and environmental care activities. Through direct involvement in these activities, santri can hone their life skills in real life and gain valuable experience.

Implementation of *Life Skills* Learning in Islamic Boarding *Schools*

The implementation of *life skills* in Islamic boarding schools is an effort to equip students with life skills needed to face challenges in the real world. [11].

Table 2. Implementation of Life Skills Learning in Islamic Boarding Schools

Year	Author and Article Title	Research Results
2023	Anam, Abdurrahmansyah, Hawi Implementation of Life Skills Education in Improving the Quality of Santri Sma Pondok Modern Sumber Daya At-Taqwa Tanjunganom	The implementation of life skills education in Pondok Modern Sumber Daya At-Taqwa Tanjunganom includes vocational skills, personal skills, thinking skills, and social skills.
2022	Zainal Abidin Implementation of Life Skill Education at Darussalam Blokagung Banyuwangi Islamic Boarding School	Pondok Pesantren Darussalam has implemented the *life skills* education component, which is marked by the existence of educational programs that are oriented towards developing the skills and expertise of santri. However, the implementation of *life skills* education is carried out separately from the existing formal curriculum, so it

Year	Author and Article Title	Research Results
		is not arranged as part of an official education unit. This life skills education is managed independently and placed in its own unit, through the establishment of various skills institutions, organizations, and course and training activities.
2022	Zamharir Implementation of Life Skill Education for Santri Pesantren Al-Kautsar Drajat Baureno Bojonegoro	The form of implementation of *life skills* education at Al-Kautsar Islamic Boarding School includes (1) General Skills, which include Personal Skills and Social Skills, and (2) Special Skills, which consist of Academic Skills and Vocational Skills.

Life skills include various skills, such as social, emotional, and practical skills, which can help students interact with the environment, manage themselves, and contribute positively to society. [12].

1. The Importance of *Life Skills* in Islamic Boarding *Schools*
   Islamic boarding schools not only function as religious education institutions, but also as places to develop the character and skills of students. *Life skills* are important because;
   a. Facing Life's Challenges
      Santri need to have skills to face various challenges in life, both in the pesantren environment and in the community.
   b. Character Development
      Life skills help students form good characters, such as discipline, responsibility, and cooperation.
   c. Independence
      With sufficient skills, santri can be more independent and able to manage their daily lives.
2. Skills Taught
   Some of the skills that can be implemented in boarding schools include:

   a. Social Skills
      Build the ability to communicate, cooperate and interact with others.
   b. Emotional Skills
      Manage emotions, build empathy and improve emotional intelligence.
   c. Practical Skills
      Skills such as cooking, gardening, or crafts that can support independence.
   d. Leadership Skills
      Develop the ability to lead and organize through activities in the pesantren.
3. Implementation Method
   The implementation of life skills in Islamic boarding schools can be done through various methods, such as:
   a. Formal Learning
      Integrate *life skills* learning into the existing curriculum.
   b. Extracurricular Activities
      Organize activities such as training, *workshops* or seminars that focus on skill development.
   c. Direct Practice
      Provide opportunities for students to apply the skills they have learned in everyday life, such as through social projects or community activities.
   d. Mentoring and Coaching
      Presenting mentors or coaches who can provide guidance and support to students.
4. Challenges in Implementation
   Some of the challenges that may be faced in implementing *life skills* in Islamic boarding schools include:
   a. Resistance to Change
      Some may be reluctant to change the traditional way of learning.
   b. Limited Resources
      Limitations in terms of facilities, funds, or experienced teaching staff in the field of *life skills*.
   c. Perception and Understanding
      There needs to be a good understanding from all parties about the importance of *life skills* in education.

The implementation of *life skills* in boarding schools is very important to prepare students for life in the community. With the right approach and support from all parties, it is expected that students can develop the skills needed to become independent, responsible individuals, and be able to contribute positively to the surrounding environment. [13].

Impact of *Life Skills* Learning in Islamic Boarding *Schools*

Life skills learning in boarding schools has a significant impact on the development of students, both personally and socially. This impact can be seen from various aspects that contribute to the character building and skills of students.

Table 3. Impact of Life Skills Learning in Islamic Boarding Schools

Year	Author and Article Title	Research Results
2020	Khoiron Hilmy Management of Life Skill Education (At Pondok Pesantren Al Mawaddah Hongosoco Jekulo Kudus)	*Life skills* learning in boarding schools has a significant impact on the development of students. Through this education, students are not only equipped with religious knowledge, but also practical skills that help them become independent and adaptive individuals.
2022	Mar'atus Sholikhah Management of Santri Life Skills at Hidayatussalikin Islamic Boarding School Pematang Pasir Village, Ketapang District, South Lampung	*Life skills* learning in Islamic boarding schools has a significant positive impact in forming students who are independent, competitive, and ready to face the challenges of *life*. This program helps students develop practical skills such as self-management, effective communication, and critical and creative thinking skills.
2020	Arif Rahman Hakim Life Skill Education as an Effort to Create Santri Independence at Pondok Pesantren Al Urwatul Wutsqo	As a result, santri not only excel in religious aspects but also have the readiness to actively participate in social and economic life. The vocational skills acquired
	Bulurejo Diwek Jombang	through this learning also provide them with provisions to enter the world of work or open business opportunities. Thus, *life skills* learning strengthens the role of pesantren in developing individuals who are spiritually, intellectually, and practically balanced.

From the recapitulation of the results of the research study, we can describe the various impacts of Life Skills Learning in Islamic Boarding Schools as follows:

1. Positive Impact on Santri Character
   Life skills learning plays an important role in shaping the character of santri, among others:
   a. Discipline Improvement
      Santris learn to manage their time and responsibilities, which are important parts of everyday life.
   b. Empathy Development
      Through social skills, students learn to understand and feel what others are experiencing, increasing a sense of caring.
   c. Independence
      Santri who are trained with practical skills become more independent and able to overcome daily problems.
2. Impact on Social Skills
   Life skills learning also has an impact on the social skills of santri:
   a. Communication Skills
      Santri learn how to interact well, both in formal and informal contexts.
   b. Teamwork
      Through group activities, students learn to work together and respect the opinions of others.
   c. Conflict Resolution
      Santri are trained to resolve conflicts in a constructive way, reducing the potential for disputes.
3. Impact on Mental and Emotional Health

Life skills learning contributes to the mental and emotional health of santri:

   a. Stress Management
      Santri are taught techniques to manage stress and emotions, which is important in dealing with pressure.

   b. Improved Emotional Intelligence
      Santri learn to recognize and manage their own emotions as well as understand the emotions of others.

4. Impact on Economic Independence

The practical skills taught can increase the economic independence of santri:

   a. Job Skills
      Santri who have practical skills such as cooking, gardening or handicrafts can create business opportunities.

   b. Entrepreneurship Education
      Learning about entrepreneurship can motivate students to start their own business in the future.

5. Impact on Community

Life skills learning in boarding schools also has an impact on the surrounding community:

   a. Social Contribution
      Skilled santris can better contribute to society through social and community service activities.

   b. Quality of Life Improvement
      With their skills, santri can help improve the quality of their lives and those around them.

The impact of learning *life skills* in Islamic boarding schools is very broad and deep. By developing relevant life skills, santri are not only prepared to face challenges in the outside world, but are also equipped with characters and values that will guide them throughout life [14]. Effective implementation of this learning will produce a generation of santri who are independent, responsible, and able to make a positive contribution to society [15].

IV. CONCLUSION

The integration of *life skills* learning in Islamic boarding schools in the archipelago is very important to prepare santri to face challenges in the increasingly complex era of globalization and digitalization. By developing relevant life skills, such as relevant life skills, such as social, emotional, and practical skills, santri will not only be able to adapt to the changing times, but will also have a strong character, independence and the ability to contribute positively to society.

Although there are challenges in its implementation, such as limited resources and resistance to change, the commitment to integrate *life skills* education with Islamic values that can make pesantren a center for developing quality skills, so that pesantren graduates can compete to play an active role in modern society.

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Analysis of Differences in the Implementation of STEM Education in Indonesia and Malaysia: A Literature Review

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Abstract-This study aims to analyze the differences in the implementation of the STEM (Science, Technology, Engineering, and Mathematic) approach in science education in Indonesia and Malaysia. This research uses a literature study with four stages, namely determining the topic of study, searching and selecting literature, analyzing and synthesizing literature, and organizing the results of literature review. The results of the literature study show that STEM implementation in Indonesia and Malaysia uses a combination with other learning models and activities, such as problem-based learning, project-based learning, and learning that emphasizes hands on and mind on activities. The implementation of STEM in Indonesia has challenges related to limited facilities, infrastructure, and teacher training that has not been specific to STEM, especially in rural areas. Meanwhile, the implementation of STEM education in Malaysia is supported by structured policies that allow the integration of STEM into the national curriculum as a whole, especially in urban areas. Furthermore, the results of the literature review show that both countries recognize STEM education as an important part of developing 21st century skills through the integration of components in STEM.

Keywords— STEM, Indonesia, Malaysia

I. INTRODUCTION

The STEM (Science, Technology, Engineering, and Mathematics) approach to science learning has become an important curriculum integration strategy in developing students' critical thinking, problem solving, and innovation skills [1], [2]. The application of STEM aims to integrate various scientific disciplines in an applicable learning framework, so that students not only understand the concepts theoretically but can apply them in real-life situations [3]. However, the implementation of the STEM approach in science learning still experiences differences that are influenced by various factors, such as the availability of resources, and curriculum policies [4]. The STEM approach has an important role in science education as an effort to develop 21st century skills in students.

The implementation of the STEM approach in science learning is increasing along with the demands and needs of the times. In its implementation, STEM provides opportunities for students to practice critical thinking skills, creativity, and the ability to solve complex problems [5]. By integrating the four disciplines, STEM-based science learning helps students understand scientific concepts in an applied manner and connect them to real life. STEM learning also emphasizes the importance of collaboration and digital literacy needed to adapt to the demands and changes in the world of work [6], [7]. Therefore, the STEM approach in science learning is essential to prepare a generation that is able to face global challenges and make a positive contribution to society [8].

In the implementation of STEM in schools, there are different challenges, such as the challenges faced in Indonesia, namely the implementation of STEM is still constrained by limited facilities, infrastructure support, and uneven teacher training in various regions. Currently, many schools in rural and remote areas experience limited access to adequate laboratory equipment and technology, making it difficult to implement STEM learning [9]. However, the Indonesian government has launched various programs to develop STEM curriculum and provide training to teachers in stages in several regions.

Meanwhile, the implementation of STEM in Malaysia has received policy support from the government, such as more structured teacher training programs and the provision of adequate facilities in schools. Furthermore, Malaysia has also included STEM subjects in the national curriculum through various research-based projects that directly involve students, especially in urban schools [10]. However, Malaysia also faces challenges such as ease of access and improving the quality of STEM learning in rural areas still needs to be improved. This shows that both countries still face challenges in ensuring equitable accessibility and quality of STEM learning across the region [11].

Based on this explanation, it shows that the implementation of STEM in Indonesia and Malaysia has some differences in several aspects of the implementation of the STEM approach in schools.

Thus, this article will conduct a literature study on STEM implementation in Indonesia, STEM implementation in Malaysia and the differences in STEM implementation between Indonesia and Malaysia. The study of the differences in implementation will also be reviewed from several factors that influence the differences in implementation, so as to provide an overview of the factors that influence the implementation of STEM in the two countries.

II. METHOD

In this research, four stages of literature study were used, which consisted of determining the topic of literature study, searching and selecting literature, analyzing and synthesizing literature, and organizing writing [12]. The topic chosen in this study includes the implementation of STEM in Indonesia and Malaysia, and the differences between the two countries are also studied. The literature search process for the needs of this research used google schoolar, springer, and various other journals that have relevance to the theme, both journals in Indonesia and journals in Malaysia. Article selection was carried out to ensure that the articles analyzed had good credibility with the criteria of the year of publication in the range 2014-2024, relevance to the topic studied, journals containing explanations of STEM in Indonesia and Malaysia, and completeness of journal identity. The analysis and synthesis process was carried out by creating an analysis matrix to obtain a complete picture of the content of each literature.

III. RESULTS AND DISCUSSION

The results and discussion describe the results of the literature study with a focus on STEM implementation in Indonesia and Malaysia, and analyze the differences in STEM implementation in the two countries. The discussion consists of a description of STEM implementation in Indonesia, STEM Implementation in Malaysia, and Analysis of Differences in STEM Implementation in Indonesia and Malaysia.

STEM IMPLEMENTATION IN INDONESIA

Based on the literature study on several articles that discuss the implementation of STEM in Indonesia, the following picture is obtained:

Table 1: STEM implementation in Indonesia

No	Author Name/Year	Strategy	Results
1.	[13]	PBL goes through five EiE steps. The five EiE steps can be described as follows: (ask), (imagine), (plan), (create), and (improve).	Increase students' interest in learning physics subjects, especially on magnetic induction material.
2.	[14]	Implementation of PjBL-STEM with	improve students' higher order
		the stages of Reflection, Research, Discovery, Application, and Communication.	thinking skills on biotechnology material.
3.	[15]	Application of PjBL STEM learning with the provision of Student Worksheets (LKS) and science literacy questions.	Significant impact on students' science literacy, both male and female in the aspects of science knowledge, attitude, and competence.
4.	[16]	Application of STEM from home PjBL model by providing phenomena in daily life, determining tools and materials, designing biopori designs and making biopori project designs.	Improve students' concept mastery and creative thinking skills.
5.	[17]	Application of the Project-Based Learning model with a STEM approach to seek information, design and develop relevant conceptual understanding based on projects.	The application of PBL model with STEM approach is effective in improving students' mathematical creative thinking skills.

Based on Table 1, it can be seen that the implementation of STEM in Indonesia is combined with several learning models, such as the Problem-Based Learning learning model [13], [17], and Project-Based Learning learning model [14], [15], [16]. The application of the combination of STEM with this learning model is carried out to increase student interest and learning outcomes through the form of innovative learning steps. Some research results show that exposing learning stages, such as Reflection, Research, Discovery, Application, and Communication [14]. Meanwhile, other studies describe different stages that emphasize finding information, designing and developing relevant conceptual understanding based on the project [17]. These stages have an impact on improving students' creative thinking skills.

In another study, the implementation of STEM in Indonesia combined with the PBL model used five steps from Engineering is Everywhere (EiE), namely (ask), (imagine), (plan), (create), and (improve) [13]. In another study, the application of STEM with a combination of PjBL using the stages of reflection, research, discovery, application, and communication which can help students develop higher order thinking skills in biotechnology material [14]. This approach integrates STEM components to build skills that match the demands of the 21st century [18]. Under these conditions, students not only acquire

theoretical knowledge, but are also challenged to apply it in real situations through project-based activities.

Overall, these five articles show that the STEM approach applied through PBL and PjBL models has a significant impact on science literacy, creative thinking skills, and concept mastery in students [19], [20]. Through activities involving projects and daily life phenomena, students not only learn conceptually, but can learn meaningfully. The findings from this study confirm that an integrated STEM approach in the learning process can be an innovative solution to create more effective learning experiences across various disciplines.

STEM IMPLEMENTATION IN MALAYSIA

In this section, we will discuss the implementation of STEM in Malaysia which is based on the results of several studies that have been conducted in Malaysia. The following Table 2 describes the implementation of STEM in Malaysia.

Table 2: STEM implementation in Malaysia

No	Author Name/Year	Strategy	Results
1.	[21]	STEM-based Problem Based Learning (PBL) approach with the use of relevant questions or problems.	The application of the PBL-STEM approach is effective in arousing students' interest in science to learn from a real-life context.
2.	[22]	STEM learning is based on "hands-on" and "minds-on" activities.	Robot-based STEM learning has proven effective in connecting teaching and learning with critical thinking skills
3.	[23]	Implementation of team-based robotics through the use of LEGO NXT Mindstorm	There is a significant difference in students' perception of STEM learning. This data was obtained through the STEM Semantics Perception Data and STEM Career Interest Scales, which showed a positive increase in students' interest and understanding of STEM.
4.	[24]	PBL learning goes through a five-stage engineering design process as follows: (1) ask, (2) imagine, (3) create, (4) test, and (5) improve.	This research significantly increased students' interest in STEM.
5.	[25]	STEM integration in ProjectBased Learning (PBL) using HOTS development module as a conceptual framework.	Project-based learning method with STEM integration can be an effective approach to improve students' HOTS.

The results of the literature study show that STEM implementation in Malaysia generally focuses on increasing students' interest and skills in science. In its implementation, STEM implementation is integrated with Problem-Based Learning (PBL) learning model with real problems and relevant to students' lives. This combination can increase students' interest in classroom learning that is linked to real-life contexts [21]. This STEM-PBL strategy in Malaysia provides opportunities for students to learn through solving relevant problems and applying theory directly in real conditions, so that students can gain a deep understanding of scientific concepts.

In another study, the implementation of STEM in Malaysia emphasized "hands-on" and "minds-on" activities, involving robots as learning tools, such strategies can improve students' critical thinking skills [22], [23]. In the robot-assisted STEM implementation, students are challenged to develop critical thinking skills through various activities utilizing robots as the medium [22]. Meanwhile, the use of LEGO NXT Mindstorm in robotics in STEM implementation in Malaysia has an impact on increasing students' interest in STEM [23].

In another study, STEM implementation in Malaysia was combined with project-based learning activities in engineering design and the development of higher order thinking skills [24], [25]. In its implementation, STEM-PjBL emphasizes the five stages of design (ask, imagine, create, test, improve). The strategy can increase students' interest in STEM [24]. In another study, STEM was implemented with the help of HOTS module in project-based learning. This strategy helps students develop analytical and creative thinking skills, thus supporting students in facing real-life STEM challenges [25]. Thus, all articles show that the STEM approach in Malaysia has the potential to enhance students' critical thinking skills and interest through learning strategies combined with real problem-based activities, hands on and minds on activities, as well as project-based activities and design engineering.

DIFFERENCES IN STEM IMPLEMENTATION IN INDONESIA AND MALAYSIA

The differences in STEM implementation in Indonesia and Malaysia are not too specific at the technical level of implementation in the classroom, in general the implementation in both countries has similarities in combination with learning models. However, the two countries have different challenges that will have an impact on the implementation of

STEM in schools. The challenge in Indonesia lies in the need to improve facilities and infrastructure, especially in rural areas. Schools in some rural areas do not have access to adequate laboratory facilities and STEM-specific teacher training, so project-based and experiential STEM implementation has not been optimized [11], [26]. The government has made various efforts through training programs and curriculum development aimed at facilitating the process of STEM development and implementation equally.

Meanwhile, in the implementation of STEM in Malaysia, there is government support in the implementation of STEM. The support includes scheduled teacher training and the provision of adequate facilities at various schools [10]. The Malaysian curriculum also includes research-based projects that can make STEM integration can be implemented thoroughly [24]. However, Malaysia also still faces the same challenges as Indonesia in ensuring equitable access for schools in rural areas that still experience limitations in the implementation of STEM in Schools [22].

IV. CONCLUSION

The implementation of STEM in Indonesia and Malaysia has fundamental similarities in learning strategies, which combine STEM with other learning models, such as problem-based learning, project-based learning, and learning with hand on and mind on activities. In both countries, the strategies can improve students' thinking skills and interest in STEM. The fundamental difference obtained from the results of the literature study shows that the implementation of STEM in Indonesia and Malaysia is supported by different policies and curricula, so that the implementation experiences slight differences. However, both countries still experience problems with equitable access and adequate facilities in STEM implementation, especially in rural areas.

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The Cultivation Of Islamic Religious Education Values As A Response To Bullying In Schools

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Abstract-Bullying is a form of abuse of power or dominance that can have a negative impact on its victims, both physically, psychologically and socially. So the purpose of this study is to find out how the cultivation of Islamic religious education values against bullying in schools. This research uses a narrative literature review method with several stages including; protocol search (searching the article database using google scholar with the keywords bullying and instilling Islamic religious education values), appraisial (suitability of the database with the theme, completeness of database identity, year of publication of articles 2017-2024), shynthesis, analysis and report. The results of this study indicate that the trend of research articles on Google Schoolar about bullying has increased significantly in 2023 and as a response to bullying is by instilling the values of faith, instilling the values of empathy and compassion, instilling the values of tolerance and justice, strengthening the values of honesty and responsibility, and by fostering awareness to be a good person. Thus, the cultivation of Islamic religious education values is expected to be one of the effective solutions in efforts to prevent and handle bullying in schools. This effort will contribute to the formation of positive character and social behavior in accordance with religious values.

Keywords: Values cultivation, Islamic religious education, Bullying

I. INTRODUCTION

Bullying is a phenomenon that has long been a serious concern in various circles, especially in the junior high school environment. The act not only harms the victim physically and mentally, but also damages the favorable learning climate. many now realize that bullying is a very harmful behavior and can affect one's attitude. Bullying is a behavior that should be avoided by everyone because bullying not only affects the attitude of the bullying victim at the time of the incident, but can also affect their attitude in the future. With the influence that bullying has on a person's development, it is appropriate for everyone to understand what bullying is.

Bullying is an aggressive act that is usually done by someone to intimidate or control others who are considered weaker. This behavior that deviates from social norms can occur anywhere, from schools to the workplace. Data from the Indonesian Child Protection Commission (KPAI) and the Federation of Indonesian Teachers' Unions (FSGI) show that in 2022 there were 226 cases of bullying, which is a terror for children who are still in school. According to education level, the most victims of bullying are elementary school students (around 26 percent), junior high school students (around 25 percent), and high school students (around 18.75 percent). Some of the most common types of bullying are physical (55.5%), verbal (29.3%), and psychological (15.2%). [1].

Bullying is an aggressive act that is intentionally inflicted by individuals or groups repeatedly on helpless victims. Bullying is one of the most prevalent forms of violence in schools and is on the rise. Youth violence is the 4th leading cause of youth death worldwide with 200,000 cases of people dying each year.

From the above statement, we can conclude that bullying is a social problem that must be addressed immediately. Because violence is also a social problem that must be addressed immediately, because it includes mental illness that can damage mentally, both the mentality of the perpetrator, witnesses and what is worse is that it damages the victim's mentality and causes death.

A person will begin to know the outside world as they grow and develop into adolescents. They begin to socialize and relate to peers. A person's social skills can be improved if the religious teachings given by both parents can be taken optimally. Because humans develop and grow from stage to stage without forgetting the lessons they have learned in the previous phase.

Bullying can occur due to many factors, such as social inequality, strata, economic factors, differences in lifestyle, and so on. no exception to the pattern of children's education in shaping morals and personality. One of the causes that can make children do or can also be victims of bullying is a situation where children are too focused on cyberspace / social media,

the tendency of children who are too focused on their cellphones, even most of their time and attention is on their cellphones. This can make them less aware of their surroundings. They become insensitive to social problems that occur, apathy, selfishness and individualism grow into their new personality.

In order for adolescents to grow and develop optimally, they must be prepared for various systematic and continuous actions. Especially in the field of religion and spirituality. Which is capable of forming strong morals and character. This is where the role and function of religious education is very decisive for the future sustainability of students, where religious education is able to shape, direct and stimulate the character of students who are morally good. In addition, Islamic Religious Education does not only introduce religious teachings, but also includes character and moral building. [2].

In the midst of rampant bullying in schools, the application of Islamic Religious Education values becomes increasingly important as a holistic response. Through an understanding of compassion, justice, and empathy taught in Islamic teachings, students are expected to become agents of change in preventing and overcoming bullying in the school environment. Therefore, this approach not only strengthens students' religious identity, but also forms an inclusive character and prioritizes mutual respect, maintaining unity, and creating a safe and comfortable learning environment for all.

Based on the background of the problem, the researcher is interested in discussing how "The cultivation of Islamic religious education values as a response to bullying in schools".

II. METHOD

This research uses a narrative literature review approach by finding references to previous ideas that are aligned with the topic being discussed by analyzing and comparing them. A systematic, detailed and iterative approach to finding, assessing and summarizing works that have been assembled from the ideas of academics or practitioners is known as a literature review. In general, the process of compiling a literature review involves reading, summarizing, and writing the author's perspective on several literature sources relevant to the problem and subject under discussion. This literature review is a great source for generating concepts and aims to provide an overview of the subject being analyzed.

The literature study in this research discusses the cultivation of Islamic religious education values as a response to bullying in schools. This research is a series that explains how to instill Islamic religious education values as a response to prevent bullying in schools. Data taken from existing scientific articles and several references from related books.

For the stages using the narrative literature review method:

Protocol search

At this stage, the focus is on studies and database searches, where the focus of the study is the cultivation of Islamic religious education values as a response to bullying in schools. Meanwhile, the search for article databases was carried out using Google Scholar with the keywords Bullying and the cultivation of Islamic religious values.

Apprasial

at this stage determine and select databases which include; suitability of the database with the theme, completeness of database identity, year of publication of articles 2017-2024.

Synthesis

At this stage, the selected database is extracted and categorized according to the focus of the study on the cultivation of Islamic religious education values as a response to bullying in schools.

Analysis

At this stage, the overall data analysis of the related articles is carried out.

Report

This stage produces a report in the form of an article that can be published.
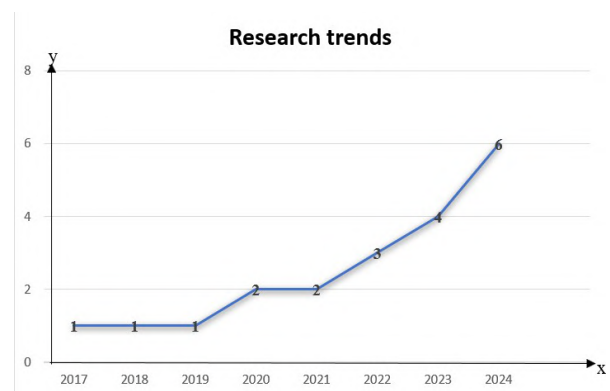
III. RESULTS AND DISCUSSION

Figure 1.0 Trend of research on bullying from 2017-2024

Based on the graph in Figure 1.0 with the x-axis describing the year and the y-axis describing the number, it shows that bullying actions have increased and decreased quite drastically. bullying attitudes that occur among teenagers, especially in the school environment, have become a conversation from the past 7 years. The increase continues to occur every year, even from before the pandemic until the Corona pandemic, bullying still continues, because bullying is not only *face to face,* but in typing messages to others that can harm one party is also included in bullying that must be held accountable.

In 2024 as the highest graph of the previous few years, it became a trend of conversation in every school in overcoming bullying attitudes, with some prevention

carried out by each school, of course, it can help in preventing bullying. Therefore, researchers are interested in researching more deeply about how to instill Islamic religious education values as a response to bullying in schools.

By instilling the values of how to prevent bullying in every school, in 2024 it is hoped that there will be a drastic decrease in bullying.

Bullying is a negative action carried out by someone repeatedly that attacks weaker people, both mentally and physically. [3]. Bullying is a desire to harm that causes someone to suffer both physically and mentally. Bullying can occur at various levels of education, be it in kindergarten, elementary school, junior high school, or high school.

Bullying can be done verbally, physically, or cyberspace, someone who commits bullying usually does not realize that the behavior they are doing is wrong. Someone who is intimidated makes them uncomfortable which can make them lose confidence which will harm themselves.

Bullying in Indonesian is defined as menyakat, which means disturbing, disturbing or hindering, in other words bullying can also be interpreted as a threat or disturbance from someone who feels he has more power so that his victims can experience psychological disorders in the form of stress, depression, excessive anxiety, and feel that their lives will not be safe if they are in that environment.

From the rise of bullying among adolescents, especially in the school environment, which causes students to feel anxious, fearful and lack of concentration in learning, thus having an impact on the decline in intelligence and the ability to analyze a student.

A person who bullies a person who is inferior and weaker than them will feel confident when bullying, so they will favor violence, lack empathy for others, and be aggressive.

Bullying Factors

The existence of bullying can be caused by a lack of attention from parents and teachers which causes bullying to occur. In addition, bullying actions can occur due to several factors, including:

1. Family factors, family behavior that exemplifies violent attitudes in a condition or situation that can be seen by the child, so that he commits acts of bulliying at school. [4].

2. Friendship factors, wrong associations that result in a bad friendship environment in solving problems, adolescence is a period when someone is looking for identity. The friendship environment, groups, and various pressures that exist will affect the treatment of others (Nugroho et al., 2020). [5].

3. Environmental factors, attitudes that justify bullying behavior that is not resolved immediately so that students' psychology is cultured.

4. Media and technology factors, watching films or videos that contain elements of violence then they will practice it on their peers so that the media, be it videos, films, the internet, or books or magazines, have a significant influence on children's behavior. [6].

Types of Bullying

The types of bullying behavior include::

1. Verbally, such as cursing, denouncing, intimidating, making fun of, insulting the shortcomings that exist within a person. [7].

2. Non-verbally, bullying is carried out non-verbally with body styles such as sticking out the tongue, sardonic gaze, showing a face like mocking at the victim. [2].

3. Physically, bullying behavior is physically carried out by biting the victim, grabbing hair, hitting, kicking, spitting and damaging. [8].

4. Cyber bullying in this form is usually carried out through social media such as Facebook, Instagram, Twitter in the form of messages or pictures, silent calls that are hurtful or harmful. [4]

Bullying has various impacts on its victims. As victims of bullying will have a high risk of suffering from various physical and mental health problems. For example, the emergence

of various psychological problems such as depression, anxiety, and sleep disorders. In addition, victims of bullying can have physical health problems such as pain in various parts of the former bullying, lazy to do activities and lack of enthusiasm in learning which will affect their education. [9].

Bullying actions that result in harm to someone must of course be accounted for and prevented by approaching the bully so that appropriate treatment can be carried out. In addition, the perpetrators of bullying must be given education to change behavior and behavior towards others and provide advice on what things should be left and done. Then equip students to overcome a problem that arises in a school environment that is uncomfortable for these students. Accustoming students to defend themselves in order to avoid being victims of violence, and if they get violence students must immediately report and seek help. Therefore, bullying is a mistake and a mistake that requires further action to deal with the problem. various ways are needed, one of which is by instilling Islamic values to the perpetrators of bullying so that they do not repeat their actions.

Cultivating Islamic Religious Education Values as a Response to Bullying Actions

There are several steps that we can take as an effort to instill Islamic Religious Education values to respond to bullying, including:

Instilling the Values of Belief

Aqidah is a faith, a belief that exists within, about the bond to what is believed, as Muslims must believe or believe in Allah's commands contained in the Qur'an, which are related to orders to avoid bullying attitudes. As explained in the Al-Quran letter Al-Hujurat verse 11 which means:

"O you who believe, let not a group of men despise another group, so that those who are laughed at may be better than them. And let not a group of women despise another group, so that those who are despised may be better than them. And do not reproach yourselves and do not call each other by derogatory names. The worst of calls is that which comes after faith, and whoever does not repent, then they are the wrongdoers."

Based on the verse above, Allah forbids us to humiliate others because it could be that the person who is humiliated is better than the one who humiliates. In addition, bullying will lead to badness both to oneself and the victim. Islam is a religion of rahmatan lil alamin, which means that Islam is a religion that brings Grace to all, besides that Islam is a religion of peace. Islam teaches its people to love and care for each other.

Instilling Moral Values

Morals are an inseparable unity within ourselves, because all human activities in life have a relationship with themselves and their environment. With that, the cultivation of moral values is needed so that there is no gap in life regarding bad and good life, one of the moral values in preventing bullying is to instill morals towards fellow human beings, that every human being is equal, no one is higher or lower, therefore bullying attitudes that view others as inferior must be avoided.

Instilling the Values of Empathy and Compassion

The attitude of empathy is called the attitude of understanding or feeling the feelings of others, which is a moral behavior of a person. Empathy is closely related to one's behavior. Children who have empathetic traits are classified as "good" children, who are gentle, who are caring, who direct themselves to others. When they behave, speak to others, they always pay attention to the feelings/emotions of the person they are dealing with by paying attention to the intonation of their speech, gestures, and facial expressions.

Thus someone who has good enough empathy will have good moral ethics, and usually with an empathetic attitude in themselves, they will avoid bullying. From this it is clear that empathy is very important to be instilled in children from an early age, in order to form a civilized and highly moral person, Love is something that is needed by all humans. Likewise, in education, affection is very necessary where education based on affection can produce psychological comfort for students. The process involves parts of

education, namely cognitive, the process of transferring knowledge, changing values and forming personalities with various aspects. [10].

According to Abdurrahman Mas'ud, the method used must emphasize the formation of creativity, sharpening of conscience, religiosity of students, and increasing social sensitivity. This can happen by getting to know and understand students more closely.

Instilling Values of Tolerance and Justice

Tolerance is an attitude of respect and appreciation for every difference in humanity, which is individual or group in nature, by accepting every difference both in terms of beliefs, culture, interests, and those that are contrary to oneself.

Tolerance describes a pattern of moral social life because it makes a person able to appreciate the different qualities in others, open themselves to new views and beliefs, and respect others regardless of ethnicity, gender, appearance, culture, religion, beliefs, abilities, or sexual orientation. [11].

Justice is the provision of rights and obligations in a balanced and proportional manner. Justice means treating people fairly, and not differentiating, and giving what is right to someone who does not harm, both individuals and groups. [11].

Therefore, it would be nice to behave tolerantly and fairly to fellow friends, so that there is no bullying behavior that can harm someone.

Strengthening the Values of Honesty and Responsibility

Honesty is a word and deed that is in accordance with the true actions, without any lies or something that contradicts the facts. Honesty is one of the most important values in building relationships with oneself and others. However, honesty is difficult for people who tend to lie because they want to get something instantly. So honesty requires postponing temporary pleasures in order to get happiness forever [12].

In addition to instilling the value of honesty, instilling an attitude of responsibility is also important. An attitude of responsibility is a person's behavior to carry out his duties and obligations that he should do, both towards God, self, family, community, environment, and also the state. [13]

Planting the values of honesty to students as an effort to prevent and overcome bullying so that the

perpetrators will admit their mistakes and can be given education. In addition, instilling the value of responsibility is very important considering that bullying is a mistake and with an honest and responsible person, it can be an important point in efforts to handle bullying in the school environment.

Raising Awareness to Become a Good Person

Planting awareness to students to become a good person as a response to bullying that occurs. Generally, bullying actions are carried out because the perpetrators lack awareness and beliefs about right and wrong things. By instilling good values such as peace, compassion, love for others, responsibility, accepting differences, learners will have better ways to resolve conflicts they face. In the process, instilling good values to children must involve various parties, especially parents and schools. Parents cannot fully entrust children's education to schools because the nature of the role of parents as educators is natural and cannot be replaced. Which is where the busyness of both parents cannot be an excuse to leave the responsibility as an educator at home.[14]. This is because the first place social values are introduced to children is by their parents and closest people. Therefore, good communication in the family is mandatory, besides that there is the term "Al-ummu madrasatul uula" which means that the mother who is part of the family is the first place a child will learn, so that the cultivation of character, moral values to children depends on parental education. [5].

IV. CONCLUSION

Bullying is an act that is still a complicated problem in the school environment at this time. Efforts to instill Islamic religious values by instilling moral values, values of faith, values of empathy and compassion, values of tolerance and justice, values of honesty and responsibility, and instilling awareness to do good as a response to bullying actions, especially those that occur in the school environment.

Students who are victims of bullying will have various problems such as a sense of trauma that will make them reluctant to go to school which will affect their future. Therefore, in addition to instilling Islamic religious values, the role of parents is needed as the first place to get education so that children have good morals and personality.

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Development of Religious Moderation in the Islamic Religious Education Curriculum: a Narrative Literature Review

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Abstract- The purpose of this research is to investigate how the Islamic Religious Education (PAI) curriculum in Indonesia develops religious moderation. A narrative literature review approach was used, using various types of literature, including books, scientific journals and official government documents. The research shows that although the concepts and principles of religious moderation have been incorporated into the PAI curriculum, the successful implementation has not been fully realized. The focus of PAI education based on religious moderation should be on contextual, critical, and dialogical methods. Religious moderation in the PAI curriculum can be implemented in several ways, including through the creation of educational resources, teacher preparation programs, and the application of information and communication technology. To create a future generation that is tolerant, peaceful, and has noble character, it is very important to develop a religious moderation curriculum in PAI learning. The government, schools, teachers, parents and the community must provide support and work together to support this initiative. However, the inclusion of religious moderation in the PAI curriculum is a significant step towards raising a new generation that is respectful, peace-loving, and accepting.

Keywords: Religious moderation, Islamic Religious Education, Curriculum, Narrative Literature Review

I. INTRODUCTION

Through the many Muslim communities in the world, Indonesia is the largest where the majority of the population identify themselves as Muslim. There is no denying that it has a very rich variety of "ethnicities, languages, regional scripts, and cultures". However, diversity also presents its own difficulties, especially when trying to unite the nation, make it safe, and provide justice. As a result, Indonesia is often talked about, especially in relation to religious moderation. Religious moderation is a religious doctrine that emphasizes diversity in terms of nationality, religion, customs, and other aspects of life. Conversely, Islam that is not moderate does not recognize or justify diversity.

Islam needs to be implemented in a way that can help solve problems in the world because Islam is a religion that extends mercy to all nature. One of the problems is the emergence of radical ideas and behaviors that favor strict and harsh interpretations of religion and disparage softer and more moderate ideals. Extremists tend to adopt extreme religious practices that ignore human beings in favor of glorifying God alone. Although religion itself teaches that human sustainability is an essential component, they are prepared to commit acts of violence "for the sake of God." [6].

Learning is a deliberate and organized effort to lead and support students in realizing their physical and spiritual potential so that they can mature and become independent individuals. The history of human progress shows the important role played by education in improving the lives of future generations, especially in relation to the expectations of society. The purpose of Islamic Education is to promote "awareness, appreciation, experience, and skills" of students related to the religion of Islam to the extent of making Muslims who are devoted to Allah SWT, and have good morals in their lives, society, nation and state in order to continue the highest level of education.

Various phenomena that occur in the educational environment, one of which is the increasing "number of bullying, hate speech on social media, the proliferation of fake news, acts of terrorism, the spread of radicalism, and various other cases of religious intolerance" show that the target of PAI is fairly close in reality. This raises the question of what role Islamic Religious Education has played so far in achieving these goals [11].

The key elements of the educational process and the achievement of learning objectives are learners and

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educators. Another important component in the implementation of learning and knowledge transfer to students is the curriculum. In educational institutions, curriculum making requires various actions that are normative, reasonable, and adapted to the provisions of educational institutions, especially in religious learning, learning based on religious moderation can be realized through the curriculum.

Islamic moderation should be encouraged especially by educational institutions, which makes incorporating these ideals into education very important. The best place to help students become more sensitive to diversity is at school. Teachers should educate their students that every religion spreads messages of kindness, not hatred, and that diversity should be respected in the classroom by encouraging interfaith dialog. Teachers not only teach those with religion, but also those who teach other subjects. Thus, have a very important responsibility in educating students about the facts, principles and ideals of Islamic moderation. Teachers should not spread hatred, act as spokespersons for anti-Pancasila organizations, or support students' extreme and intolerable viewpoints." [16]

Finding the path to goodness, brotherhood and benefit through moderation in religious practice is crucial, especially in the context of education. Promoting the ideals of religious moderation both formally and informally through the curriculum can reduce or even stop extremist behavior, fanaticism, and actions that undermine interfaith harmony in Indonesia. When Hakim Saifuddin, the minister of religion, proclaimed 2019 to be the year of religious moderation, the word "religious moderation" gained official recognition. Particularly at State Islamic Religious Universities (PTKIN) and the Ministry of Religious Affairs, the idea of religious moderation has received significant attention in both academic and religious circles. In his capacity as Minister of Religious Affairs, Lukman Hakim Saifuddin specifically highlighted religious moderation as a key feature of Indonesia's heterogeneous society. In fact, 2019 has been declared the International Year of Moderation by global organizations such as the United Nations (UN), which recognizes the value of moderation.

As strong religious perspectives voiced by groups of people acting in the name of religion have tested Indonesia's diversity in recent years, education on religious moderation has become increasingly important in fostering national awareness. This phenomenon can be seen in real actions and comments made on social media. Restrictive and intolerable groups, which often ignore local circumstances and national issues, pose a threat to interfaith unity in Indonesia. Within this framework, it has an essential role in fostering solidarity and human civilization. This research aims to explain and examine the development

of religious moderation in the Islamic religious education curriculum, taking into account the contextual factors mentioned above. [14].

II. METHOD

This research uses a technique to describe and interpret phenomena theoretically based on studies found in the literature, called literature research. Primary data sources for this research come from various works of literature, including books and journals that are the subject of the investigation. Books and journals are examples of secondary data sources that are also used as support. The data collection methods used were searching, organizing and editing.

Using text data from previous research that has been updated in recent editions is a component of desk research. Desk research has four distinct qualities, which are as follows: (1) It does not require field observations, but deals directly with texts containing numbers or system data. (2) The researcher can directly access data from desk research because the data is already available in an easily accessible format. (3) Since secondary data is collected from publications such as books, newspapers, and other sources, the secondary data is part of the data used in the literature. (4) Since the literature research has been recorded as stored text records, the data is not constrained by time or location. [15]

In the figure above, it can be seen that the tendency of religious moderation research is still increasing in the last 10 years. The figure above also shows that research that shows religious moderation in the PAI curriculum still plays an interesting topic to continue to be studied by researchers and academics. In addition to presenting data analysis, the topic of religious moderation research will be discussed in this study.
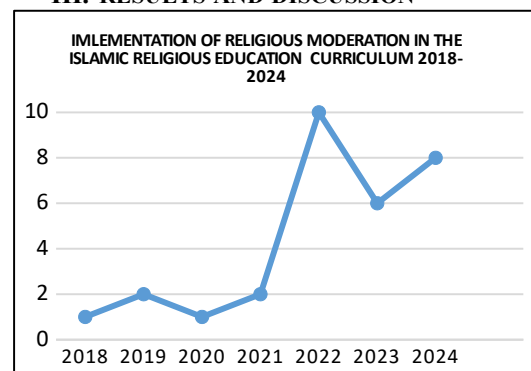
III. RESULTS AND DISCUSSION

Figure 1. Diverse Moderation Research Trend
In the PAI Curriculum 2018-2024

In the figure above, it can be seen that the tendency of religious moderation research is still increasing in the last 10 years. The figure above also shows that research that shows religious moderation in the PAI curriculum still plays an interesting topic to continue to be studied by researchers and academics. In addition to presenting data analysis, the topic of

religious moderation research will be discussed in this study.

Concepts and Principles of Religious Moderation in the Islamic Religious Education curriculum

In terms of terminology, "moderation" refers to balance. However, in English, moderation refers to reasonable behavior or moderation. Although Al-Asfahaniy defines the Arabic term for moderation as sawa'un, which implies a midpoint between two borders, a sense of justice, standard values, or as usual, the term wasat itself has the term wasat or wasatiyah. Wasathan also refers to avoiding behaviors and viewpoints that deviate from the boundaries of religious truth. In the book The Great Theft, Khaled Abou el Fadl defines wasathan as seeking the middle way, or adopting a point of view that is neither too to the left nor to the right. We call the perpetrator a referee. In Indonesian, the word "wasit" is translated as "mediator".

To reduce the growth of excessive practices in actual practice, religious moderation is the process of understanding and applying religious laws in a reasonable way. Since philosophy already incorporates concepts of moderation, such as the value of justice or balance, religious moderation does not mean moderating religion. In order for religious perspectives not to be dogmatic or one-sided, moderation must be practiced by every religious believer who always appreciates the middle value, or wasat/niyah. Less fair, and beyond what is recommended is not in line with it, [8].

The targets expected through a Religious Moderation are:
a. Fostering religious life in a country that is historically pluralistic and multicultural, religious moderation is as important as farming in managing religious life.
b. Although the idea of religious moderation will not mix different religious beliefs with each other, because the goal is to always uphold tolerance with other religious believers, religious moderation is very important when applied to various types of problems and thus no longer needs to be debated in society.

Yusuf al-Qardhawi, an Egyptian scholar, believes that Muslims should be able to adopt what is known as moderate behavior, or the middle way, to make religious worship easier to practice. The Islamic guidelines for moderate behavior are as follows:

1. Justice

A sense of justice as an expression of unity and harmony between obligations and rights, so that religious ideals will be more meaningful in people's lives by prioritizing a sense of justice.

2. Balance

A balanced attitude in everyday life is maintained by a feeling of balance, which is an expression of a moderate attitude and leads to peace in the relationship between humans and Allah SWT.

3. Tolerance

A form of moderate attitude towards the sustainability of a diverse society, both in terms of "religion, language, and ethnicity", with an attitude of tolerance embedded in each individual, it will create positive values that respect each other for differences. JNESCO defines tolerance as an attitude that fosters respect for each other's cultural and religious differences and admiration for them. It can also support a person's character and freedom of speech.

Principles of Religious Moderation

1. Tawassuth (Taking the Middle Way)

Tawassuth is an attitude that is in the middle, or moderate between two attitudes not too to the left (liberalism) and not too to the right (fundamentalism) It means taking the middle path. So, Islam will be widely accepted in all walks of life with this tawassuth mentality (Ministry of Religious Affairs of the Republic of Indonesia, 2019). As in the Qur'an explained in Surah Al-Baqoroh verse 143 which means "And so (also) We have created you (Muslims), O Muslims, as a middle people, so that you are witnesses to (the actions of) mankind and so that the Messenger (Muhammad) is a witness to (the actions of) mankind. Indeed I, Muhammad, am your messenger". (Al-Baqarah, Qs.: 143)

2. Tawazun (Balance)

Giving something its due without adding or subtracting is another meaning of tawazun. A Muslim who adopts the mentality of tawazun can achieve outward and inward peace, which manifests as stability and tranquility in daily activities and true inner happiness in the form of mental peace. (Ministry of Religious Affairs of the Republic of Indonesia, 2019).

3. I'tidal (Straight and Firm)

Itidal, as a verb refers to being firm and straight; it means putting things in their proper place, exercising rights, and performing duties in a reasonable manner. Itidal is a component of the application of ethics and justice for all Muslims [12].

4. Tasamuh (Tolerance)

Tasāmuh means to accept everything gracefully or tolerantly. Tasamuh on the other hand, refers to the act of accepting or tolerating differences leniently. According to Hasyim, tolerance is giving other communities the opportunity to practice their beliefs without breaking the law [20].

5. Musawah (Egalitarian)

Musāwah is an Arabic word that means equality and respect for fellow human beings as creatures of God. Regardless of gender, skin color, or ethnicity, everyone is entitled to equal dignity.

6. Syura (deliberation)

An explanation that means to state and raise something. Shurā is also defined as deliberation, which

is the process of considering or requesting and comparing viewpoints.

In this case, religious moderation is the initial part needed to foster respect. In the PAI curriculum, it is a vision of an attitude that seeks to find a middle position through two different and excessive attitudes, so that no one dominates. This link includes values such as "Toleration, peace, interfaith dialog, openness, and rejection of hate speech".[17]

Islamic Religious Education Learning Based on Religious Moderation

The development of religious moderation is not explicitly taught in different subjects, but it is included in the lessons through incorporating the value of moderation in the teaching and learning process, especially in PAI lessons. Therefore, because there is no special lesson, children do not feel burdened with additional lessons. Thanks to the involvement of all stakeholders in the school, especially the PAI teachers who act as the liding sector, the series of internalization of religious moderation learning that is given not instantly has been successfully implemented.

There is also the value of learning religious moderation that is internalized in PAI, among others, the importance of "tolerance, religious harmony, having an attitude of compassion for others, peace-loving, polite, responsive, and proactive" in finding solutions to various problems when interacting with friends and family in interacting with the social environment efficiently. [2]

To form accepting and multicultural students, PAI learning incorporates the concept of religious moderation *(wasathiyah)*. This is part of the effort to undermine extremism and fanaticism based on religion and beliefs. Various elements are related to PAI lessons: First, curriculum, second, educators, third, materials, fourth, methods and media, and fifth, PAI evaluation. The compound is a unity that cannot be separated. [3] Various factors related to teaching, namely:

1. Islamic Religious Education Curriculum

The idea of Islamic moderation already exists in the PAI curriculum in accordance with the content of the curriculum. However, although the idea of Islamic moderation can influence an inclusive and tolerant mindset, its implementation is still not optimal. Islamic Religious Education on the other hand focuses mainly on the truth of its own religion and other religions.

To help students develop a moderate attitude towards religion, religious moderation should be implemented in the educational environment. Therefore, in order for there to be an act of moderate Islam in students, there is a need to develop an Islamic education curriculum in pesantren-based schools that studies Islamic moderation. This curriculum teaches students how to: (1) Building harmony with different communities, both within and outside Islam; (2) Spreading comfort to the social environment; (3) Promoting interfaith conversations; (4) Instilling transparency in actions with parties outside Islam; and (5) Rejecting hate speech both inside and outside school. [17]

Students who are taught Islamic moderation are not allowed to imitate the extremes. Rather, it is required that they follow the way of the Prophet Muhammad and his relatives, which is reasonable, straight, and does not deviate from the truth; not the way of those who incur the wrath of Allah or those who go astray. The aim of tolerance to respect those who practice different religions, and mutual respect in social life is taught in Islamic religious education. This shows how important it is to teach students about religious moderation in their daily lives.

2. Islamic Education Teacher

Part of the method to reduce intolerance and radicalism in Indonesia is to implement PAI learning based on religious moderation, which requires tolerant and multicultural teachers. To achieve the desired results, teachers must be sincere in educating students to believe, practice and adhere to Islamic principles through various activities such as training and mentoring.

As a result of this science, some components that must be studied in order to study PAI are such as: 1) PAI becomes a deliberate effort, which is organized and intentional training, teaching, and directing to produce desired results. 2) Learners who want to be directed, educated, and equipped to achieve goals in order to increase their faith, understanding, appreciation, and ability to practice Islamic learning in various contexts. 3) In order to achieve the goal of religious learning itself, a teacher should provide guidance to his students in addition to lecturing and teaching.[5]

3. Islamic Religious Education material

Following the establishment of an appropriate curriculum with a moderate and tolerant approach to religion in the classroom. Then, the content taught needs to be linked to current religious challenges and incorporate wasathiyah Islamic knowledge. [20]. Here, some PAI material development activities on "character education, anti-corruption education, national values for the national level, religious radicalism in the name of women, and human rights" for the international level-are used. To help students learn and practice the material better, it is very important to relate it to real or conceptual events when providing it.

4. Islamic Religious Learning Methods and Media

The resources and instruments that are used through the teacher and the students during the teaching process are called methods and media. The media and learning strategies used are tailored to the subject matter and are intended to attract students to learn it. Since not all ways to deliver material are lecture-based, other approaches should also be used in

this case. In addition, instructors can use comics, posters and other media to convey the idea of moderation. As various teaching strategies and media will encourage a love for learning and ensure that learning will not be boring.[4]

5. Learning Evaluation of Islamic Religious Education

In this case, the evaluation should consider all three domains-cognitive, affective, and psychomotor as well as students' awareness to maintain a moderate religious attitude in addition to numerical values. Therefore, a moderate and tolerant generation is anticipated by evaluating the curriculum, materials, media, and methodology, and evaluating students from three domains, namely "cognitive, affective, and psychomotor" [3].

Religious moderation can be applied in extracurricular activities and other environments besides the classroom to help students develop and practice religious moderation values that they can bring to their daily lives.

Implementation of Religious Moderation in the Islamic Religious Education Curriculum

The Working Group for Strengthening the Religious Moderation Program at the Ministry of Religious Affairs (KEMENAG) is described in its Decision No. 328 2022. Some of its main responsibilities are:

1. Oversee the development and selection of religious moderation programs.
2. Provide guidance and programming to strengthen religious moderation.
3. Develop further initiatives and action plans to promote religious moderation.
4. Setting up events to promote religious moderation.
5. Observe and assess initiatives to support religious moderation.
6. Cooperate with other ministries or organizations to enhance religious moderation efforts [7].

From elementary school to university, the Islamic Education curriculum serves as a foundation that instills the ideals of moderation. To reduce acts of aggression, intimidation and brawls that are still prevalent in educational institutions today, the teaching of Islam is essential.

According to Rusmayani, there are several methods that can be implemented to instill moderation in elementary schools, including:

a) building children's self-confidence, trust in others, trust in the education process, and trust in authority figures in behavior or activities.
b) Develop empathy for your other family members and friends.
c) Encourage students to value morality in their lives.
d) Develop a sense of humanity to respect each other as social beings.
e) mastery of behaviors that are praised in their community or in the classroom, [1]

Through the implementation of the Islamic Religious Education Teacher Continuous Professional Development Program (PPKB GPAI), the Ministry of Religious Affairs is further enhancing religious moderation. The main goal is to put the PPKB GPAI into practice, specifically becoming a religious moderation exercise that advances the abilities of PAI teachers, [1]

Being a place where students come together to learn different subjects, hear about the experiences of different friends, and even encounter different types of beliefs, schools tend to sow the seeds of radicalism or extreme fanaticism for one belief over another. For this reason, there is a need for a program to strengthen religious moderation in schools starting with elementary school to college, [1].

The following are actions that the government has found to strengthen religious moderation:

a) Religious moderation is a key focus of the government's national long-term development plan (RPJPN), an attempt to recognize Indonesia's pluralism.
b) Schools, madrasas, pesantren and universities are examples of educational institutions that need to emphasize the importance of religious moderation.
c) Better understanding of religion or interfaith education, [1]

The first and most important tool for teaching religious moderation both inside and outside educational institutions is education. The first level of education to implement religious moderation in the classroom is primary education. Educators can engage in the following actions to advance educational professionalism and implement programs aimed at religious moderation:

a) gave instructions on creating curriculum materials that moderate religion.
b) Provide instructions on how to create learning materials with moderate religious content.
c) Provided instructions on how to create HoTS questions that have religious content moderation.
d) Analyze program implementation and learning outcomes for religious moderation.

A culture of religious moderation can be fostered in schools through the development of the following activities:

1. Islamic Sprituality

The development of extracurricular activities, or rohis, can begin in elementary school. Since religious activities are part of the curriculum, it is very important to emphasize the importance of religious moderation values in schools. Examples of the implementation of rohis include mabit, book reviews or discussions with religious themes, recitation and memorization of the Qur'an from the coach to assess and strengthen Islamic religious knowledge, and strengthen the value of religious moderation.

2. Islamic Education Performance

It serves as a medium to instill the value of Islamic education to students for their future lives. The purpose of the PAI Performance is to increase students' understanding of Islam, foster a sense of brotherhood to fellow Muslims and fellow classmates-despite a sense of competition-increase creativity in presenting PAI, and incorporate values of integrity, courage, and-most importantly-increase their piety and faith in Allah SWT [1]

Based on the cultural differences in religious moderation between elementary schools and madrasahs, it can be concluded that elementary schools have more Islamic religious education curriculum, which contributes to high Islamic values and knowledge. However, because the diversity of ideas in madrasahs has the potential to foster radicalism, each madrasah education program is also required to be able to improvise through creativity in the increasing intolerance caused by the advancement of social media and information technology that can be accessed freely by all users.

In addition to developing the curriculum, school authorities must be able to manage the institution and school environment to value freedom and critical thinking. They should also examine how students' mindsets are affected by exposure to potentially radical ideas in the classroom to minimize vulnerability to radicalism as early as possible. The moderation education approach in educational institutions has a high hurdle in instilling the value of religious moderation, namely the cultural value of tolerance to understand each other's differences [19].

Religious Moderation Curriculum Development Strategy in Islamic Religious Education Learning

The Ministry of Religious Affairs' goals and missions are the foundation for religious moderation as a means to improve character education in the PAI framework. The vision of the Ministry of Religious Affairs is described as follows in the Decree of the Minister of Religious Affairs No. 39 2015: "The Realization of a Religious, Harmonious, Intelligent, and Prosperous Indonesian Society in order to Realize a Sovereign, Independent, and Personality Based on Gotong Royong". The implementation of a harmonious and religiously observant Indonesian population is a major component of the Ministry of Religious Affairs' objectives that are closely related to the issue of moderation. Then, improving the discernment and application of religious teaching and fostering harmony between and within religious communities is a major component of the Ministry of Religious Affairs' objectives. The foundation for the implementation of Islamic Religious Education is the goals and mission of the Ministry of Religious Affairs mentioned above. [13]

Islamic religious education, which is applied at least through learning at all levels of education, is knowledge-based and shapes the attitudes, personality,

and skills of students when practicing Islamic teachings. At the primary and secondary education levels, PAI is organized in formal education units called "PAUD/TK, SD/SDLB, SMP/SMPLB, SMA/SMALB, and SMK". The purpose of PAI at various levels is to help students understand the teachings of science, technology and art and develop an understanding, appreciation, and practice of Islamic religious teachings [12].

Working through PAI, he found several methods that can be developed on the strength of religious moderation, such as:

1. Strengthening the Paradigm of Religious Moderation

The following is a description of the paradigm of religious moderation. First, according to Government Regulation No. 55/2007 on Religious Education and Religious Education and Law No. 20/2003 on the National Education System, religious education plays an important role in producing good citizens and Muslims, in line with Pancasila and the 1945 Constitution. The goals and objectives of Islam and the state are related to religious education.

Second, students' observations and behaviors towards their religion and country are influenced by their religious beliefs through PAI educators. PAI educators have a strategic position to shape moderate attitudes in this environment.

Third, PAI mentors have different opinions regarding religious issues and tolerance. These opinions are shaped by life experiences, insights gained from studying Islam, and the tendency to join Islamic organizations, which in turn shape their beliefs and religious behavior.

Fourth, teachers and PAI play a role in the emergence of radicalism. The Indonesian Ministry of Religious Affairs is in a position to deal with this situation. As a result, the policies developed can be put into effect immediately. Therefore, while there are various factors that contribute to the emergence of radicalism in schools, efforts to counter these ideas are a priority. These efforts include policies regarding religious education curriculum and learning, training teachers to expand their lesson plans to include cultural values of peace, such as democracy, multiculturalism, and humanity, and training teachers to improve their teaching methodologies. [18].

2. Strengthening curriculum content

According to the competency standards for graduates of Islamic Religious Education, it contains competency requirements. The foundation for creating religious moderation materials is provided by "core competencies, which include spiritual attitudes, social attitudes, knowledge, and abilities". Similarly, the Basic Competencies (KD) serve as a guide to promote religious moderation. In fact, various contents based on the KD have shown the possibility of students developing into moderates. Several points regarding

religious moderation have been mentioned in the KD as well as the scope of PAI materials. These points include showing the behavior of sincerity, patience, forgiveness, honesty, trustworthiness, and istikamah to others; democracy; tolerance; and acting in a way that cares for others and the environment (Permendikbud No. 24, 2016). Analyzing the relationship between the social aspects of humanity and the level of religious knowledge helps to strengthen this moderate attitude.

Examining this relationship requires careful consideration in the context of mainstreaming religious moderation in education. Each KD and breadth of material is linked to this mainstreaming, which then becomes a variable. By mutual agreement with the Curriculum Center of the Ministry of Education and Culture, or by re-analyzing through a special team, the Directorate of Islamic Education can implement it in the mainstreaming curriculum policy.

3. Strengthening Islamic Religious Education learning

Learning is a key component of mainstreaming religious moderation, in addition to content breadth and KD. It is important to develop markers of religious moderation in education in this environment. These guidelines relate to teaching activities that demonstrate the value and implementation of religious moderation. There are also teaching guidelines through mainstreaming religious moderation such as:

Students' attitudes and behaviors are transformed and internalized by taking into account the values of Pancasila, the 1945 Constitution, and Islamic norms that are inclusive, tolerant, moderate, and respectful of the dignity of others. They are also expected to worship in accordance with religious teachings and have noble character that is realized during social interactions.

a. Integration of moderate Islamic beliefs into educational materials The combined aim of this incorporation is to create a rahmatan lil 'alamin version of Islam. Relevant Islamic expectations are explained in lesson plans or discussion topics.
b. Planning lessons is a dialogic and interactive process with room for improvement.
c. Humanist and gender-responsive educational relationships are a means for the learning process.
d. Understanding and applying Islamic religious beliefs and norms that preserve the ideals of tolerance, inclusivism, moderation and Indonesian-ness is part of the teaching sequence, both inside and outside the classroom.
e. The principles of honesty, education, authenticity (according to ability), objectivity, accountability and transparency are all integrated into the assessment of learning processes and outcomes.
f. If educators can demonstrate that they are reasonable, then the learning process can be fulfilled.

The following are some possible indicators: Firstly Islamic Religious Education teachers who are considered moderate have high or praiseworthy morality. Second Teachers have an understanding of how to incorporate the Islamic Religious Education curriculum with a moderate personality and attitude. And third Teachers apply Islamic teachings and have strong national ideas.

Being moderate in facing the plurality of the Republic of Indonesia, and practicing it in all Islamic Religious Education programs. How an educator implements and presents moderation-based Islamic Religious Education learning materials will be a major factor in how faith-based learning is implemented. Learners will find it easier to absorb and scrutinize the material when explained about moderation if they follow these steps. At the end of the learning activities, students will master the learning objectives related to religious moderation, which they can then use in their daily lives. [12].

IV. CONCLUSION

A culture of moderation in religious education is fostered by promoting the following key principles: seeking the middle way, maintaining balance, encouraging equality and promoting tolerance. The concept of religious moderation in the Islamic Education curriculum is based on achieving balance in understanding and applying religious laws. Moderation does not mean moderating religion itself, but rather understanding and applying religious laws wisely.

In implementing religious moderation in the Islamic Religious Education curriculum, it is necessary to integrate the value of moderation in teaching and learning activities. This can be achieved by incorporating the concept of moderation in lesson plans, teacher training, curriculum development, teaching methods and evaluation methods. By internalizing the concept of moderation in Islamic education, students can develop a deep sense of tolerance, compassion, peace and empathy towards others.

To instill the values of tolerance, peace and respect for diversity, the Ministry of Religious Affairs plays an important role in promoting religious moderation through various initiatives, such as the development of programs and guidelines to strengthen religious moderation. By emphasizing the importance of moderation in religious education, schools can create an environment conducive to encouraging peaceful coexistence and interfaith dialogue to strengthen religious moderation.

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Effectiveness of Digital Worksheets for Physics Experiments Based on Physics Demonstration Videos on YouTube (PDVY) in Enhancing Science Process Skills

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Abstract—The aim of this study is to evaluate the effectiveness of a digital worksheet based on Physics Demonstration Videos on YouTube (PDVY) in improving science process skills (SPS). The research utilizes a quasi-experimental design with a pretest-posttest control group model. The subjects of the study are 12th-grade students from the 2024/2025 academic year at a high school in Bandung Regency, selected through a random assignment technique. Data were collected using SPS test instruments and questionnaires. The SPS test was used to measure the improvement of SPS, analyzed using the Mann-Whitney U statistical test, while the student response questionnaire was employed to assess reactions to the use of the PDVY-based digital worksheet. Data were analyzed using IBM SPSS Statistics software version 30. The results of the Mann-Whitney U test showed an asymptotic significance (2-tailed) value < 0.001, with a significance level of < 0.05, indicating a significant difference between the posttest scores of the control and experimental groups. A descriptive analysis of the student response questionnaires revealed the lowest score of 4 and the highest score of 5 in each aspect, indicating very positive student responses. In conclusion, learning with the PDVY-based digital worksheet is effective in enhancing SPS, with positive feedback from students.

Keywords—Digital Worksheets, Physics Experiments, Science Process Skills, PDVY.

I. Introduction

Education is the cornerstone of a nation's development [1]. To meet the demands of rapid advancements in technology, innovation in the learning process has become essential [2]. Today, we are in an era where science and technology are advancing at an unprecedented pace, creating vast opportunities to enhance learning effectiveness. One critical aspect of education is physics education, as an integral part of natural sciences that supports fundamental understanding of the principles underlying life and the universe [3].

Advancements in technology and information have had a significant impact on education [4]. The availability of Physics Demonstration Videos on YouTube (PDVY) is a tangible example of how science and technology can be utilized as engaging learning tools. PDVY provides students with easy and quick access to explore physics concepts through captivating visualizations [5]. Alongside technological developments, the use of digital worksheets can further innovate the application of advanced technology to enhance students' understanding of physics concepts [6].

Science process skills have become increasingly essential in today's education due to rapid advancements in science and technology [7]. This shift requires teachers not only to teach concepts and facts but also to demonstrate that students tend to understand complex and abstract concepts more effectively when provided with concrete examples. Furthermore, scientific and technological discoveries and developments are not absolute; they are inherently relative. In the learning process, the development of concepts cannot be separated from the cultivation of attitudes and values within students [8].

Physics is a field of study that can help students enhance their Science Process Skills (SPS) through experiments that involve various SPS aspects [9]. Science process skills refer to the abilities to engage in activities in science learning that yield concepts, theories, principles, laws, or facts as evidence [10]. According to Rustaman (2007), SPS aspects in the context of physics include: (1) observation, (2) grouping or classification, (3) interpretation, (4) prediction, (5) formulating questions, (6) hypothesizing, (7) planning experiments, (8) using tools and materials, (9) applying concepts, and (10) communication.

However, teachers often still rely on conventional methods, such as lectures, which result in a lack of interaction in the learning process. This approach leads students to become passive, merely receiving information without opportunities to process it. Consequently, students participate less in activities that develop science process skills, such as simple experiments, observations, or data analysis. This

inactivity hinders students' ability to think critically, as they are not directly involved in exploration and discovery. The situation feels monotonous due to limited creativity in nurturing students' potential, causing students to easily feel bored with learning, which in turn reduces their creativity and problem-solving abilities. Additionally, common challenges that arise during the learning process include: minimal student participation in asking questions, low motivation to learn, a tendency to rely on rote memorization leading to limited conceptual understanding, and insufficient readiness to engage in the learning process [11].

In addition to students' creativity levels, adequate physics experiment equipment can provide a more in-depth and interactive learning experience. With such equipment, students can conduct hands-on experiments, allowing them to observe physical phenomena directly, test theoretical concepts, and develop practical skills for real-world physics scenarios. This approach not only enhances students' understanding of physics concepts but also stimulates their creativity in exploring new ideas and finding solutions to complex problems [12].

In practice, there are often limitations in the availability of physics experiment equipment in the field. These limitations may include a lack of funds to purchase or update equipment, constraints on space or facilities to store and use the equipment, and challenges in maintaining and servicing existing equipment. As a result, students do not receive sufficient opportunities to conduct hands-on physics experiments, which can hinder the potential for an in-depth and interactive learning experience [5].

To address the challenges students face, innovative approaches in learning are needed to enhance their science process skills. One promising solution is the introduction of digital worksheets for physics experiments based on Physics Demonstration Videos on YouTube (PDVY). These PDVY-based digital worksheets combine YouTube physics demonstration videos with interactive digital worksheets to help students understand physics concepts in a visually engaging way. This approach not only enables students to grasp physics concepts more effectively but also provides flexibility in terms of time and location for learning. The model includes several key components: physics demonstration videos, interactive digital worksheets, questions, guidelines, and activities [13].The use of Physics Demonstration Videos on YouTube (PDVY) offers the advantage of clearer and more engaging visualization of physics concepts. The multimedia nature of these videos helps students better understand abstract concepts [5]. Therefore, integrating digital worksheets that support the use of PDVY can be an effective solution to enhance students' understanding of physics subject matter [13].

The research conducted by [6] shows that the digital worksheet for physics experiments based on PDVY developed in this study has good validity. The content aspect of the digital worksheet aligns with the high school physics curriculum and the experiment material conducted. The language aspect of the digital worksheet also uses clear and easily understandable language. The presentation aspect of the digital worksheet is well-organized and attractive. A similar study by [14] showed results indicating an increase in student engagement and learning motivation.

Based on the background that has been outlined, there appears to be a gap in studies related to the use of PDVY-based digital worksheets in improving students' science process skills. Previous studies have tended to focus on the validity of PDVY-based digital worksheets for physics experiments, leaving a gap in understanding the potential of these digital worksheets for more broadly developing students' science process skills. While some research has used other learning models, such as PhET simulations, to enhance students' science process skills, there has yet to be sufficient study on the potential of PDVY-based digital worksheets in this context. Therefore, further research exploring the application of PDVY-based digital worksheets to improve students' science process skills will be a valuable contribution to expanding the understanding of effective science learning.

Therefore, this study aims to fill the knowledge gap by focusing on the use of digital worksheets for physics experiments based on Physics Demonstration Videos on YouTube (PDVY) in improving students' science process skills. This represents the novelty of this research compared to previous studies. Science process skills are defined as outlined by [15].

II. METHOD

This study employed a quasi-experimental design with a pretest-posttest control group design, involving two sample groups: the experimental group and the control group. Students were randomly selected from the same class using a random assignment technique to form these groups [16], at one of the public high schools (SMAN) in Bandung Regency during the 2024/2025 academic year. The experimental group received treatment with a guided inquiry method using a digital worksheet based on Physics Demonstration Videos on YouTube (PDVY), while the control group received treatment with the guided inquiry method without using the PDVY-based digital worksheet.results and discussion.

The instruments used in this study included the Science Process Skills (SPS) Test and a questionnaire. These instruments were validated by experts and deemed suitable, with validity scores exceeding 0.514 and reliability scores above 0.6. The SPS Test was used to measure students' science process skills before (pretest) and after (posttest) learning using the PDVY-based digital worksheet. The questionnaire was given to the experimental group to evaluate their responses to the PDVY-based digital worksheet.

The collected data were statistically analyzed using the Mann-Whitney U test, and the effect size (r) was calculated based on the z-value for the non-parametric test to provide information about the strength of the treatment effect on the experimental group [17]. Meanwhile, the questionnaire data were analyzed descriptively to describe the level of student satisfaction with the use of the digital worksheet.

III. RESULTS AND DISCUSSION

The research on the Effectiveness of Digital Worksheets for Physics Experiments Based on Physics Demonstration Videos on YouTube (PDVY) in Enhancing Science Process Skills" yielded the following data results:

Results of the SPS Test for the Control Group.

The data collected from pretests and posttests administered before and after the activities were analyzed using the Wilcoxon Signed Ranks Test in IBM SPSS Statistics version 30 to determine the difference in scores between the control and experimental groups. The analysis results are presented in Table 1.

TABLE 1. PRETEST - POSTTEST SCORE OF CONTROL GROUP[a]

	Pretest - Posttest Score Of Control Group
Z	-3.139[b]
Asymp. Sig. (2-tailed)	.002

[a]Wilcoxon Signed Ranks Test
[b]Based on positive ranks.

Based on the statistical test results in Table 1, the significance value (Asymp. Sig.) of 0.002 (less than 0.05) indicates a statistically significant difference between the pretest and posttest scores in the control group. This result suggests a significant change. The negative Z value and the "Based on positive ranks" notation indicate that posttest scores are higher than pretest scores, showing an improvement in the control group's scores even without the treatment.

Results of the SPS Test for the Experimental Group

On the other hand, the statistical test results in Table 2 show a very small significance value, below 0.001, indicating a statistically highly significant difference between pretest and posttest scores in the experimental group. Because this significance value is well below 0.05, it can be concluded that the observed change is highly meaningful. The negative Z value and the note "Based on positive ranks" indicate that posttest scores are generally higher than pretest scores in the experimental group, meaning that students in the experimental group experienced a significant score increase after the treatment. The data are presented in Table 2 below.

TABLE 2. PRETEST - POSTTEST SCORE OF EXPERIMENTAL GROUP[a]

	Pretest - Posttest Score Of Experimental Group
Z	-3.455[b]
Asymp. Sig. (2-tailed)	<.001

[a]Wilcoxon Signed Ranks Test
[b]Based on positive ranks.

To compare the posttest results between the control and experimental groups, the Mann-Whitney U Test was used. This test aims to determine whether there is a significant difference between the posttest results of the two groups. The analysis results are listed in Table 3 below.

TABLE 3. POSTTEST CONTROL-EXPERIMENTAL GROUP[a]

Independent-Samples Mann-Whitney U Test Summary	
Standardized Test Statistic	4.743
Asymptotic Sig.(2-sided test)	<.001
Exact Sig.(2-sided test)	.000

[a]Mann-Whitney U Test

Based on the results of the Mann-Whitney U Test for comparing the posttest scores between the control and experimental groups, the Asymptotic Significance (2-tailed) value is < 0.001. With a significance level well below 0.05, this result indicates a significant difference between the posttest scores of the experimental and control groups. This means that the researcher can reject the null hypothesis (H0), which states that there is no difference between the two groups.

This significance value confirms the above asymptotic significance result, with a value of 0.000, indicating that the difference between the experimental and control groups is highly significant. The high Z value supports this significant result, showing that the difference between the two groups is quite clear. A comparison of the average pretest and posttest scores for the control and experimental groups is shown in Figure 1.
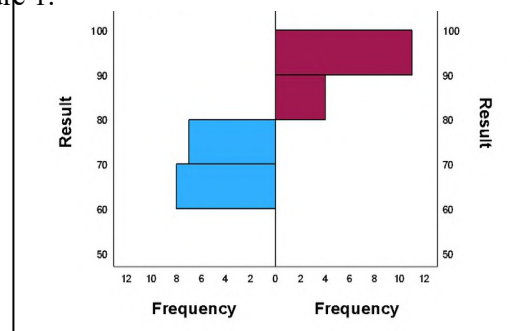

Fig 1. Independent-Samples Mann-whitney U Test

To strengthen this finding, the effect size r was calculated based on the z value obtained from the Mann-Whitney Test. According to Cohen's interpretation, an r value of 0.87 ≥ 0.5 can be categorized as a large effect. A higher r value indicates that the use of the PDVY-based digital worksheet has a stronger impact on students' science process skills, thus providing more convincing evidence of the effectiveness of this learning media in improving students' understanding and science skills in the experimental group. The following is the interpretation of the effect size r based on

Cohen's guidelines used by the researcher in Table 4.

The results of the study indicate an improvement in science process skills (SPS) in the experimental group after using the PDVY-based digital worksheet. This improvement is believed to be due to several key factors that support the effectiveness of this learning media.

First, the PDVY-based digital worksheet allows students to repeatedly and specifically observe physical phenomena, thereby enhancing their deep understanding of concepts. The physics demonstration videos on YouTube provide clear and realistic visualizations, which make it easier for students to connect theory with practical phenomena in the real world. Previous research supports this finding. According to [18], the use of visual media accompanied by structured explanations can improve retention and understanding of scientific concepts, especially when presented in an engaging multimedia format relevant to daily life. Students in the experimental group were able to visually observe the Doppler effect demonstration, predict the outcomes, and test their understanding through structured tasks in the digital worksheet, which encouraged active engagement and the development of SPS.

Moreover, the guided structure of the PDVY-based digital worksheet guides students through clear steps, from observation, hypothesis formulation, data collection, to drawing conclusions. This structure aligns with the guided inquiry approach, which, according to [19], can help students develop scientific process skills in a more systematic manner.

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Respondents' Perceptions

The analysis of the student response questionnaire was conducted to evaluate the level of satisfaction and acceptance of students regarding the use of PDVY-based digital worksheets in enhancing science process skills. The data obtained from the questionnaire were processed descriptively to calculate the average score for each item, providing an overview of how students responded to this learning media. The results of the analysis are presented in tables and graphs to facilitate the interpretation and understanding of students' perceptions regarding the effectiveness of this digital worksheet. The analysis results are shown in Table 5.

TABLE 5. RESPONDENTS' PERCEPTIONS

	Min	Max	Mean	SD
This digital worksheet is easy to use.	5	5	5.00	.000
The design is attractive and motivates me to learn.	5	5	5.00	.000
The material is easy to understand.	4	5	4.93	.258
The instructions are clear and easy to follow.	4	5	4.53	.516
This worksheet helps me understand physics concepts.	4	5	4.67	.488
It facilitates interaction with the material.	4	5	4.67	.488
The technology increases my interest in learning.	4	5	4.33	.488
This worksheet supports independent learning.	5	5	5.00	.000
It encourages critical and creative thinking.	4	5	4.40	.507
I feel comfortable using it as a learning tool.	5	5	5.00	.000
I understand better with this than with textbooks.	4	5	4.40	.507
This worksheet provides helpful feedback.	5	5	5.00	.000
I would recommend it to my friends.	4	5	4.40	.507
I am satisfied with this PDVY-based worksheet.	5	5	5.00	.000

Note. Strongly Agree (5); Agree (4);Neutral (3); Disagree (2); Strongly Disagree (1)

Based on Table 5, several items, such as "This digital worksheet is easy to use," "The design is attractive and motivates me to learn," "This worksheet supports independent learning," "I feel comfortable using it as a learning tool," and "I am satisfied with this PDVY-based worksheet," received the highest average scores (5.00) with zero standard deviation. This indicates that students found the PDVY-based digital worksheet very easy to use, attractive, comfortable, and effective in supporting independent learning. These results are in line with [21] research, which emphasizes the importance of easy-to-use and engaging learning designs in increasing student motivation.

For items such as "The material is easy to understand" and "The instructions are clear and easy to follow," the average scores were close to 5, with slight variation (SD 0.258 and 0.516). These findings are supported by [22], who showed that easy-to-understand material and clear instructions can enhance students' conceptual understanding. The alignment of these findings with previous research suggests that the structure and clarity of instructions in digital media are key factors for success in the learning process.

In aspects related to understanding physics concepts and interaction with the material, such as "This worksheet helps me understand physics concepts" and "It facilitates interaction with the material," the average scores were high (4.67–5.00). These results are consistent with [23], who stated that clear and relevant visualizations can strengthen students' understanding of scientific concepts. The PDVY-based digital worksheet, which integrates physics demonstration videos, has proven to enhance student understanding through direct interaction with the material.

The statement "The technology increases my interest in learning" received an average score of 4.33, indicating that the technology used in this worksheet was fairly effective in increasing students' interest in learning. This supports the findings of [24], who stated that relevant and engaging technology-based media can stimulate students' interest in learning, although individual experiences may vary.

Statements related to critical and creative thinking, such as "It encourages critical and creative thinking" and "I understand better with this than with textbooks," received average scores of 4.40. This aligns with the research of [25], which emphasized that technology-based learning approaches can promote deeper cognitive engagement and enhance students' critical thinking skills.

Overall, the data show that students' responses to the use of the PDVY-based digital worksheet were very positive, supporting its effectiveness in improving science process skills (SPS). These findings strengthen previous research, which indicates that technology-based learning media not only facilitate the learning process but also increase student engagement and understanding, particularly in the context of science.

IV. CONCLUSION

Based on the research results, it can be concluded that the PDVY-based digital worksheet is effective in enhancing students' science process skills. This is demonstrated by a significant difference in the science process skills between the control and experimental groups, with a sig. (2-tailed) value from the Mann-Whitney U test of < 0.01. The effectiveness of this digital worksheet is also supported by an effect size (r) of 0.87, which, according to Cohen's interpretation, is considered large (≥ 0.5).

The researcher suggests conducting further studies with a more varied sample, such as at different grade levels or schools with different conditions. This would provide a broader picture of the effectiveness of the PDVY-based digital worksheet in various learning contexts.

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THE INFLUENCE OF THE THINK ALOUD PAIR PROBLEM SOLVING (TAPPS) APPROACH ON STUDENTS' DATA INTERPRETATION SKILLS

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Abstract— **This research aims to determine the effect of physics learning using the Think Aloud Pair Problem Solving (TAPPS) approach on improving students' data interpretation skills. This research uses an experimental method within the quasi-experimental category with a quantitative approach. The object of this research is the 11th-grade students at one of the MAN schools in Garut Regency. The instruments used were test questions, teaching modules, student worksheets, and observation sheets. Based on the calculation results, the effectiveness of the Think Aloud Pair Problem Solving (TAPPS) approach in improving students' data interpretation skills falls into the high category with a score of 2.125. Meanwhile, based on the T-test calculation results, the significance value (2-tailed) is < 0.05 or 0.000 < 0.05. Thus, the Thinking Aloud Pair Problem Solving (TAPPS) approach significantly enhances data interpretation skills compared to students who only use the problem-solving model.**

Keywords— ***Physics, Data interpretation skills, Think Aloud Pair Problem Solving (TAPPS)***

I. INTRODUCTION

The Organization for Economic Cooperation and Development (OECD) is the organization that oversees the Programme for International Student Assessment or PISA, releasing the latest results in 2023 [1]. The results of Indonesia's PISA are presented in Figure 1.
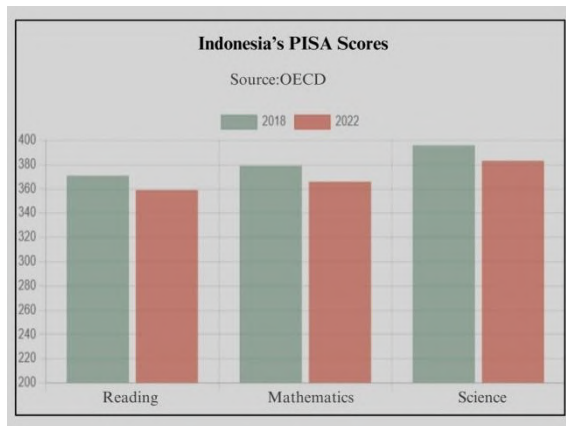
Figure 1. Comparison of Indonesia's PISA Results from 2018-2022

The PISA score in the field of numeracy literacy in 2022 is 359, down 12 points compared to 2018. The PISA score in the fields of mathematics and science literacy decreased by 13 points compared to 2018, with mathematics literacy scoring 366 and science scoring 383 in 2022. Indonesia's math score is 106 points below the world average score.

PISA not only measures students' understanding of the curriculum but also assesses their ability to think critically, solve problems, and interpret information in various life contexts. PISA questions must consider global interests and knowledge. PISA assessments are not created with school curricula in mind, but this does not mean that the curriculum used in a country does not influence PISA questions. For example, in assessments that include topics or concepts of probability and data interpretation, Australian students usually perform quite well. The Australian curriculum successfully covers both concepts. Ideas like this can reinforce that science and mathematics literacy are important educational goals and should be emphasized in the curriculum [2].

This indicates the need for significant progress in the field of science and mathematics literacy in Indonesia. Because scientific literacy is an important skill that every individual must possess in the modern era. The ability to acquire, explain, analyze, use, and communicate mathematical symbols is a prerequisite for scientific literacy. By using those mathematical symbols, one can solve problems and make decisions [3][4][5]. Ultimately, scientific literacy aids in the management of natural resources, enabling them to compete globally in various fields [1].

One of the test indicators in PISA is data interpretation, but Indonesian students have difficulty answering questions about data interpretation [6]. Data interpretation skills are important for students, especially in the field of science and science education.

For example, when conducting a physics experiment, students are required to be able to present the data from the experiment in various forms such as tables, graphs, images, and others. But there are still many students from elementary school to university who struggle to interpret graphs and data [7]. Considering the importance of data interpretation skills for students, physics education must be developed in such a way that it produces good competencies. However, the reality in the field is that students do not yet possess data interpretation skills in physics learning.

According to the findings of student interviews conducted at one of the MAN schools in Garut Regency, students stated that the physics material is difficult to understand. This is because in the physics learning process, students memorize many mathematical formulas, the teacher's explanations are monotonous and convoluted, and the material is not presented gradually, making physics difficult to understand. In addition, teachers rarely conduct practical activities. Thus, it causes students to be unaccustomed to reading graphs, interpreting tables, and converting data into various forms, such as from tables to graphs and vice versa.

Considering the importance of mastering physics concepts for students and the still low data interpretation skills, because students will not be able to master concepts if they cannot interpret data in their learning. Therefore, a method that can improve students' data interpretation skills is needed. The application of teaching methods affects how well a lesson is taught [8].

Given the aforementioned circumstances, the researcher is eager to implement a model that is thought to be able to assist in enhancing students' abilities to comprehend data. Students can be encouraged to think critically and logically by using the Problem Solving model with the Think Aloud Pair Problem Solving (TAPPS) approach. The problem-solving model can actively engage students and prepare them to tackle various problems and find answers both individually and in groups [9]. Additionally, the problem-solving model is relevant to physics learning, as students are required to actively analyze problems, formulate solutions, implement strategies, and evaluate performance outcomes [10].

The TAPPS approach is a problem-based collaborative learning approach that involves students and teachers who act as facilitators [11]. The problem in the TAPPS approach is problem-solving. Problem-solving is considered capable of helping students improve their data interpretation skills [8].With the TAPPS approach, students are trained to analyze a problem and then convey it to their partner. Students are required to actively participate and express their opinions in TAPPS activities conducted in small groups. Students will be divided into several groups consisting of two people, with each person taking on the roles of problem solver and listener [12]. Students

are expected to learn how to evaluate the work of their group members and to provide reasoning for the problems [8].

Related to the low data interpretation skills of students and the known background issues, the researcher was motivated to conduct a study titled "The Influence of the Think Aloud Pair Problem Solving (TAPPS) Approach on Students' Data Interpretation Skills."

II. METHOD

The research method used is the experimental research method, which is a research technique that can be used to test the effect (treatment) on a specific component [13]. Meanwhile, the research concept used is quasi-experimental (semu eksperimen). The research method used is the pretest-posttest control design. The population of this study is the 11th-grade students at one of the MAN schools in Garut Regency. Meanwhile, the sample for this research consists of the experimental class (XI-H) with 33 students and the control class (XI-I) with 33 students. The sampling method used is random sampling.

More clearly, the stages of the quasi-experimental research with pretest and posttest on the experimental group and the control group are presented in Figure 2.
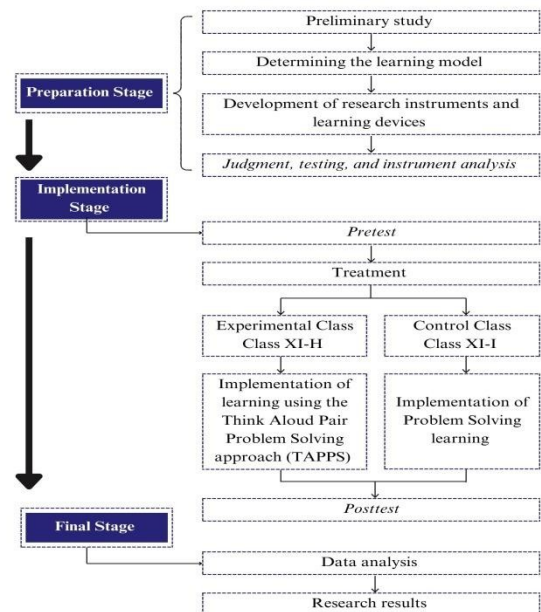

Figure 2. Stages of Quasi-Experimental Research

The study's hypotheses are as follows: H0, the experimental class and the control class did not significantly differ in their average gains in data interpretation abilities, and H1, the experimental class and the control class did significantly differ in their average gains. According to the research design, the control group was taught the Problem Solving learning model without the Think Aloud Pair Problem Solving (TAPPS) technique, whereas the experimental group was taught the Problem Solving learning model with the TAPPS approach.

The stages of Problem Solving learning with the Think Aloud Pair Problem Solving (TAPPS) approach are presented in Figure 3.
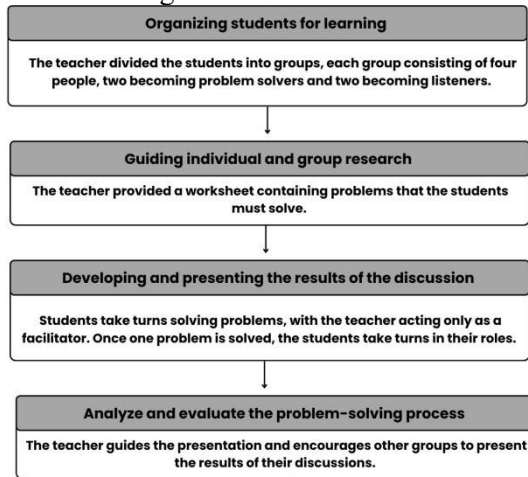

Figure 3. Stages of Problem Solving Learning with the Think Aloud Pair Problem Solving Approach (TAPPS)

The instruments used in this study are test questions, teaching modules, student worksheets, and observation sheets. The data interpretation skills test questions used consist of 5 questions. The test question indicators used are proposed by Tawil & Liliasari [14] as listed in Table 1.

Table 1. Test Question Indicators

Measured skills	Form of the Question	Number of Questions
Connecting the observation results	Description	2 questions
Determining the pattern or regularity in a series	Description	1 questions
Concluding	Description	2 questions

To obtain the test questions that will be used in the research, a trial run is conducted first, followed by determining the validity of the test items and their reliability, which is calculated using the Alpha Cronbach formula. The statistical technique used to answer the hypothesis test in this research is the inferential statistical technique. Inferential statistics consists of parametric statistics which are used to test population parameters through sample data. Before using statistical tests, the data must be normally distributed; if it is not normally distributed, non-parametric statistical tests are used. Then, to see the effectiveness of the model used, the researcher employed Cohen's d Effect Size.

III. RESULTS AND DISCUSSION

In this study, the researcher obtained data from the pretest and posttest results conducted in the experimental class and the control class presented in Table 2

Table 2. N-Gain Results of Data Interpretation Skills Test in the Experimental Class and Control Class

N-Gain	Experimental Class	33	0,72	0,87	0,56	0,08
	Control Class	33	0,48	0,68	0,10	0,14

Table 2 demonstrates that the experimental class's average N-gain score is 0.72, falling within the top range. The control class's average N-gain score, on the other hand, is 0.48, falling into the moderate range. The experimental class's maximum score is 0.87, whereas the control class's maximum score is 0.68. The experimental class has a minimum score of 0.56, while the control class has a minimum score of 0.10. The control class has a standard deviation of 0.14, whereas the experimental class has a standard deviation of 0.08. To ascertain whether or not the starting and final abilities of the two classes differ, inferential statistical tests must be performed. The data must pass the inferential statistical test before it can be used. The results of the data normality test are shown in the following Table 3.

Table 3. Results of the Data Normality Test

Normality Test					
	Experimental Group and Control Group	Shapiro Wilk			
		Statistik	Df	Sig.	Exp.
Data Interpretation Skills	Pretest Experiment	0,971	33	0,520	Normal
	Posttest Experiment	0,964	33	0,334	Normal
	Pretest Control	0,944	33	0,091	Normal
	Posttest Control	0,944	33	0,090	Normal
	N-Gain experimental class	0,958	33	0,226	Normal
	N-Gain control class	0,988	33	0,964	Normal

The experimental and control classes' pretest and posttest data were determined to originate from a normally distributed population based on the normality test results. Therefore, the t-test is utilized to run the mean difference test because it satisfies the requirements for doing so. The following Table 4 displays the t-test findings.

Table 4. T-Test Results

Paired Samples Test								
	Paired Differences							
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
Pair 1 N-Gain Experiment and N-Gain Control	23,242	16,261	2,830	17,476	29,008	8,211	32	0,000

According to Table 4, H0 is rejected and H1 is accepted if the sig (2-tailed) value is less than 0.05. H0 is approved and H1 is denied if the sig (2-tailed) value is greater than 0.05. 0.000 < 0.05 is the sig. (2-tailed) value, as reported by the t-test analysis, thus, based on the criteria used for making decisions, it can be said that students who use the Problem Solving model in conjunction with the Think Aloud Pair Problem Solving (TAPPS) approach greatly enhance their ability to interpret data when compared to students who use the Problem Solving model alone.

Next, to determine the extent of the effectiveness in physics learning taught using the think aloud pair problem solving approach, an effect size test was conducted. The effect size test is a statistical follow-up test aimed at determining the magnitude of the treatment's effect.

$$d = \frac{X_t - X_c}{\sqrt{\frac{(S_A)^2 + (S_B)^2}{2}}}$$

$$d = \frac{81,67 - 65,39}{\sqrt{\frac{(5,630)^2 + (9,414)^2}{2}}}$$

$$d = \frac{16,28}{7,660} = 2,125$$

Based on the calculations obtained using effect size, a Cohen's D value of ≥ 0.8 was achieved. When viewed based on the effect size interpretation table, a "high" effectiveness category is obtained. This means that the effectiveness level of the Problem-Solving model with the Think Aloud Pair Problem Solving (TAPPS) approach in improving students' data interpretation skills is high.

According to this research, students who used the Problem-Solving model with the Think Aloud Pair Problem Solving (TAPPS) strategy showed an average improvement in their data interpretation skills compared to those who used the Problem Solving technique without the TAPPS approach. The difference in data interpretation skills between the experimental and control classes is due to each stage of the TAPPS approach where students are paired as problem solvers and listeners.

Additionally, in both the experimental and control classes, each meeting, students are given a Student Worksheet that contains different stages of problem-solving. In the experimental class, the problem-solving stages use the Problem-Solving model with the Think Aloud Pair Problem Solving (TAPPS) learning approach, while in the control class, the problem-solving stages use the Problem Solving model. In the experimental class, each question in the Student Worksheet must be solved in pairs as a problem solver and listener.

Students assigned as problem solvers solve problems and explain the stages of the resolution process to the listeners, from problem description to solution. The listeners are tasked with paying attention to and understanding all the stages and solutions from the problem solver. If the problem solver makes a mistake, the listener corrects it without offering help to solve it. Then, if there is a difference of opinion, the listener can provide feedback to the problem solver.

In this collaborative process, there is interaction between students and their partners who support and help each other, so that students who do not yet understand can learn through collaboration. The Thinking Aloud Pair Problem Solving (TAPPS) approach has several advantages for students: (1) students become more engaged in the learning process; (2) students become more responsible because each student in a pair has their own tasks; (3) students are trained to solve problems in depth, making their thinking process more organized.

This is in line with Barkley, Cross & Major that TAPPS can enhance analytical skills by helping learners formulate ideas, practice concepts, and identify errors in others' reasoning [15]. TAPPS can also utilize problem-solving to actively engage students in the learning process, and students have the freedom to express their ideas and thoughts [16]. Additionally, in the Thinking Aloud Pair Problem Solving (TAPPS) approach, there are shortcomings: (1) students find it difficult to express their thoughts to their partners; and (2) problem solvers require supervision from listeners while they are solving problems. The weaknesses of TAPPS can be addressed with the help of the teacher in guiding the ongoing discussion process.

When it came to interpreting data, pupils in the experimental class outperformed those in the control group. Thus, a study conducted at one of the MAN schools in Garut Regency showed that the Thinking Aloud Pair Problem Solving (TAPPS) strategy enhanced students' data interpretation abilities. Students worked effectively together in both groups and pairs, and they actively participated in the learning process.

IV. CONCLUSION

The results of the data analysis show that the data interpretation skills of students using the Problem-Solving model with the Think Aloud Pair Problem Solving (TAPPS) approach are significantly greater compared to those using only the Problem Solving model, with an average improvement of 0.72 falling into the "high" category. The Effect size results obtained a Cohen's d value of 2.125 > 0.8 with a "high" effectiveness category, indicating that the effectiveness level of the Problem-Solving model with the Think Aloud Pair Problem Solving (TAPPS) approach has a high impact on improving students' data interpretation skills.

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M3 BOARD LEARNING MEDIA AS A SOLUTION TO DIFFICULTIES IN MEAN, MEDIAN, MODE MATERIAL IN 6TH GRADE ELEMENTARY SCHOOL MATHEMATICS LEARNING

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Abstract—Students' interest in learning mathematics is relatively low, because students often find it difficult to understand the material being taught, so students avoid and are reluctant to take mathematics lessons, this has an impact on students' learning outcomes. The results of the Program for International Student Assessment (PISA) survey also show that students are low in mathematics. Therefore, the teacher as a facilitator has a very important role. How to determine appropriate learning methods and media to help students understand the mathematical concepts being studied. This research uses qualitative research. In this research, researchers collected analytical data obtained from data collection using a qualitative approach expressed in the form of words. There are several difficulties found in learning mathematics at the Al Izzah Superior Elementary School in Bandung, including students having difficulties with skills and communication in learning mathematics such as understanding and carrying out arithmetic operations. Apart from that, the main difficulty in this discussion is the difficulty in understanding mathematical concepts such as mean, median and mode, as well as in solving mathematical problems.

Keywords—Difficulty, Students, Mathematics

I. INTRODUCTION

Mathematics is a subject studied at all levels of education, ranging from elementary schools, junior high schools (SMP), high school (SMA), and even to the college level [1]. This is intended to equip students with systematic thinking, logical, analytical, creative, and the ability to work together [2]. so it can be concluded that mathematics is one of the important sciences to learn. As we know, mathematics is very closely related to the problems found in everyday life. One of the purposes of mathematics based on the curriculum in 2013 is "that students understand the concept of mathematics, explain the linkages of the concept, and apply concepts or algorithms flexible, accurate, efficient, and appropriate in troubleshooting".

Mathematics learning at elementary school (SD) is certainly very important to learn because the knowledge that students get at this level will be provisions for the next level. Of course, in this case, the teacher carries a large responsibility. Not a few teachers have difficulty meeting mathematics with students in certain materials. General difficulties that teachers are often experienced in mathematics learning, namely in terms of understanding and understanding the basic concepts of mathematical material correctly.

The interest in learning mathematics in students is also relatively low because often students find it difficult to understand the material taught, so students avoid and are reluctant to take math lessons. This has an impact on the learning outcomes of students. The results of the Program Survey for International Student Assessment (PISA) also show that students are low in mathematics lessons[1].

Therefore, the teacher as a facilitator has a very important role. How to determine the right methods and media methods so that help students understand the concept of mathematics studied.

Learning media made to help teachers and make it easier for students to be very much needed in the hope of being a solution to the difficulty of understanding the concepts of material in mathematics lessons. Many experts provide opinions regarding the benefits of learning media in the learning process. The benefits of learning media in the learning process, namely 1) learning will more attract the attention of students,

causing learning motivation to learners, 2) learning media can provide meaning so students are easier to understand the material so that the realization of learning goals, and 3) the learning method will be more aried. Thus creating meaningful learning because students are directly involved[3].

This research uses a qualitative research type. In this study, the researcher collects analytical data obtained from data collection with a qualitative approach expressed in the form of words. This research was conducted at Al-Izzah Bandung Elementary School, located at Jl. Cigending No. 10, Pasirwangi, Cigending, Ujung Berung District, Bandung City, West Java Province, 40611. The research was conducted on Monday, October 16, 2023.

The research is aimed at describing the difficulties in learning mathematics, particularly faced by upper-grade students, with a focus on the first semester of 6th grade. In data collection, this research was conducted using interview, observation, and documentation techniques. The research conducted through interviews with the class VI homeroom teacher yielded results, providing general information related to students who experience difficulties in mathematics, particularly in the topics of mean, median, and mode, starting from students who have not mastered multiplication and division in the previous grade.

The target of this observation was carried out on direct homerooms, which became the subject of research. From the initial information and data on students who inspired the difficulties in mathematics lessons on the material of the mean, median, and mode, it was that the sixth grade students were designated as students who had difficulty learning mathematics in material mean, median, and categorized mode experiencing the most learning difficulties looks visible.

The study was conducted with the steps to record the results of observation, interviews, and documentation that had been obtained. The data obtained was then arranged according to the problems found and concluded in the form of articles.

The purpose of this study is to know what the teacher's difficulties have experienced in defending mathematics to the participants so that they can find the solution to the problem. Based on research that has been done, researchers found one of the teachers who had difficulty teaching one of the mathematics subject matters in one of the schools in the city of Bandung.

II. METHOD

This research uses a case study approach aimed at deeply understanding the mathematical learning difficulties faced by 6th-grade students at SD Al-Izzah Bandung, particularly on the topics of mean, median, and mode. The case study approach was chosen because it allows researchers to explore phenomena in detail within a specific context, namely the process of mathematical learning in elementary school.

This research is a type of qualitative study, where data is collected in descriptive form, consisting of words or narratives, through interviews, observations, and documentation. The data is analyzed to obtain a comprehensive understanding of the issues occurring in the field.

The research was conducted at SD Al-Izzah Bandung located at Jl. Cigending No. 10, Pasirwangi, Ujung Berung District, Bandung City, West Java Province. Data collection was conducted on Monday, October 16, 2023, involving sixth-grade teachers as the main subjects and sixth-grade students experiencing learning difficulties as the focus of the research.

In the data collection process, several techniques were used. First, interviews were conducted with sixth-grade teachers to delve into their experiences in teaching mathematics, specifically mean, median, and mode. The teachers also provided insights into the difficulties faced by students, the teaching strategies that have been implemented, and the challenges encountered during the learning process.

In addition to interviews, the researcher conducted direct observations in the classroom to observe the mathematics learning process, interactions between teachers and students, as well as student behavior during lessons. These observations aimed to provide a real picture of the classroom learning dynamics. As a complement, the researcher also collected data through documentation, such as student learning outcome records, lesson plans, and teacher reflection notes.

The research steps begin with identifying students who experience learning difficulties through interviews with teachers and analysis of student learning outcomes. After that, observations are conducted to directly note the problems that arise during the learning process. Subsequently, the obtained data are systematically analyzed to identify the main issues faced by students and teachers, as well as to formulate relevant solutions.

This research focuses on three main aspects: first, students' difficulties in understanding the concepts of mean, median, and mode; second, the challenges faced by teachers in delivering the material; and third, alternative learning solutions that can help students better understand the material.

Through this research, it is hoped that a clearer understanding of the challenges in mathematics learning at the elementary school level can be obtained. The results of this research are also expected to make a tangible contribution to improving the quality of

learning, both from the perspective of students and teachers.

III. RESULTS AND DISCUSSION

There are several difficulties found in mathematics learning at SD Unggulan Al Izzah Bandung, including students having difficulties with skills and communication in mathematics learning, such as understanding and performing arithmetic operations. Additionally, the main difficulty discussed here is the difficulty in understanding mathematical concepts such as mean, median, and mode, as well as in solving mathematical problems. Some of the difficulties experienced by students in knowing and understanding the concepts of mean, median, and mode in mathematics learning include students having trouble distinguishing between the total number of data and the frequency of data, making it difficult to understand the concept of mean (average), students often forget to determine the median correctly because they do not understand how to sort the data first, students have difficulty determining the mode because they do not understand the concept of mode and that a mode exists only if there are two identical values or no mode if there are more than one different value, and students have a limited understanding of several statistical concepts, such as mean, median, and mode, which causes difficulty in determining these values.

To overcome these difficulties, several efforts that can be made include: (1) Enhancing the understanding of mathematical concepts through engaging and applicative learning approaches[4], (2) Conducting online learning by utilizing technology to help students understand mathematical concepts and skills [5], (3) Developing students' mathematical communication skills through various learning methods that encourage interaction and discussion, (4) Informing students about the difference between the number of data and the amount of data, as well as how to sort data first before determining the median[6], (5) Teaching students how to correctly calculate the mode, which involves understanding the concept of mode and how to determine it for data with two identical values or no mode if there are more than one different value, (6) Developing students' communication skills in the mathematics learning process, as done in research using the index card type learning model with the aid of statistical board media. By implementing these alternative efforts, students can overcome their difficulties in understanding the concepts of mean, median, and mode in mathematics learning.

In reality, mathematics education is an abstract science. In mathematics learning, teachers should use teaching aids so that students can understand the concepts being taught. Abstract mathematical concepts can become concrete with the help of visual aids. Teaching aids can be understood as tools to assist the learning process, so that the information being conveyed can be well received, allowing the learning process to be carried out effectively and efficiently.

The material on mean, median, and mode is one of the main issues causing difficulties for students in learning mathematics in the 6th grade at SD Unggulan Al Izzah Bandung. To address this issue, the author provides a solution by suggesting the M3 board learning media as a tool to help students understand the material.

The word "Media" comes from Latin as the plural form of "Medium," which linguistically refers to an intermediary or messenger. In the context of education, learning media, or commonly referred to as media, refers to various types of components within the student's environment that can stimulate their thinking. Media is defined as anything used to convey messages from the sender to the receiver with the aim of stimulating the student's thoughts, feelings, attention, and interests so that the learning process can occur. With this definition, learning media encompasses all elements used in teaching and learning activities to convey information so that educational communication interactions between teachers and students can take place effectively and beneficially[7].

The M3 Board (Mean, Median, and Mode) is one of the teaching media used in mathematics education, particularly in the topic of statistics. The M3 board consists of three parts: the mean (average), median (middle value), and mode (most frequently occurring value), displayed in the form of tables or diagrams. The M3 board is used to help students understand the concepts of mean, median, and mode more easily and quickly, as well as to assist students in directly determining the median and mode values easily and quickly [8].

Based on research findings and the utilization of the M3 board (Mean, Median, Mode) in mathematics education, there are several findings that indicate the effectiveness of using this media. Some research results show that the use of the M3 board can enhance students' interest, motivation, and ability to understand and solve problems related to mean, median, and mode. In addition, the use of statistical board media can also help students directly determine the median and mode values easily and quickly, as well as facilitate the understanding of these concepts [9].

Thus, the use of learning media in the form of M3 boards (Mean, Median, Mode) or statistical boards can be an effective solution in helping students overcome difficulties in understanding the concepts of mean, median, and mode in elementary school mathematics education. This media can enhance students' interest, motivation, and understanding of these concepts, thereby supporting the achievement of mathematics learning objectives.

The M3 Board (Mean, Median, and Mode) can be used in statistics learning with the following steps: 1) Concept Explanation: The teacher explains the concepts of mean, median, and mode to the students. 2) Use of the M3 Board: The teacher shows the M3 board to the students and explains how each concept (mean, median, and mode) is represented on the board. 3) Usage Example: The teacher provides an example of using the M3 board to determine the mean, median, and mode from a set of data. The teacher can also ask students to try using the M3 board to solve problems related to mean, median, and mode. 4) Discussion and Practice: The teacher facilitates a class discussion on the use of the M3 board and gives students exercises to use the M3 board independently. With the above steps, the use of the M3 board can help students understand and apply the concepts of mean, median, and mode in mathematics learning.

Every learning medium has its own advantages and disadvantages in its usage. The advantages and disadvantages of using the M3 board (Mean, Median, and Mode) in mathematics learning at elementary school are as follows. The advantages of the M3 learning board are: 1) Effective visualization: The statistics board helps students see data visualization and remember statistical concepts better, 2) Better understanding of statistical concepts: The use of the statistics board can help students understand the concepts of mean, median, and mode more easily and quickly, 3) Increased learning interest: The statistics board can increase students' interest in learning due to its attractive and interactive visualization.

As for the disadvantages of the M3 board learning media: 1) Limitations in the amount of data, the statistics board may not always be suitable for representing large amounts of data, as the visualization approach may not be effective for depicting large datasets, 2) Dependence on students' understanding, the use of the statistics board may not be effective if students do not understand the statistical concepts explained on the board. Overall, the use of statistical board props in statistics education has its advantages and disadvantages. However, the advantages provided can help students overcome their difficulties in understanding statistical concepts and enhance their comprehension of this material.

IV. CONCLUSION

There are several difficulties found in mathematics learning at SD Unggulan Al Izzah Bandung, including students having difficulties with skills and communication in mathematics learning, such as understanding and performing arithmetic operations. In addition, the main difficulty discussed here is the difficulty in understanding mathematical concepts such

as mean, median, and mode, as well as in solving mathematical problems.

The material on mean, median, and mode is one of the main issues causing difficulties for students in learning mathematics in the 6th grade at SD Unggulan Al Izzah Bandung. To address this issue, the author provides a solution by suggesting the use of the M3 board as a tool to help students understand the material. The M3 board (Mean, Median, and Mode) is one of the learning media used in mathematics education, particularly in statistics.

Based on research results and the utilization of the M3 board (Mean, Median, Mode) in mathematics education, there are several findings that demonstrate the effectiveness of using this media. Some research findings indicate that the use of the M3 board can enhance students' interest, motivation, and ability to understand and solve problems related to mean, median, and mode.

Overall, the use of statistical board props in statistics education has its advantages and disadvantages. However, the advantages provided can help students overcome their difficulties in understanding statistical concepts and enhance their comprehension of this material.

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Implementation of P5PPRA in Madrasah Aliyah

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Abstract-This study aims to analyze the literature regarding the Implementation of the Pancasila Student Profile Strengthening Project (P5) and the Rahmatan Lil'Alamin Student Profile (PPRA) in Madrasah Aliyah which aims to form a young generation with character, love for the country, and respect for Islamic values. The research used a Systematic Literature Review approach with the stages of determining themes, searching, selecting literature, analyzing and interpreting, preparing drafts, and disseminating results. The focus of the study on 3 things, namely Impact, Constraints and Challenges, and Implications for Technology. The results showed that; P5 emphasizes six main characters, including faith, piety, and gotong royong, while PPRA focuses on inclusive and tolerant values. While these goals are important, many teachers face difficulties in integrating these values into daily learning. Research shows that lack of training, adequate infrastructure and resistance to change are the main challenges. However, with more integrated policy support and training for educators, the implementation of P5 and PPRA can have a positive impact on students' character, making them more faithful, creative and ready to face challenges in the digital era. Therefore, collaboration between schools, government and communities is needed to achieve holistic education goals.

Keywords-Implementation, P5PPRA, Madrasahs

I. INTRODUCTION

The implementation of the Pancasila Student Profile (P5) and Rahmatan Lil'Alamin Student Profile (PPRA) Strengthening Project is part of education to create a young generation with character, love for the country, and respect for Islamic values that prioritize compassion for all creatures. In education, P5 focuses on six main characters: faith, piety, noble character, independence, critical thinking, creativity, mutual cooperation, and global diversity. [1]. On the other hand, PPRA emphasizes Islamic values that are inclusive, tolerant, and care for the surrounding social and natural environment.[2].

Although the objectives of this profile are important for forming students with strong character and ethics, it is often difficult to implement them in schools or madrasahs. Research in several secondary schools in Central Java shows that many teachers still have difficulties in incorporating the P5 and Rahmatan lil'Alamin values into all subjects thoroughly. This is because they do not understand how to teach effectively and have limited time to conduct project-based activities.[3]. Many P5 programs end up as just an additional activity with no long-term impact on student character.

In addition, in madrasahs that want to implement the Rahmatan lil'Alamin Profile, there is a challenge in balancing curricular activities and the inculcation of comprehensive Islamic values. For example, a study at a Madrasah Aliyah in Jakarta showed that the Rahmatan lil'Alamin values in the school are only practiced in formal occasions and have not become a daily culture for students. This problem is made more difficult by the lack of training and resources for teachers to teach practical and relevant Islamic values in the teaching and learning process.

Limited facilities and support from the surrounding environment are also significant obstacles in implementing this profile. Survey results from the Ministry of Education and Culture[2]about 45% of schools in Indonesia still lack infrastructure to support project-based learning or environmental programs. This can be a problem when wanting to implement the Pancasila and Rahmatan lil'Alamin learner profile thoroughly. Students cannot practice social and character skills through meaningful practical activities.

From the above cases, it can be concluded that more integrated policies and support from the school, government, and community are needed so that the implementation of P5 and PPRA can run well. Holistic character education in schools and madrasahs requires coaching of teaching staff, provision of facilities and infrastructure, and continuous evaluation.

II. METHOD

Systematic literature review (SLR) is used in this study which has the aim of obtaining data on the variables being studied in a clear, accountable, and reliable manner [4]. Identifying, reviewing, evaluating and interpreting any available research with the topic area of phenomena of interest and certain relevant research questions is carried out by the SLR method.[5] The literature review consists of 1) classification and definition of approaches, 2) article search, 3) article selection, 4) data analysis and interpretation, 5) article drafting, and 6) article dissemination stage of the results.

III. RESULTS AND DISCUSSION

The results of this research are drawn on a structured literature review, focusing on three themes, namely, the impact on student character, constraints and challenges and implications in the technological era. The following is an explanation of the three themes.

Impact on Student Character

Indonesian students become students with character, competence and behavior in accordance with the content of Pancasila. Students are required to be better, so many students become people of character and faith.

Indicators are developed to have a positive impact, namely the achievement of Pancasila students who are Rahmatan Lil'alamin in referring to peace, happiness, and safety for all creatures created by Allah SWT, critical and creative reasoning.

The purpose of P2RA is to produce a generation that is not only equipped with academic knowledge, but integrity and good ethics. This generation must be able to reflect the extent to which in understanding it, mastering it and implementing it in life. And able to become a moderate generation, able to create a life of nation and tolerance.

Table.1 Impact on student character with P5PPRA Implementation at Madrasah Aliyah

Year	Author & Article Title	Research Results
2024	[6] Implementasi Project Penguatan Profil Pelajar Pancasila (P5) dan Profil Pelajar Rahmatan lil Alamin (P2RA) di Madrasah Aliyah Negeri (MAN 2) Kuantan Singingi dalam Konteks Kurikulum Merdeka	The results of this study show that there are benefits in using P5P2RA, although there are still some challenges.
2023	[7] Implementasi Project penguatan profil pelajar Pancasila (P5) Profil Pelajar Rahmatan Lil Alamin (P2RA) Dalam Kurikulum Prototipe Di Sekolah / Madrasah	The application of P5 in student learning can be an effective tool and method, therefore many students are able to transform into

Year	Author & Article Title	Research Results
		students with character, noble character, global diversity, and mutual cooperation.
2024	[8] Konsep Profil Pelajar Rahmatan Lil Alamin Dalam Pendidikan Islam Menurut Perspektif Qs Al Anbiya Ayat 107	The goal of P2RA is to create a generation that is not only academic, but has high integrity.

From Table 1 above, it can be concluded that the application of P5 is able to make students better. With good application, it will help students become people of character, responsibility, etc.

The goal of P2RA is to create a generation that is not only academic, but has high integrity.

Constraints and Challenges and Implications in the Age of Technology

Constraints and challenges faced in the implementation of the Pancasila Student Profile and Rahmatan Lil'Alamin Student Profile Strengthening Project at Madrasah Aliyah Negri 2 Kuatan Singingi lack of training for teachers, limited resources and resistance from various parties who are still accustomed to the conventional curriculum.

In this Islamic learning, the learning process is also needed in the use of digitalization, in the implementation of technology-based learning by starting learning with praying carefully, reflection, appreciation and motivation. This learning process the teacher still remains a command and facilitator by preparing teaching materials for PAI materials, such as images, videos, and other texts by being packaged as interestingly as possible, with the available digital-based.

The digitization produced in its implementation has high validity and can encourage students to understand the concepts learned. PAI learning can be implemented one of them using the canvas application.

Table.2 Constraints of P5PPRA Implementation in Madrasah Aliyah in the era of Technology

Year	Author & Article Title	Research Results
2024	[6] Implementasi Project Penguatan Profil Pelajar Pancasila (P5) dan Profil Pelajar Rahmatan lil Alamin (P2RA) di Madrasah Aliyah Negeri (MAN 2) Kuantan Singingi dalam Konteks Kurikulum Merdeka	The results of this study show that there are still some challenges that need to be addressed.
2023	[9]	The learning process of

	Digitalisasi Manajemen dan Pembelajaran Pendidikan Agama Islam di Sekolah Menengah Atas (SMA)	Islamic religious education requires digital technology-based learning, it cannot be denied because nowadays everything requires technology.
2022	[10] Pengembangan Model Pembelajaran Pendidikan Agama Islam	The development of PAI learning can be developed on the basis of technology

Based on the results of the table, the implementation of P5P2RA can be concluded that there are still teachers who are still accustomed to the previous curriculum, this program still cannot adapt to the teacher's ability, over time, this program will run as planned.

In using technology-based media, Islamic learning will be quickly realized, because with the times, students are happier in using this technological media. The form of digitization of learning can adapt students in learning PAI with an emphasis on character. [11].

Challenges and Implications in the Age of Technology

The implementation of P5PPRA (Educator and Education Personnel Development Program) in Madrasah Aliyah in the technological era faces various challenges, but also offers significant opportunities to improve the quality of education. [12]. The following is a discussion of the challenges and implications of P5PPRA in this context.

1. Challenges in Implementing P5PPRA in the Age of Technology [13]
   a. Limited Technology Infrastructure
      Many Madrasah Aliyah still lack stable internet access and adequate hardware to support technology-based learning.
   b. Educator Digital Skills
      Not all educators have sufficient skills in using technology, which can hinder effective learning.
   c. Resistance to Change
      Some educators may feel comfortable with traditional teaching methods and be reluctant to adapt to new technologies.
   d. Limited Resources
      Limited budgets for training and technology development may hinder optimal implementation of P5PPRA.
2. Implication of P5PPRA in the Age of Technology[14]
   a. Educator Training and Development

Conduct training programs that focus on the use of technology in learning, such as the use of e-learning platforms and educational apps.
   b. Technology Integration in Curriculum
      Develop a curriculum that integrates technology, so that students can learn in a more interactive and relevant way.
   c. Use of Digital Aids
      Utilize digital tools such as learning videos, simulations and educational apps to enhance students' learning experience.
   d. Collaboration with Third Parties
      Cooperate with other educational institutions or non-governmental organizations for support in training and technology development.

By understanding the challenges and implications of P5PPRA in the technological era, Madrasah Aliyah is expected to optimize the potential of technology to improve the quality of education and prepare students for an increasingly digital future.[15].

From the challenges above, there are several ways to overcome them, one of which is that madrasah teachers can attend training with flexibility, without being tied to a specific schedule, which can allow them to develop their skills independently. As long as there is an internet connection, training materials can be accessed anywhere. Madrasah teachers can broaden their horizons and knowledge in various fields and can deepen their understanding of some topics by focusing on materials that are considered important or complex. They can also customize learning according to their own level, focusing on material that is often considered important or complex. [16].

IV. CONCLUSION

The implementation of the Pancasila Student Profile (P5) and Profil Pelajar Rahmatan Lil'Alamin (PPRA) strengthening project in schools and madrasahs in Indonesia has faced a number of obstacles, such as a lack of training for teachers, infrastructure issues, and resistance to changes in teaching methods. Nevertheless, research shows that the implementation of P5 and PPRA can have a positive impact on students' character, making them more faithful, noble, and possessing critical and creative thinking skills. Therefore, more integrated policies from all parties, including training for teachers and integration of technology in the curriculum, are needed to optimize the implementation of these two programs in an increasingly digital and relevant educational context.

Although sometimes this implementation is said to be successful, there will definitely be obstacles and challenges, one of which is the lack of digital skills of educators where not all educators have sufficient skills

in using technology, and it can be an obstacle to an effective learning process.

Madrasa teachers can attend the training with flexibility, without being tied to a specific schedule, which allows them to develop their skills independently. As long as there is an internet connection, training materials can be accessed anywhere. Madrasah teachers can broaden their horizons and knowledge in various fields and can deepen their understanding of some topics by focusing on materials that are considered important or complex.

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Development of Socio-Scientific Issues (SSI)-Based Video on Cell Division as Learning Media for Junior High School Class IX

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Abstract—**The use of videos as learning media is crucial for educators as it enhances students' understanding of instructional content. This study aimed to assess the quality of SSI-based learning videos for teaching cell division in Grade IX junior high school science classes, focusing on characteristics, feasibility, and responses. The research employed a Research and Development (R&D) methodology, following the ADDIE model, which includes the stages of analysis, design, development, implementation, and evaluation. Data collection instruments comprised feasibility validation sheets, characteristics validation sheets, and response questionnaires. The findings revealed that the developed learning video media exhibited high validity, making it suitable for instructional use. Both the characteristics and feasibility validation phases were classified as very valid, with a percentage of 91% and 90%, respectively. Trials involving teacher and student responses further substantiated the effectiveness of the learning videos; teacher feedback indicated a positive response (83%), categorized as good, while student feedback showed a slightly higher response (86%), categorized as very good. In conclusion, the findings demonstrate that SSI-based learning videos are highly effective as supplementary instructional media in science education, enhancing student engagement and facilitating the understanding of complex scientific concepts such as cell division.**

Keywords: Learning video, Socio-Scientific Issues, SSI, SSI based learning video.

I. INTRODUCTION

Learning is an interactive process involving students, teachers, and learning resources within a learning environment. The primary components of this process include students, educators, media, and learning resources, all of which interact within a connected system to achieve optimal learning outcomes based on predefined goals [1]. In the classroom, the role of teachers is crucial in shaping students' character and facilitating access to knowledge through the use of learning resources and media. In the 21st century, the integration of evolving technologies enhances the delivery of material and supports effective learning. Learning media serves as a tool for delivering information, allowing students to receive content in an engaging and accurate manner. Well-

designed, student-oriented learning media can significantly improve the quality of the learning process [2].

Studies indicate that 70% of students agree that educational videos enhance learning by providing direct auditory explanations of the content [3]. The use of learning media can stimulate student interest, motivation, and engagement, thereby facilitating more effective learning activities [4]. Video media, in particular, has the advantage of incorporating dynamic elements, making it an effective tool for explaining abstract concepts and complex content. It is also commonly used to streamline learning strategies and illustrate real-world conditions [5].

Learning videos are particularly useful for conveying material that cannot be directly observed or is inherently abstract. In everyday life, we encounter various issues discussed in public media that require critical thinking and problem-solving skills These issues often relate to controversial environmental and scientific topics, such as climate change, environmental pollution, global warming, biodiversity loss, biotechnology (e.g., cloning), radiation, and the effects of electromagnetic waves from cell phones on human health. These topics are collectively referred to as Socio-Scientific Issues (SSI). A key feature of deliberative dialogue in SSI discussions is the opportunity for justification, critique, and reasoning [6].

SSI is a relatively new concept in Indonesia, which has resulted in a lack of SSI-based learning media. SSI exposes students to societal issues through a scientific lens, encouraging them to think critically and contribute to solving problems within society. SSI allows students to engage with real-world problems and encourages discussion and problem-solving around these issues [7].

In the research conducted, the authors found that science education in one Indonesian school incorporated learning media such as teaching aids,

posters, and videos. Among these, video media was the most frequently used. The videos, typically designed by subject teachers, were sourced from platforms such as YouTube. However, the development of SSI-based video media, particularly in the context of cell division, remains underexplored. This area presents an opportunity for further development, as many scientific concepts are closely linked to societal issues.

Cell division, for example, addresses abnormalities in mitosis and meiosis. One such abnormality, resulting from excessive cell division, is trisomy—a condition where chromosomes that should exist in pairs are present in triplets. This occurs in chromosome 21 and leads to Down Syndrome, a genetic disorder characterized by distinctive physical deviations. This disorder is a significant societal concern, making it an appropriate subject for SSI-based video media. The development of such educational videos can help students better understand genetic disorders and related societal issues. By using SSI-based videos, educators can facilitate students' ability to critically address and solve real-world problems, particularly those arising from genetic disorders due to chromosomal abnormalities.

II. METHOD

The research method used in this research is Research and Development (R&D). Research and development methods are used to make certain products and test the effectiveness of these products. The development design used is the ADDIE model, which includes analyze, design, development, implementation and evaluation [8]. Each stage in this model is detailed as follows:

Analyze

Interviews with science teachers revealed that the use of video media in some schools remains limited. Several obstacles contribute to this, including inadequate viewing tools such as projectors and a lack of creativity and interest among teachers in utilizing video media effectively. In schools where video media is used, the videos typically focus on general content rather than addressing socio-scientific issues (SSI). Furthermore, during the interviews, it was found that many teachers are not familiar with the concept of SSI, and as a result, SSI-based learning has not been implemented. These findings suggest that the current learning process has not reached its full potential, and there is a need for appropriate facilities and resources aligned with students' educational needs. Therefore, an innovative tool tailored to these needs is required to enhance students' understanding of the learning material.

Design

The design phase involves the creation of SSI-based learning video media products. This phase consists of several key steps. First, the researchers selected applications suitable for creating educational videos. These included DaVinci Resolve for video editing, which integrates audio and visual elements,

and Canva for supplementary visual editing. Additionally, CapCut was utilized to edit and combine animation effects, Canva illustrations, and the edited content from DaVinci Resolve.

The second step involved the development of a storyboard or script that aligns with the learning objectives of the video. The storyboard was meticulously designed, using clear and concise language, and accompanied by a layout presentation to ensure that the content was easily understandable and effective for educational purposes.

Development

The development phase begins with the collection of video materials (images and audio) based on the storyboard. Three applications—DaVinci Resolve, Canva, and CapCut—were used to create the learning video. First, a visual background was designed, followed by an intro in CapCut. The sequences and designs were then combined in DaVinci Resolve, with effects, transitions, and background sound adjustments made in CapCut.

After completing the video, it was reviewed by two supervisors for initial validation. Feedback from three science education lecturers suggested adding learning objectives, as the video currently focused only on cell division content. Revisions will be made to incorporate these objectives, improving the educational value of the video.

Implementation

The validated SSI-based learning video was then implemented in classroom activities focusing on cell division. The purpose of this implementation was to assess the characteristics, feasibility, and student and teacher responses to the media. The video was used with 25 ninth-grade junior high school students and 6 science teachers during the lesson on cell division.

Evaluation

The results of the implementation of the SSI-based learning video will be evaluated in the final stage of the ADDIE model through validity assessments. This evaluation aims to determine the characteristics and feasibility of the developed video materials for the learning process.

Data were collected using validation sheets and questionnaires. The validation sheets assessed video characteristics and feasibility, with inputs from lecturers and teachers as experts. A total of six experts were involved in assessing the validity of the developed SSI-based learning video. The Likert scale with four choices was used for the questionnaires: very good, good, poor, and very poor. Questionnaires were distributed to 6 science teachers and 25 grade IX students to evaluate their responses to the developed learning video. The data obtained using the instruments were then converted into percentages and interpreted into categories as shown in Table 1 for characteristics and feasibility, and Table 2 for responses.

TABLE 1. CRITERIA FOR VALIDITY LEVEL

Validity Level	Criteria	Information
85% < X ≤ 100%	Very valid	No revision needed
70% < X ≤ 85%	Valid	Can be used with minor revisions
50% < X ≤ 70%	Valid enough	Can be used with major revisions
0% < X ≤ 50%	Invalid	Should not be used

TABLE 2. CRITERIA FOR RESPONSE LEVEL

Response Level	Criteria
85% < X ≤ 100%	Very good
70% < X ≤ 85%	Good
50% < X ≤ 70%	Poor
0% < X ≤ 50%	Very poor

III. RESULTS AND DISCUSSION

Characteristics of SSI-based Learning Videos

The characteristics of learning video media must meet the following criteria: (1) Depicts events or activities from different locations; (2) Can be used repeatedly; (3) Playable on a television or other devices; (4) Capable of capturing students' attention; (5) Usable for both group and individual learning; (6) Long messages can be condensed into concise formats; (7) Displays up-to-date images and relevant informational objects. [9]. As for the SSI aspect, the video should present interdisciplinary issues including ethical aspects, higher order thinking skills, and real-world problems. The complete validation results are presented in the table 3.

TABLE 3. VALIDATION OF THE CHARACTERISTICS OF SSI-BASED LEARNING VIDEOS

No	Indicator	Percentage (%)	Criteria
1	Learning video characteristics	93	Very valid
2	SSI characteristics	83	Valid
	Average	91	Very valid

Based on Table 3, the validity test of the characteristics of SSI-based learning videos for Grade IX cell division material showed an average percentage of 91%, indicating that the videos are appropriate and feasible for use in the learning process. The developed learning video meets the necessary criteria for an educational video and aligns with the characteristics of SSI. The validation results suggest that SSI-based videos can enhance students' critical thinking on societal issues. SSI-based learning (Social Science Issues) improves the effectiveness of learning about social life, including the advantages and disadvantages of emerging scientific issues. SSI is a learning approach that addresses social problems in society, fostering the development of students' critical thinking, communication skills, social attitudes, care, and cooperation [10].

Feasibility of SSI-based Learning Videos

The validation of feasibility includes four indicators: content feasibility, video presentation, language, and graphics. The detailed results of the assessment for each of these indicators are presented in Table 4.

TABLE 4. VALIDATION OF THE FEASIBILITY OF SSI-BASED LEARNING VIDEOS

No	Indicator	Percentage (%)	Criteria
1	Content feasibility	91	Very valid
2	Video presentation	90	Very valid
3	Language	93	Very valid
4	Graphics	88	Very valid
	Average	90	Very valid

Based on Table 4, the content feasibility aspect received a percentage of 91%, placing it in the very valid category. SSI-based learning videos are considered effective in motivating students' learning, making them suitable for the learning process. Additionally, educational videos help foster student interest and attention, attributed to the engaging design of the media and the material presentation, which aligns with the instructional objectives. The presentation feasibility received a percentage of 90%, also categorized as very valid. A well-structured presentation aids students in understanding the learning flow. Furthermore, the language aspect was rated as very valid, with a percentage of 93%. The use of clear and appropriate language facilitates students' comprehension of the content, motivating them and increasing their interest in learning. The graphics in the SSI-based learning video were rated very valid, with a percentage of 88%. The high quality of the video's visuals supports the learning process, as attractive media design has been shown to enhance student motivation and engagement in learning [11] [12].

The results of the feasibility test conducted by expert validators across four aspects show that the developed SSI-based learning video received an overall average score of 90%, categorizing it as very valid. These findings indicate that the SSI-based learning video on cell division is suitable for use as a media tool in the learning process. The video was deemed highly feasible in terms of content, presentation, language, and graphics, facilitating educators in delivering material and aiding students in understanding the content effectively.

For a learning media product to be effective, its features must be aligned with appropriate learning content and presented in a clear, systematic manner. Video-based learning media serve as a powerful tool in the student learning process, with educators playing a crucial role in selecting media that best supports the teaching and learning process, tailored to students' needs and the learning context [13]. Given their numerous advantages, learning videos are frequently utilized by educators as a standard teaching tool. Furthermore, it has been noted that video-based learning enhances engagement, making the learning experience more interesting and enjoyable [14].

Responses to SSI-based Learning Videos

Questionnaires were administered to gather feedback from both teachers and students regarding the developed SSI-based learning video. As the video is intended for use by both educators and learners, this feedback is crucial for obtaining relevant insights and making necessary improvements to the video.

TABLE 5. TEACHER AND STUDENT RESPONSES TO SSI-BASED LEARNING VIDEO

No	Indicator	Percentage (%)	Criteria
1	Teacher response	83	Good
2	Student response	86	Very good

Based on Table 5, while teacher response is categorized as good (83%), student response is categorized as very good (86%). The data obtained from the teacher and student responses indicate that the developed video media is highly effective for learning. These findings align with previous research, which suggests that the development of learning video media is an effective strategy for streamlining the learning process and improving student outcomes [11]. Following feasibility and characteristics tests and the distribution of questionnaires, the developed teaching media can be implemented in the learning process to address learning challenges, particularly in the topic of cell division. Research by [8] demonstrates that the presence of learning media enhances effectiveness and promotes student engagement in learning.

The advantages of SSI-based video learning media include their ability to engage students in solving social problems related to science. SSI-based educational video media are suitable for both classroom and independent learning environments, as the videos can be uploaded online for easy access. This allows both students and teachers to better understand the content of the learning material and the social issues that arise in real life. SSI-based learning prepares students to engage with and address social problems related to scientific issues [15].

IV. CONCLUSION

Based on the result of this study, it can be concluded that: Firsly, the validation of characteristics of SSI-based learning videos, included two indicators: the learning video and SSI characteristics, which was categorized as very valid with an average percentage of 91%. Secondly, the validation of feasibility of SSI-based learning videos, included four indicators: content feasibility, video presentation, language, and graphics. The overall validation results were categorized as very valid, with an average percentage of 90%. Thirdly, responses to the SSI-based learning videos were collected from both teachers and students. The teacher response was categorized as good, with an average percentage of 83%, while the student response was categorized as very good, with an average percentage of 86%.

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Implementation of Merdeka Curriculum in Islamic Education Learning: Narrative Literature Review

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Abstract— An independent curriculum is one that allows schools to develop their capabilities according to their own tools and resources. The curriculum allows teachers to deliver important material, giving students a wide and free space is the most important process to maximize their potential and achieve the best educational results. The purpose of this study is to determine how effective the Merdeka Curriculum is in learning (PAI). The method used for this research is Narrative Literature Review which collects actual data from scientific journals. The results showed that the independent curriculum works well for PAI because the flow of the curriculum is very suitable for the characteristics of PAI which must be fulfilled from Aqidah, Akhlaq, Qur'an Hadith, Jurisprudence, and Tarikh.

Keywords— Independent curriculum, Islamic religious education, learning methods

I. INTRODUCTION

The curriculum is one source of guidance for teachers to achieve learning objectives. [7]. The curriculum must be continuously developed and refined to support innovation, critical thinking, and creativity. [8]. Education never stops changing due to the needs of the times and advances in science and technology.

Strong management in terms of implementation, planning and evaluation is essential for education. [15]. Without good management, education will not succeed. The government is trying to improve the quality of education, so the curriculum is constantly updated. Currently, the curriculum used is the independent curriculum. [10]. This curriculum stipulates that teachers' lesson plans should be fun so that students are not pressured. Teachers provide direction and guidance to students to ensure that their interests and talents continue to develop. [2]. It is expected that the independent curriculum will improve student achievement in various fields, not only in academics but also non-academics.

Merdeka Belajar Curriculum is a curriculum that focuses on students and allows for diverse learning methods that are fun, both in the classroom and outside the classroom. The project-based learning model provides students to learn more about ideas. By providing various media for projects, teachers increase student creativity. This phenomenon is felt when the teacher delivers the subject matter. [9].

Islamic religious education is very important for daily life because it encourages students to think critically and relate to God and the universe, so that they can understand and believe the lessons and apply them in their daily lives. [5]. Currently, Islamic Religious Education is starting to be addressed and prepared to create and succeed the independent learning curriculum because it is a subject that aims to guide children to become true Muslims, have firm faith, do good deeds, and have good character and be useful for the people of the nation and state. [11].

In school learning in the 5.0 era, extensive PAI materials can be delivered thoroughly. Therefore, teachers must be able to quickly determine the most effective and fundamental learning materials for students to understand and practice.

Conducted to increase knowledge about the use of independent curriculum in pai learning. The results can serve as a basis for the creation of an effective independent curriculum in pai learning that will help students understand the pai material thoroughly.

II. METHOD

The Narrative Literature Review method was used in this research. That is, this research analyzes the content of literature selected from various sources to produce conclusions and new ideas. This research collected secondary data in the form of journal articles indirectly. Over the past four years (2021-2024), data was collected from high-quality national journals with

databases accessible through the Google Schoolar web on the subject of Merdeka Curriculum on PAI Learning. A total of twenty articles were found that fit the research objectives.

The journal analysis provides information about the implementation of Merdeka Curriculum in PAI learning. More accountable sources are then used to make conclusions about the data the author has collected. This qualitative research uses a lot of references or written sources to explain the topic under study. In this research, descriptive methods are used regularly and systematically.

Stages of the narrative literature review method:

1. Protocol search
   Namely focusing on studies and database searches, focusing on the study of the Implementation of Merdeka Curriculum in PAI learning.
2. Apprasial
   Conduct database selection which includes suitability to the theme
3. Syntesis
   Categorize according to the focus of the research study title
4. Analysis
   Thorough analysis of relevant articles
5. Report
   Produce a report in the form of a published article.

III.   RESULTS AND DISCUSSION

The following research graph shows the trend of research on the application of the independent curriculum in pai learning, published on Google Schoolar from 2021-2024:
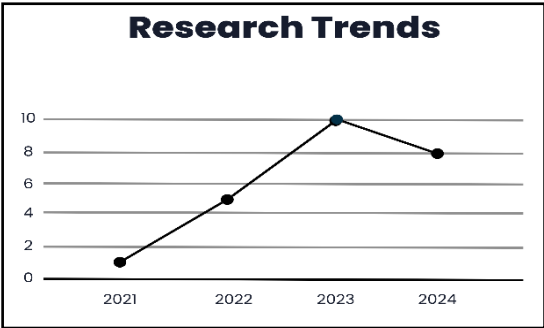
Figure 1. Research Trend of Independent Curriculum in Islamic Education Learning

Figure 1 shows that from 2021-2024, the trend of research on the Merdeka Curriculum continued to increase. However, in 2024, the trend decreased, making the author want to repeat this research topic as information about the results of implementing the Merdeka Curriculum in PAI learning that has been implemented.

In addition, Figure 1 shows that researchers are interested in research on this topic as according to research conducted by Aini Qolbiyah at SMK Negeri 5 Pekanbaru, it allows schools to explore what they have according to their resources and inputs. In addition, this curriculum allows teachers to deliver important PAI lessons. [4].

Table 2. Mapping of Research Results on the Implementation of Merdeka Curriculum in PAI Learning

No.	Author/Journal/ Year	Methods	Results
1	Wakib. Muhammad, at al. / Journal of Tarbiyahislamiyah December 2023 Edition	Qualitative approach and case study type	Shows that the application of Merdeka curriculum in Islamic learning encourages students to learn independently and improve critical thinking skills in Islamic religious education at Bustanul "Ulum High School."
2.	Wachidi. Mei, at al / Scientific Journal of Education Science (JIIP) October 2023	Qualitative descriptive *field* research	At Al Jihad Senior High School and Al Khairiyah Senior High School in North Jakarta, the independent curriculum for PAI and Budi pekerti subjects generally runs well and efficiently.
3.	Ilian. zuqriva at al / Jurna Homepage January 2024	Qualitative	The Merdeka Curriculum at SMAN 1 Bukit Tinggi shows a good learning atmosphere, and this is also

No.	Author / Journal	Method	Results
			supported by the school background which has adequate facilities.
4.	Nur Zaini. Cendekia Journal 2023	Qualitative	Indicates that the findings of this study help learners to thoroughly understand what is being taught in Pai.
5.	Ariana. Djuniawan. at al / Journal of Education and Teaching Review / 2023	Exploratory involving Cross Sectional Survey	The results of this study show that the curriculum can serve as an effective tool to improve students' ability to think critically in PAI learning.
6.	Aprilina Selly / Journal of Education and Culture 2023	Descriptive	It shows that this curriculum aims to give students the freedom to learn PAI in accordance with national education goals and the Pancasila student profile.
7.	Selamat, Ervina / Indonesian Journal of Education Research 2023	Qualitative	According to this study, the free curriculum requires teachers to encourage and help students find strategies in PAI learning.
8.	Evi Susilowati.Journal of Science Education 2022	Qualitative	The results show that teachers face difficulties when implementing the self-learning curriculum at school.
9.	Isa.Syifaun,/Journal of Islamic Education 2023	Qualitative	The results showed that the implementation of the independent learning curriculum at SMP Muhammadiyah 1 Sidoarjo improved critical thinking skills in Islamic Religious Education lessons.
10.	Aini Qolbiyah.Indonesian Journal of Education Research 2022	Descriptive Qualitative	The results showed that the Merdeka Curriculum in PAI lessons requires appropriate learning media during the learning process.

Table 2 shows that Merdeka Curriculum uses various structural approaches to provide students with sufficient opportunities to learn concepts and improve their abilities, as soft skills and character abilities relevant to the Pancasila Learner Profile are the main focus of project-based learning. [6]. Teachers have the opportunity to choose teaching tools that suit students' interests and needs. Instead, learning is designed for a specific theme. [14].

Islamic Religious Education teaching is able to foster students' critical attitudes in relation to benefits and current situations. [11]. Islamic Religious Education learning should encourage students' creativity, collaboration skills, and self-confidence. In addition, the objectives of the learning process, learning outcomes, should be assessable by the Islamic Education teacher according to the level and phase of the learners. [3].

The steps taken to implement learning curriculum innovation or reform take into account the resources available to deliver education to the community. The Islamic Religious Education curriculum, as well as other curricula, continues to change over time. The purpose of curriculum reform is to make the curriculum a guide for teachers to direct their teaching to adapt to the times. [13]. Islamic Education learning is designed to engage students.

In implementing the learning curriculum, PAI teachers face several challenges including: (1) lack of experience with learning independence; (2) not being able to obtain references easily; (3) not having sufficient knowledge of technology; and (4) not understanding the meaning of the curriculum. [17].

Therefore, the learning objectives set out in BSKAP head decree no. 33 of 2022 must be considered by PAI teachers, i.e. they must be appropriate to the level and phase of the learners. These learning objectives are not limited to one school year; instead, they are organized in stages to provide flexibility in the learning process. [4].

Akidah, or belief, is the first material that must be taught to students in Islamic religion lessons, because akidah is basic for all people who are Muslims. As one of the hadiths narrated by Jundub Bin Abdillah in Ibn Majah, it is stated that the Companions taught the Prophet the creed for the first time. They said, "We are teenagers approaching puberty, we learned faith before learning the Qur'an, and after we learned the Qur'an, our faith increased". [18].

After gaining knowledge of his creed, the teacher begins to teach the Qur'an properly. This means that one should start teaching the Qur'an after gaining knowledge of the creed. Qur'an learning is a lesson on how to read, understand, and practice it so that it can be applied effectively in students' lives. [16].

Further materials include fiqh lessons that deal with methods of mahdhoh worship that are obligatory. Although students have the freedom to choose for themselves in the free curriculum, PAI teachers can help them by talking, solving problems, and practicing.

Moral learning must be studied in PAI. Knowledge is the result of morals. According to HR. Bukhari, the Prophet said, "*I was sent only to perfect good manners*". The essence of Islamic education is to improve morals. Moral education should begin at an early age and focus on systematic habituation. Teachers should show moral examples and apply them in daily life. Actually, moral learning can be applied in all Islamic education materials, even in all subjects, because morals can be learned through students' analysis of their teachers' actions and comments. Therefore, teachers' characters and beliefs must be carefully considered to instill good morals in students.

In addition, historical material must be conveyed to students so that they are able to take inspiration from the struggles of the Prophets, Companions and previous Islamic heroes and emulate their morals in their daily lives. Videos or stories can be used to teach history. Students can improve their ability to retell the struggles of the Prophet and the Companions from what they have understood.

PAI learning must be carried out in stages in line with the description given by the Prophet Muhammad Saw in the hadith, namely starting with faith, then Aqidah, and morals. To best fulfill their religious obligations, students must first be taught these three main components. Then teaching the prayer service so that they can understand is the most important.

PAI teachers must master the independent curriculum systematically and be able to understand well the material that must be learned by all students. Therefore, the success of PAI learning is greatly influenced by the teacher's understanding in determining the material that is considered important and creating a learning flow that takes into account the needs and obligations of students. [12].

IV. CONCLUSION

With some reference articles that we have reviewed, we can conclude that the learning curriculum is a flexible curriculum that allows schools to develop PAI subject matter according to the resources available. This curriculum also gives teachers the freedom to provide PAI subject matter, which allows students to develop their interests and potential. Educators' skills in determining learning topics and creating organized learning paths consider the needs of the learners.

The independent curriculum has been used well in PAI learning. Learning is successful because teachers' placement and identification of students works well. Mapping information can be used by educators to create lessons that are relevant to their abilities and beneficial to students. Tarikh, Jurisprudence, Akhlak, and Akidah, as well as Qur'an and Hadith, are the most important subjects to be taught to students. These materials are chosen because they are obligatory and beneficial to society as a whole.

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Implementation of RADEC Model to Improve Critical Thinking Skills of High School Students

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Abstract- **This research aims to examine the effectiveness of RADEC (Read, Answer, Discuss, Explain, Create) learning model in improving critical thinking skills of high school students. The research method used was a quasi-experiment with a pretest- posttest control group design. The experimental class used the RADEC model, while the control class used the Guided Inquiry learning model. Data were collected through, student worksheets (LKS), and critical thinking skills tests. The results of the analysis showed that the application of the RADEC model was significantly more effective in improving students' critical thinking skills compared to the Guided Inquiry model. The average posttest score in the experimental class reached 81.85, while the control class only reached 68.70. The independent sample t-test results showed a significant difference between the two groups. The N-Gain value in the experimental class of 65.67% showed a sufficient effectiveness category, while the control class was only 45.63%. The results of this study reinforce that the RADEC learning model can be used as an alternative in improving the critical thinking skills of high school students.**

Keywords: RADEC, Critical thinking skills, and learning model effectiveness

I. INTRODUCTION

Critical thinking skills are one of the skills that every student needs to master. Students who master critical thinking skills will be skilled in explaining simple things, building basic skills, concluding and making explanations. By unproving critical thinking skills in students, students will be able to see the potential that exists in themselves, so that they will be trained to solve various problems they will face. [1]

A person can be said to have critical thinking skills if his reasoning work and argumentation skills involve five aspects, including: (1) providing simple explanations (elementary clarification) (2) building basic skills (basic support) (3) inferring (4) making further explanations (advance clarification) and (5) strategies and tactics [2]. These critical thinking skills are essential in a variety of contexts, including education, work, and everyday life, as they help individuals to think analytically, make thoughtful decisions, and communicate effectively.

The results showed that the critical thinking skills of high school students in Physics subjects in various regions are still relatively low. This low ability can be seen from the difficulty of students in understanding and solving physics problems that require in-depth analysis and systematic thinking. In addition, students' interpretation skills are also considered inadequate, reflecting obstacles in understanding and processing the information provided. The ability to organize further explanations, provide simple explanations that are easy to understand, and draw logical conclusions is also in the low category. Overall, this condition indicates the need for more intensive efforts in improving students' critical thinking skills, especially on aspects related to concept understanding, analysis, and the delivery of logical and structured solutions in Physics learning [3], [4], [5]

The research results that have been presented are also related to the learning activities carried out in each school. Learning activities in schools have not been able to encourage students to develop critical thinking skills [6]. Learning activities only direct students to memorise and collect information, so that students are only able to explain theoretically and lack in implementing the information. teachers tend to teach students to memorize even though they have not implemented innovative research learning. The teachers tend to teach students to memorize even though they have not implemented innovative research learning [7]

In line with that, based on the result of preliminary study conducted by researchers in 2023 at one of the State High Schools in Garut Regency, it was found that the critical thinking skills of class X students were still low as seen from the lack of students' ability to answer questions that could stimulate students' to think critically. This is shown from the results of interviews with physics teachers at the school who show that they rarely see student showing critical thinking skills in learning activities. It is also evidenced by the difficulties to accept information without questioning it observations of the students' attitudes in learning activities also show that they lack focus and are easily distracted.

Based on this preliminary study, it can be concluded that students' critical thinking skills are still low. This needs to be a serious concern for schools to improve the quality of learning and help students develop their critical thinking skills.

Previous research has revealed that teachers' understanding of the steps or syntax in innovative learning models is still lacking. As a result, teachers tend to keep using traditional learning methods repeatedly. This has an impact on the learning process in the classroom which is dominated by activities such as giving homework and memorization, so that students' active participation in contributing thoughts during learning becomes very minimal [8].

With these problems, a learning model is neede that can improve student skills, especially critical thinking skills. Read, Answer, Discuss, Explain, and Create (RADEC) learning model can be an alternative and solution to educational problems, especially in learning activities. The RADEC learning model is considered to develop conceptual understanding and skills that need to be improved in students, including critical thinking skills [9].

Research has shown that the RADEC learning model makes a significant positive contribution to improving students' critical thinking skills. This model is considered to be able to provide a more effective learning approach compared to other learning models, such as the inquiry model, especially in terms of developing higher order thinking skills (HOTS). This is supported by research showing that the RADEC model is able to strengthen students' critical thinking skills through structured and sequential learning stages. The learning process starts from the reading stage to understand the basic material, followed by in-depth analysis, to the stage of creating solutions that are relevant to a particular situation or problem [10], [11], [12], [13].

Furthermore, this model also contributes to improving students' ability to analyze information and compose logical arguments in order to understand learning materials in depth. The learning stages in RADEC, such as Discussion and Explanation, provide space for students to collaborate and exchange opinions, which ultimately strengthens their critical and analytical thinking skills. By actively engaging students in learning, the RADEC model not only improves their understanding of the material but also prepares them to think more systematically and contextually. These findings suggest that RADEC model is one of the innovative and effective learning approaches to develop students' potential thoroughly. Based on this background, researchers are interested in conducting research on the implementation of the RADEC learning model to improve critical thinking skills of high school students.

II. METHOD

This research method used in this research is quasi experiment with pretest-posttest control group design. The choice of this method is based on the researcher's desire to find out the implementation of the RADEC learning model on high school students' critical thinking skills on global warming material by comparing the effectiveness of the RADEC and Guided Inquiry learning models.

The population of this study included all X grade students in one of the State High Schools in Garut district with a total sample of 54 students divided into 2 classes, namely the experimental class and the control class, each of which had 27 students.

The instrument used is a critical thinking skill test in the form of description questions on global warming material which includes the concept of the greenhouse effect, activities that cause global warming, the impact of global warming and solutions to overcome global warming. Each questions was prepared based on critical thinking skills indicators [2]

Before the research was used, the instrument was tested for validity and reliability. The validity test starts from validation by experts related to the suitability of material, construct, and grammar., then the instrument is tested on students in class XI MIPA in one of high schools, the results of the test are then validated using spss application software which is then validated by experts. The reliability of the instrument was 0,756 with a high category. The improvement of students' critical thinking skills was measured using normalized gain (N-Gain) [14].

Table 1. Interpretation of N-Gain Value

N-Gain (N)	Category
N < 0,3	Low
0,3 δ N < 0,7	High
0,7 δ N	Tinggi

III. RESULTS AND DISCUSSION

Learning activites with the RADEC learning model are divided into five stages, namely the Read,

Answer, Discuss, Explain and Create (RADEC) stages. Learning activities with this model begin with the Read and Answer stages where students independently explore understanding through online LKS. After that, students collaborate in the Discuss stage to discuss their answer in depth. Next, each group present their Explain results, explaining the understanding they have gained. The last stage is Create where students are invited to apply their knowledge by developing creative ideas based on the results of previous discussions and presentations. Thus, through the Read, Answer, Discuss, Explain and Create, students can build a comprehensive understanding and develop critical thinking skills.

The results of critical thinking skill research were obtained from the results of students' pretest-posttest in the form of descriptions questions. The pretest questions were given before implementing the learning model, while the posttest questions wre given after implementing the learning model.

Based on the results of the study, it was found that the average pretest in the experimental class was 49.26 and the average pretest in the control class was 43.52. For more details can be seen in the following table.

Table 2. Comparison of statistic data of experimental class and cntrol class in pretest.

	Class Experiment	Class Control
Average	49, 26	43,52
Maximum value	75	60
Minimum value	25	25
Standard deviation	14,053	10,544
Number of students	27	27

Based on table 3 above, it can be seen that the average score of the experimental calss and control class disputes by 5.74. The results of the difference is not significant at the 95% confidence level. After the experimental class and control class followed the learning activities for 3 times with each treatment (experimental group with RADEC learning and control group with Guided Inquiry learning), the posttest results in both classes are known as follows.

Table 4. Comparison of statistical data of experimental class and control class in *posttest*

	Experimental Class	Control Class
Average	81,85	68,70
Maximum value	100	85
Minimum value	65	50
Standard deviation	8,786	9,566
Number of students	27	27

Based on table 4 above, it can be seen that the average posttest score in both classes is greater than the pretest average. This means that both learning models applied have a positive influence in improving students' critical thinking skills. The results of the difference test throught the independent sample t test also get a *p* value of 0.001 which means that the difference is significant at the 95% confidence level.

Table 6. Results of postest mean difference test through independent sample test

Independent sample t test							
Levene's Test for Equality of Variances		Sig.	t	df	T test for equality of Means		
					Significance		Mean differenc e
	F				One - sided p	Two - sided p	
Equal variances assumed	.29 7	.588	5.260	52	<.001	<.001	13.148
Equal variances not assumed			5.260	51.62 8	<.001	<.001	13.148

Critical thinking skills are measured through five indicators, namely (1) providing simple explanations. (2) building basic skills. (3) inferring, (4) providing further explanatios, and (5) using strategies and tactics.
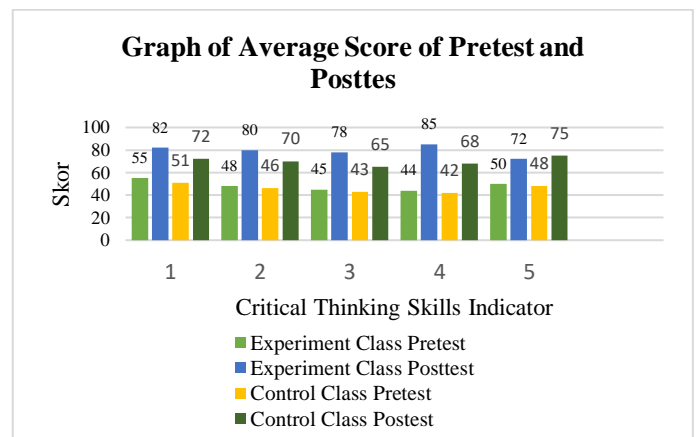

Figure 1. Graph of mean scores of pretest and posttest

1. Provides Simple Explanations Indicator

On this indicator, the experimental class showed a significant improvement after the impelemention of the RADEC model, from an average pretest score of 55.00 to 82.00 on the posttest. Students in the experimental class showed a better understanding in providing basic explanations related to the concepr of global warming, compared to the control class which increased from 51.00 to 72.00

2. Basic Skill Building Indicator

On this indicator showed an average increase from 48.00 in the pretest to 80.00 in the posttest in the experimental class. The RADEC model provided space fr students to explore and construct understanding through group discussions, which supported the improvement of this skill. In the control class, the posttest score on this indicator also increased, but to a lesser extent, from 46.00 to 70.00.

3. Inferring Indicator

The experimental class experineced a significant increase in this indicator, from an average pretest of 45.00 to 78.00 in the posttest. Throught the Explain and Discuss stages, students were trained to draw conclusions from their discussions results, which helped them improve their critical thinking skills. The control class showed a smaller improvement on this indicator, from 43.00 to 65.00.

4. Provides Further Explanations Indicator

The largest increase in the experimental class occured in this indicator, with the average score increasing from 44.00 in the pretest to 85.00 in the posttest. The Explain and Create stages in RADEC provide opportunities for students to provide more indepth arguments and explanations. In the control class, the increase in this indicator occired from 42.00 in the pretest to 68.00 in the posttest.

5. Indicators of Using Strategis and Tactics

In this indicator, both classes showed improvement, but the control class was slightly higher in the posttest, which was 75.00 compared to 72.00 in the experimental class. This is due to the focus of Guided Inquiry wich gives more attention to certain strategies in solving problems through the inquiry process.

Furthermore, the N-Gain results, which measure the effectiviness of skill improvement, showed that the RADEC model achieved an average N-Gain of 65,67%, classified as moderately effecitive. Meanwehile, the control class with the Guided Inquiry odel only achieved an average N-Gain of 45.63%, which is in the less effective category. This achievement indicates that students in the experimental class obtained a more significant increase in critical thinking skills than students un the control class. The higher N-Gain value in the experimental class indicates that each stage in the RADEC model provides greater opportunities for students to understand, integrate, and apply the concepts learned.

Strengthening the results of the previous N-Gain calculation, the effect size is calculated to measure the extent to which the difference in posttest results between the experimental class and the control class has practical significance. Based on the calculation, the effect size value of the posttest results of the experimental class compared teh control class is 1.14 which falls into the category of "high effective". This effect size value indicates that the implementation of the RADEC model has a large influence on improving students' critical thinking skills.

Student Worksheets were also used as an additional instrument to measure student engagement and understanding at each stage of learning. The Student Worksheets (LKS) in the experimental class served as an important instrument in supporting each RADEC stage: Read, Answer, Discuss, Explain, and Create. In the learning process, the worksheet was designed to help students develop deeper and more structured answers at each stage.

In the experimental class, the results of the worksheet completed by each group of students showed consistent improvement at each lesson, both in the accuracy of the answers and the depth of student analysis. Students in the RADEC class showed better progress in constructing complex and logical answers, especially at the Explain and Create stages, which required students to present the results of the discussion and construct solutions.
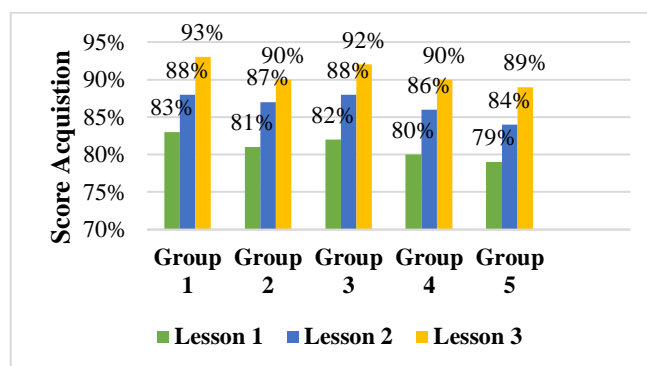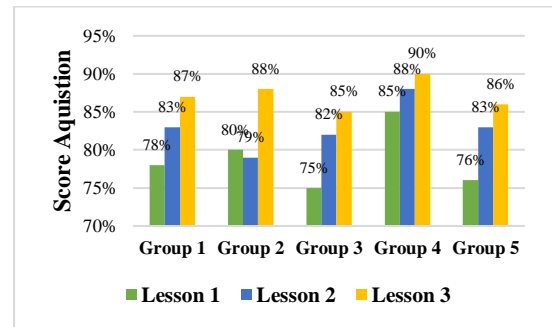

Figure 2. Graph of the acquistion of students worksheet scores in the experimental class

Based on Figure 3, it can be seen that the results of filling out the experimental class Student Worksheet (LKS) for three lessons on global warming material are classified as increasing. The sub-materials discussed in this student worksheet are the greenhouse effect and activities that cause global warming in the first lesson, the impact of global warming in the second lesson, and solutions to overcome global warming in the third lesson.

In the initial stage, namely the Read and Answer stage, the student worksheet (LKS) is structured with a series of questions designed to stimulate students' initial understanding of the global warming material. In this stage, students are asked to read and summarize information, which aims to help them identify key concepts and build a basic understanding of the material. Based on the data from the LKS, most students in the experimental class were able to provide fairly precise answers. However, at this stage, students' depth of analysis was still limited. This

is in line with the research results that highlight the importance of mastering prior knowledge as a foundation in the learning process [15].

At the Discuss stage, the student worksheets are designed to encourage collaboration among students in exploring answers from various points of view. Group discussions provide opportunities for students to share ideas, exchange opinions, and hone their ability to formulate sharper arguments. Previous research emphasizes that social interaction plays an important role in supporting the development of cognitive and critical thinking skills [16]. At this stage, students are asked to record the results of their group discussions on the LKS, which will be further developed in the next stage of learning. Based on the results of the discussion data analysis, students in the experimental class showed an increased ability to criticize each other's answers. This can be seen from the variety of ideas and arguments recorded on their LKS, reflecting a more in-depth and varied thinking process..

At the Explain stage, students in the experimental class were asked to present the results of their discussion. The student worksheets showed that students not only provided factual answers, but also developed more in-depth arguments. Many students added new points beyond the basic information provided, indicating a more comprehensive understanding. For example, on the subtopic "the impact of global warming," some students managed to connect environmental consequences with socio-economic impacts, demonstrating their ability to analyze the topic thoroughly. Through the process of explaining the results of the discussion, students organized their thinking, improved their communication skills, and utilized creative ideas to apply knowledge in a broader context. This activity supported the enhancement of conceptual understanding and higher-order thinking skills, in line with findings confirming that activities that involve explaining and developing ideas can strengthen students' learning abilities [15].

And at the Create stage, students are required to generate creative ideas as a solution to the problem of global warming. The LKS at this stage plays a role in guiding students to develop innovative problem-solving steps. An increase in the quality of answers was seen, where students were able to compile solutions based on the understanding of the concepts they had developed. Students in the experimental class tended to write more diverse solutions, for example by including proposals for environmental policies or strategies for reducing greenhouse gas emissions.

In the control class that used the Guided Inquiry learning model, the worksheet was also used to document students' answers at each stage. However, due to the more directed and focused structure of Guided Inquiry, students' answers in the control class tended to be factual and not as complex as the answers in the experimental class.

Figure 3. Graph of acquistion of students worksheet scores in the control class

Based on Figure 3, it can be seen that the results of filling out the experimental class Student Worksheet (LKS) for three lessons on global warming material are classified as increasing. The sub-materials discussed in this student worksheet are the greenhouse effect and activities that cause global warming in the first lesson, the impact of global warming in the second lesson, and solutions to overcome global warming in the third lesson

In the Introduction and Core stages, students are given problems to answer through data collection or simple experiments. The results showed that students in the control class had a fairly good understanding of the practical steps in the experiment, but tended to lack depth in explaining the causes or effects of the observed phenomena. Their answers were generally more descriptive than analytical.

And at the Inference stage, the LKS in the control class recorded students' answers in formulating conclusions from the experiment. However, students often simply summarised the answers given without developing further thoughts. For example, on the subtopic "activities that cause global warming", students in the control class only listed the causes without linking them to broader implications.

It is important to note that there were variations in the scores obtained by students over the three meetings. This difference is influenced by several factors, one of which is the increasing level of complexity of the material from one meeting to the next. Research shows that the level of difficulty of the material can affect students' understanding and performance. In addition, differences in students' prior knowledge related to each subtopic are also a factor that affects their performance results, considering that uneven initial understanding can affect students' ability to absorb and process the material taught [15]

Student motivation in learning is a crucial factor that greatly affects the success of the learning process. One of the factors that can increase student motivation is the relevance of the topic being taught.

When students feel that the material being studied has a direct link to their daily lives or to their future goals, they will be more motivated to understand and master it. For example, if a student with an interest in the environment learns about climate change, he will feel more motivated because the topic is relevant to his concern for the future of the planet [17]. In addition to topic relevance, the development of students' critical thinking skills also plays an important role in improving academic achievement. Critical thinking skills allow students to analyze information, evaluate arguments, and draw logical conclusions. Thus, students not only memorize information, but are also able to understand concepts more deeply. For example, in history subjects, students who have critical thinking skills can analyze various historical sources, compare different perspectives, and compose their own interpretation of an event [18].

Over time, students became more proficient in applying the RADEC model, making the learning process more effective. Solid cooperation within the group also contributes to the quality of discussion and group work. The feedback given periodically not only helps students correct mistakes, but also encourages them to become more independent learners [19].

Overall, the results showed that strodents in the experimental class ware better able to develop critical and analytical answers. The RADEC model provided space for stradents to explore and discuss their ideas in preater depth, particularly at the Discuss and Explain stages. In contrast, the LES answers in the control class were mare focused on recording facts, with little exploration of alternative ideas. The increase in accuracy and depth of answers on the experimental class worksheets was consistent across each lesson, suggesting that the RADEC learning stages not only increased stadent engagement, but also facilitated the development of their critical thinking skills

This improvement in critical thinking skills influenced by the RADEC learning model encourages active and collaborative engagement. The Read and Answer stages, play an important role in building students' prior knowledge of the global warming material. Prior to in-class activities, students are asked to read basic information and answer related questions, which significantly helps them in understanding the context of the material. Prior knowledge is an important foundation in the learning process, as it prepares students to engage in more in-depth and analytical learning activities [15]. At this stage, students not only receive information, but also encourage their ability to think independently and start the analysis process. This can be seen from the increase in the mean score of the experimental class pretest which is higher than the control class, indicating that students involved in this preparation stage are better prepared to understand and process information during learning.

At the Discuss stage, students participate in an in-depth group discussion regarding their pre-learning answers. This stage not only trains stadents to express opinions, but also to evaluate different points of view and consider arguments from other group members. This discussion strengthens critical thinking skills in the form of analysis and evaluation, as students need to filter information and provide responses based on their understanding. The social interaction through discusion is very important in cognitive development and critical thinking, especially when students are faced with challenges to consider different views [16]. This is reflected in the results of the experimental class Student Worksheet (LKS), which showed that the RADEC class scored higher than the control class, particularly on the evaluation and collaberation indicators.

The Explain stage provides an opportunity for students to present the results of their group discussion. The results showed that through this activity, students in the experimental class were able to organise their thoughts better, which is part of critical thinking skills in the aspect of presenting agamunts. Students were asked to present the results of their disenssion to the class, which trained them to formulate and communicate their ideas logically. This activity strengthens stodents ability to filter relevant information from the discussion and organise it coherently before presentation. The ability to present client and structured argunsents is very important in critical thinking, and this stage encourages students to develop these skills. The increase in the average posttest of the experimental class showed that their critical thinking skills in the communication aspect improved significantly compared to the control class [20].

And the final stage, Create, in the RADEC model involves students in the creation of a solution to the global warming problem, which is a form of practical application of the knowledge they have gained. At this stage, students are challenged to formulate creative ideas, which demonstrates critical thinking skills in the context of problem solving. The results showed that students in the experimental class showed significant improvement in critical thinking skills in the aspects of creativity and problem solving, which was fuelled by their freedom to explore new ideas.

Previous research also concluded that the stages that encourage creativity also encourage students to develop critical thinking skills. The creative process that involves the generation of new ideas inherently requires careful evaluation of each alternative solution, so students are accustomed to weighing various aspects before making a decision [10]. The N-Gain value of 65.67% in the experimental class shows that this stage plays an important role in developing students critical thinking skills comprehensively, especially in the context of solving real problems such as global warming.

IV. CONCLUSION

Based on the research results, the RADEC (Read Answer, Discuss, Explain, Create) learning model is able to improve students' critical thinking skills on the topic of global warming at the high school level. The RADEC model proved successful in creating deeper learning through its stages that support active engagement and analytical understanding The Read and Auruer stages allow students to build a strong foundation of understanding, while the Discuss and Explain stages encourage collaboration and bener areumentation skills. The last stage, Create, facilitates sradents in developing creative solutions, which is an important aspect of critical thinking skills. This study also showed that the experimental class' Student Worksheet (LKS) results showed increased consistency in the accuracy and depth of answers, in contrast to the control class which tended to produce descriptive answers without further exploration.

Based on the significant N-Gain results and posttest scores, the RADEC model has great potential to be applied as a learning method that supports critical thinking skills among students. In addition, this study suggests that the RADEC model can be applied more widely across a range of learning topics that demand higher order thinking. In the context of further development, the RADEC model also has the potential to be combined with digital technology, for example through project-based learning or online classes, to strengthen student engagement and increase learning flexibility. This research has successfully achieved its main objective, which is to prove that the RADEC model can improve students' critical thinking skills more effectively than the Guided Inquiry model.

V. ACKNOWLEDGMENT

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Integration of Artificial Intelligence (AI) in Islamic Education Learning

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Abstract-This study aims to analyze the literature on journals that have been published regarding the use of Artificial Intelligence (AI) or better known as artificial intelligence used in learning Islamic Religious Education. The research used a Systematic Literature Review approach with the stages of determining themes, searching, selecting literature, analyzing and interpreting, preparing drafts, and disseminating results. The research used 15 articles from the selection of 30 articles obtained from various sources with publication years 2020-2024. The results showed that: 1) The use of AI in PAI learning uses various platforms such as visual mentors, Voice Assistants such as Google Assistant, Siri, and Cortana and Presentation Translator and so on. 2) The implication of the use of AI in PAI learning brings positive and negative impacts so that evaluation is needed. 3) The use of AI faces many challenges such as the risk of causing distortion and misinterpretation of religious texts. as well as the emergence of an attitude of dependence on technology, the potential influence of foreign cultures, data insecurity, and the risk of reduced human interaction.

Keywords-Artificial Intelligent, Learning, Islamic Religious Education

I. INTRODUCTION

Education is a conscious effort made by a person (teacher/lecturer) through the process of teaching, guidance and guidance to achieve maturity or prepare students in navigating their lives in the future. Related to education problems, of course, it cannot only be seen from one direction but from various components that strengthen each other.

In the era of increasing digitalization, technology has become an important and inseparable part of human life. One of the trending and most important technological advancements today is the emergence of Artificial Intelligent (AI) or better known as Artificial Intelligence. AI is the ability of machines or software to perform tasks that previously could only be performed by humans [1]. The application of Artificial Intelligent (AI) can involve various technologies such as machine learning, augmented reality (AR), virtual reality (VR), and various other technologies.

The use of artificial intelligence (AI) in Islamic Religious Education (PAI) learning offers a great opportunity to improve learning effectiveness, engagement, and personalization. In today's digital era, AI can help create more interactive and adaptive learning methods that meet the needs of each student. AI can be used to present PAI teaching content more dynamically through apps, chatbots, and learning platforms that can provide direct feedback to learners [2]. In addition, AI allows teachers to identify students' individual learning difficulties more precisely, so that learning can be personalized.

However, the application of AI in PAI learning also faces some challenges. According to a study by [3], one of the main obstacles is the lack of teachers' understanding and ability to use AI technology effectively in the classroom. In addition, the existence of AI also raises concerns regarding how religious values can be conveyed digitally without losing the emotional aspects and spiritual values that are so very important in PAI [4].

Some studies also state that technology adaptation in PAI learning requires a more careful approach than other subjects, especially in maintaining moral and ethical aspects in line with Islamic teachings [5]. In addition, the existence of limited infrastructure and limited access to AI devices in faith-based schools is a challenge in optimizing the use of AI [6].

Therefore, more in-depth research is needed to understand the opportunities, challenges, and implications of using AI in PAI learning. This study is expected to contribute to the development of appropriate strategies for the utilization of AI in PAI in order to improve the quality of learning while maintaining the essence of the religious values to be taught.

II. METHOD

Systematic Literature Review (SLR) is used in this study with the aim of obtaining a description and data on a variable that is studied explicitly, accountably and can be accounted for [7]. The data sources in this study come from scientific papers, such as journal articles, books, notes, and various reports relevant to the problem to be solved. Literature review is carried out in stages 1) Classification and Determination of approach, 2) Article search, 3) Article selection, 4)

Data analysis and interpretation, 5) Draft article, and 6) Dissemination of results. At the initial stage, the focus of the study was determined on the theme of Artificial Intelligence in learning Islamic religious education which includes three things, namely application, development, and challenges. The results of searching for articles on various pages (google scholar) obtained 30 articles which were then selected based on the criteria of publication year and article indexing. The results of screening and selection obtained 15 articles that became material for literature review. The articles that have been selected are followed up by analyzing and interpreting the data so that a conclusion is obtained about the theme studied.

III. RESULTS AND DISCUSSION

Artificial Intelligent (AI) is a branch of science that allows machines, such as computers, to perform tasks and functions as humans can. The ultimate goal of AI is for computers to be able to perform commands that are no less capable than humans. In the context of AI, there are four main approaches that can be taken:

1. Acting Humanly: AI systems are capable of performing tasks or interacting with the environment as humans do.
2. Thinking humanly: AI systems have the ability to think and process information as humans think.
3. Think rationally: AI systems can perform logical and rational thinking in decision making.
4. Act rationally: AI systems are able to act and respond to situations in a rational way, based on logic and predefined goals.

Therefore, AI seeks and aims to create machines that can mimic or even surpass human cognitive abilities in various aspects of tasks, thinking, and behavior.

AI has the ability to execute various tasks that generally require human intelligence, such as speaking, hearing, seeing, learning, thinking, and problem solving. AI can also be applied in various contexts, including web search, voice recognition, face recognition, language translation, recommending products, data analysis, and graphic arts generation [8]. [9] describes how AI works by illustrating the following concepts:

1. Machine Learning: This is an attempt to automate analytical model building. AI uses various methods, such as neural networks, statistics, operations research, and physics, to uncover insights hidden in data that have been explicitly programmed to look for or infer something.

2. Neural Network: This is a type of machine learning that involves interconnected units, similar to neurons, to process information by responding to external inputs and relaying information between the units. This process requires providing enough data to identify relationships and give meaning to data that does not have a clear definition.

3. Deep Learning: Deep learning involves the use of very large neural networks with many layers of processing units. This is made possible by advances in computing power and more sophisticated training techniques, which allow machines to understand complex patterns in large volumes of data. Typical uses include image recognition and speech recognition.

4. Cognitive Computing: This is a sub-field of AI that aims to create natural interactions between humans and machines. By utilizing AI and cognitive computing, the goal is to make machines capable of simulating human processes, including the ability to interpret images and speech, and provide coherent responses.

5. Computer Vision: Computer vision relies on pattern recognition and deep learning to recognize objects in photos or videos. If machines can process, analyze, and understand images, they can in real-time recognize and interpret images or videos as well as the surrounding environment.

6. Natural Language Processing (NLP): This is the ability of computers to analyze, understand, and generate human language, including speech. The next step of NLP is to achieve natural language interaction, where humans can communicate with computers using everyday language to perform certain tasks [10].

Artificial Intelligence in Islamic Education Learning

The role of AI is to enhance human intelligence and support them in carrying out learning activities effectively and efficiently. There are various ways to apply AI in learning activities. Along with the times, all fields, including education, are required to adapt and collaborate in solving problems [11]. In this context, AI can support Muslims in deepening their religious understanding, accessing sources of law and knowledge (such as the Qur'an and Hadith), carrying out religious commands (worship), learning Islam (tarbiyah), interacting with fellow Muslims (muamalah), and inviting others in goodness (da'wah) [12].

Islamic religious education plays an important role in dealing with rapid technological advances, by continuing to adapt in society [13]. Artificial intelligence has great potential to be applied in Islamic religious education. Here are some ways in which artificial intelligence can be used in this context:

1. Artificial intelligence systems can help adapt curriculum and learning materials based on students' level of understanding and individual needs.
2. Artificial intelligence-based chatbots can be used as virtual assistants to answer common questions about Islamic teachings, such as worship, Islamic laws, and Islamic history. They can provide instant and accurate responses, helping students get the information they need at any time.
3. Artificial intelligence can be used to develop simulations that allow students to experience situations related to Islamic teachings, such as

the Hajj simulation or interactivity with the history of Prophet Muhammad. Educational games can also be designed to enhance students' understanding of Islamic concepts.

Table 1. Article Representation of the Implementation of the use of AI in Islamic Religious Education

Year	Author and Article Title	Research Results
2024	Abdul Hafiz Development of Artificial Intelligence-Based Islamic Learning Media: An Islamic Religious Education Perspective	AI integration improves the quality of Islamic Religious Education. By utilizing AI, PAI learning media can be developed to be more adaptive, interactive, and personalized, which not only improves the quality of education but also strengthens students' character building.
2023	Siti Hawa Lubis INNOVATIVE USE OF ARTIFICIAL INTELLIGENCE IN LEARNING ISLAMIC RELIGIOUS EDUCATION AT MAN 4 PREPARATION OF MEDAN CITY	Technology utilization (AI) in Islamic religious education is still relatively low in online madrasah education. This is due to the constraints of the quality of teachers and students in managing this Madrasah e-learning application, the lack of socialization of the use of e-learning, problematic internet, limited technology and inadequate communication tools and lack of control.
2024	Apriani Astuti Effectiveness of Using Artificial Intelligence (AI)	The increased accessibility of Artificial Intelligence (AI)
	Technology in Learning Islamic Religious Education (PAI) in High School	technology allows easy access to educational resources including course materials, instructional videos, and virtual tutors that can be used anywhere at any time.
2023	Fitri Sarinda Technology-based Islamic Religious Education (AI) Artificial Intelligence	IA (Artificial Intelligence) technology makes it easier for educators to deliver teaching materials and interesting methods, so as to make students not feel bored and bored, can improve the quality of the teaching and learning process that is more active and innovative, measure student understanding, and accelerate student understanding of Islamic religious education.

Based on table 1, the integration of AI in Islamic learning media development offers various benefits that can improve the quality of Islamic education. Although there are challenges in its implementation, with the right strategy, AI can be an effective tool to enrich learning experiences and shape students' characters. Further research and practical experience will help optimize the use of AI in Islamic religious education in the future.

By utilizing AI, PAI learning media can be developed to be more adaptive, interactive, and personalized, which not only improves the quality of education but also strengthens students' character building. However, it is important to overcome challenges such as data security, algorithm bias, and teacher readiness so that the implementation of AI in PAI can run optimally and provide maximum benefits for all parties involved.

Through AI (Artificial Intelligence) technology such as visual mentors, Voice Assistants such as Google Assistant, Siri, and Cortana and Presentation Translators and so on. Thus, the utilization of AI

(Artificial Intelligence) technology is very helpful in the development of the world of Islamic education.

Implications of AI in the Context of Islamic Education

Apart from the use of AI in education in general, in the context of Islamic education, AI can also have significant implications [14]. Some of these implications include: 1). More Affordable Religious Education The use of AI in Islamic religious learning can help make religious education more affordable. With online learning and AI platforms, access to religious education resources becomes easier, especially in hard-to-access regions. 2). More Personalized Learning: AI enables more personalized learning. Learners can have a customized learning plan according to their level of knowledge and needs in Islamic religion 3). Ethical Oversight. It is important to consider ethics in the use of AI in Islamic religious education [15]. There are challenges in ensuring that the use of AI is in line with Islamic values and ethics. Therefore, it needs strict supervision and regulation, 4). Religious Research. AI can also be used in religious research. Automated text analysis can help in understanding and interpreting sacred texts.

Table 2 Representation of Articles on the Implications of using AI in Islamic Religious Education

Year	Author and Article Title	Research Results
2024	Faishol Hakim Artificial Intelligence (AI) and its Impact on the Distortion of Islamic Education	The application of AI in Islamic education, with implications that include easier access, more personalized learning, ethical supervision, religious research, and Arabic language comprehension.
2024	Yana Yuhana The Impact of Using Artificial Intelligence in the Islamic Education Process	The use of AI technology in education has a significant impact in improving the quality and effectiveness of the learning process. However, moral education must remain at the core of teaching so that students can grow into good individuals and benefit society.
2023	Wiwin Rif'atul Fauziyat THE IMPACT OF USING ARTIFICIAL INTELLIGENCE (AI)	The use of AI brings great potential to improve efficiency and effectiveness in learning Islamic religious education.
	IN ISLAMIC RELIGIOUS EDUCATION LEARNING	But there are also negative impacts of using AI, one of which is causing students' dependence on technology.

Based on table 2, the implications of using AI in PAI learning have both positive and negative impacts. The positive impact of using AI in PAI learning is that it can increase efficiency and effectiveness in PAI learning, facilitate access to learning, and instill an independent nature in students.

However, there are also negative impacts of using AI in PAI learning, namely Dependence on Technology: can reduce direct interaction between teachers and students, which is important for building personal relationships and deepening spiritual understanding, Compatibility with Islamic Values: must pay attention to the values and ethics contained in the teachings of Islam itself. For example, it is important to ensure that information is accurate and in line with religious teachings.

Evaluation of the Use of AI in PAI Learning

Integrating AI in Islamic Religious Education is not an easy task; the challenges faced refer to several aspects, namely too much dependence on technology, the potential influence of foreign cultures and data insecurity [16]. Another aspect is the risk of reduced human interaction. The use of AI can pose a risk of reduced intimate human interaction, which can affect the development of student character. Of course, this disrupts the social fabric of society, as humans are social creatures. The negative influence on the development of empathy and social skills is a challenge that persists today [17]. The use of AI can have a negative influence on the development of empathy and social skills of students. The emergence of an imbalance in the use of technology. The use of AI can lead to an imbalance in the use of technology, which can affect the quality of education. Challenges in Teaching Islamic Values. AI may pose challenges in teaching Islamic values, such as tawhid, khalifah, gratitude, patience, and tawakal, as well as teaching how to use AI in accordance with Islamic principles.

Table 3 Representation of Articles on Evaluating the use of AI in Islamic Religious Education

Year	Author and Article Title	Research Results
2024	Ana Kurnia Sari Artificial Intelligence (AI) Ethics in Islamic Education: Overcoming the Challenge of Distortion and Misinterpretation	The use of AI in Islamic education offers great potential for the advancement and accessibility of religious education, but also poses the risk of distortion and misinterpretation of religious texts. Addressing this requires

Year	Author / Title	Description
		the development of culturally and religiously sensitive AI algorithms, as well as intensive education on digital literacy for educators and students.
2023	Murniyetti Teachers' Response to the Use of Artificial Intelligence in Learning Islamic Religious Education and Budi Pekerti (Case Study in Padang City)	Teachers' responses to the use of AI in PAI and BP learning in SMA Padang City varied, teachers with less than 5 years of experience (young teachers) showed a very positive and adaptive response to AI.
2023	Septian Aristya TRANSFORMATION OF ISLAMIC RELIGIOUS EDUCATION IN THE ERA OF SOCIETY 5.0: THE USE OF AI BY STUDENTS AT PTKIN EAST KALIMANTAN	This study describes the urgency of changing the paradigm of education, especially Islamic religious education in higher education, education is not only a process of transforming religious knowledge but also as a creator of students who are responsive and ready for technological developments and AI.
2023	Roychan Abdul Aziz CHALLENGES OF ISLAMIC CHARACTER EDUCATION IN THE ERA OF ARTIFICIAL INTELLIGENCE TECHNOLOGY	Character education is the main foundation in shaping students' personalities. To strengthen character education, it is important to integrate the roles of teachers, parents and other parties in order to adapt to the development of artificial intelligence. In this case, the implementation of a comprehensive learning approach has the potential to have a positive impact in the future.
2024	Singgih Aji Purnomo Islamic Education Management and AI: Opportunities	Too much dependence on technology, the potential influence of foreign cultures, data insecurity, the risk of reduced human interaction,
	and Challenges	negative influence on the development of empathy and social skills, the emergence of imbalances in the use of technology, challenges in teaching Islamic values, to the influence of AI on Islamic character education. In the face of these challenges, a holistic approach is needed in Islamic character education in the era of Artificial Intelligence, as well as the need for better awareness and supervision in the use of technology, especially for children.
2024	Muhammad Fahrur Rozi CHALLENGES AND OPPORTUNITIES FOR ISLAMIC RELIGIOUS EDUCATION LECTURERS IN INTEGRATING ARTIFICIAL INTELLIGENCE AT MADURA UNIVERSITY	Challenges in integrating artificial intelligence (AI) include ethics, cultural sensitivity, dependence on technology, and limited resources.
2024	Ahmad Choirun Najib CHALLENGES OF ISLAMIC RELIGIOUS EDUCATION TEACHERS IN THE MODERN ERA IN THE USE OF ARTIFICIAL INTELLIGENCE (AI)	Six types of PAI teachers' challenges in using AI are digital literacy problems, lack of infrastructure, lack of preparation, ethical problems, theological problems, and educational interaction problems. Therefore, PAI teachers are required to overcome these challenges, so that the use of AI really has a positive impact on PAI learning.

Based on Table 3, the evaluation of the use of AI in PAI learning has many challenges faced by both teachers and students. The use of AI in PAI learning offers good and great potential for the advancement and accessibility of religious education, and teachers' responses to the use of AI in PAI learning received positive reviews due to the convenience. However, the use of AI is also at risk of causing the risk of distortion

and misinterpretation of religious texts. as well as the emergence of an attitude of dependence on technology, the potential influence of foreign cultures, data insecurity, and the risk of reduced human interaction. Not only that, there are also many challenges for PAI teachers in integrating the use of AI.

As an evaluation to overcome these challenges, it is necessary to develop AI algorithms that are culturally and religiously sensitive, as well as intensive education on digital literacy for educators and students. Also, a holistic approach is needed in Islamic character education in the era of Artificial Intelligence, as well as the need for better awareness and supervision in the use of technology, especially for children.

IV. CONCLUSION

The use of Artificial Intelligent (AI) in learning Islamic Religious Education provides various benefits that can improve the quality of Islamic Religious Education. By using AI, learning media can be developed to be more creative, adaptive, innovative and interesting. However, behind its many benefits, the use of AI also has a negative impact, including the tendency and dependence of students in using technology, the use of AI is also at risk of causing distortion and misinterpretation of religious texts.

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Implementation of Learning Management Information System in Islamic Boarding Schools

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Abstract-This study analyzes the implementation of the Management Information System (SIM) in Islamic boarding schools, focusing on three main aspects: the components of SIM management, its implementation, and the benefits derived in the learning process. SIM aims to enhance the quality of educational services by utilizing information technology, as well as facilitating the management of academic data, attendance, class scheduling, and curriculum administration. In addition, SIM also serves to improve transparency and accountability, and supports more efficient data-driven decision-making. The implementation of SIM in pesantren has proven to improve operational efficiency, although challenges remain, such as limited human resources, technological infrastructure, and resistance to cultural changes. Several boarding schools, such as Pondok Pesantren Sunan Drajat and Lirboyo, have successfully integrated modern management models while maintaining certain traditional aspects. The use of SIM provides significant benefits, including more integrated data management, enhanced service quality for students and parents, and a reduction in administrative burdens. This research shows that SIM not only improves the quality of education but also facilitates better educational planning for the future. Therefore, the application of SIM in Islamic boarding schools has great potential to optimize educational and academic management, as well as support the improvement of educational quality in Islamic educational institutions.

Keywords-Management Information System (SIM)

I. INTRODUCTION

Implementation of learning management information system management in Islamic boarding schools is a very important strategic step in facing educational challenges in today's digital era. [1]. Islamic boarding schools, as educational institutions that have a vital role in character building and religious knowledge, need to adapt to technological developments to improve the quality of education provided. In this context, management information systems (MIS) can be an effective tool for managing various aspects of learning, from administration to evaluation of learning outcomes. [2].

Along with the advancement of information technology, many educational institutions have begun to implement information systems to facilitate data management and the learning process. [3]. Boarding schools, which often have limitations in terms of resources and infrastructure, can utilize SIM to improve operational efficiency. With an integrated system, boarding school managers can easily access and manage student data, curriculum, lesson schedules, and evaluation results. This not only saves time, but also reduces the possibility of errors in data management.

One of the main benefits of SIM implementation in boarding schools is its ability to support better decision making. [4]. With well-managed data, managers can analyze various aspects of education, such as student attendance rates, academic performance, and the effectiveness of teaching methods. This information is crucial for formulating the right policies to improve the quality of education. For example, if the data shows that students are having difficulties in certain subjects, managers can take steps to improve the curriculum or provide additional guidance.

In addition, the aftermath of the COVID-19 pandemic has accelerated the need for distance learning [5]. Many Islamic boarding schools have been forced to adapt to online learning methods to ensure educational continuity. In this context, SIM can facilitate the distance learning process by providing a *platform* that allows interaction between teachers and students virtually. With the right system, boarding school managers can ensure that students still get access to learning materials and can participate in class discussions despite not being in the same physical location.

SIM implementation can also increase parental involvement in the education process. [6]. With transparent access to information, parents can monitor their children's academic progress in real-time. [7]. This not only improves communication between schools and parents, but also encourages parents to be more actively involved in their children's education. Greater parental involvement can contribute to increased student motivation and achievement.

However, despite the many benefits offered by management information systems, their implementation in Islamic boarding schools is not without challenges. [8]. Limited technological infrastructure, lack of

training for managers and teachers, and resistance to change are some of the barriers that may be faced [9]. [9]. Therefore, it is important for boarding schools to plan and execute a thorough implementation strategy, including training for staff and provision of adequate infrastructure.

Overall, the implementation of learning management information systems in boarding schools is a very important step to improve the quality of education. By utilizing information technology, boarding schools can manage the learning process more efficiently, support better decision-making, and increase parental involvement. [10]. In facing the challenges of an ever-changing era, boarding schools that are able to adapt and integrate technology in education management will be better prepared to produce a generation that is qualified and ready to face the future.

II. METHOD

The systematic literature review (SLR) method is used in this study to obtain a description and data on the variables under study in an explicit, structured, and accountable manner, namely conducting a study of various reference works and previous studies that have similarities. This method aims to obtain a theoretical basis relevant to the problem being studied through a review of books or other sources. The main objective is to find a more in-depth discussion of a topic or issue that is in accordance with the topic discussed in the article.

The data sources in this study come from scientific papers, such as journal articles, books, notes, and various reports relevant to the problem to be solved. The literature review was carried out in stages 1) Classification and Determination of approach, 2) article search, 3) Article selection, 4) data analysis and interpretation, 5) draft article, and 6) dissemination of results. At the initial stage, the focus of the study was determined on the theme of Implementation of Tolerance Attitudes towards Religious Diversity which includes three things, namely implementation, challenges, innovation, and evaluation. [11].

In the implementation process, article searches were conducted through various sources such as Google Scholar, Sinta, and other sources, which resulted in 30 initial articles. These articles were then filtered based on the criteria of year of publication and indexation. After the screening and selection process, 15 articles were obtained which were used as literature review materials. These selected articles were further analyzed, and the data was interpreted to get an overview and conclusions on the themes discussed.

III. RESULTS AND DISCUSSION

The results and discussion of this study are based on the results of a systematic literature review with a focus on three main themes, namely: First, Components of SIM management in boarding schools. Second, SIM implementation in boarding schools. Third, the benefits of learning SIM management in boarding schools. The

following is an explanation of these three things: Components of SIM management in boarding schools.

The management information system (SIM) component of learning in Islamic boarding schools focuses on improving the quality of educational services through the use of information technology. SIM in boarding schools aims to manage data and information efficiently, support decision making, and improve the quality of learning. [12].

The management component of learning management in Islamic boarding schools focuses on improving the quality of educational services through the use of information technology. [13]. The existence of management in boarding schools aims to manage data and information efficiently, support decision making, and improve the quality of learning. In this case, the information system allows the management of various aspects of education, such as student attendance, class scheduling, grade management, and curriculum administration, in an integrated and automated manner [13]. [3]. With the use of appropriate technology for management in boarding schools, it can reduce the administrative burden and simplify the process of evaluating and monitoring learning. [14].

In addition, SIM also serves as a tool to increase transparency and accountability in education management. With an organized information system in place, boarding school managers can more easily access the data needed to make data-driven strategic decisions. This not only supports operational efficiency, but also helps in long-term education planning. With the integration of evolving technologies, SIM in boarding schools is expected to optimize the learning process and facilitate collaboration between managers, teachers, and students to achieve better educational goals.

Table 1. Comparison of SIM Management in Islamic Boarding Schools

Aspects	Sunan Drajat Islamic Boarding School	Lirboyo Islamic Boarding School
Processing Facilities	45 tools (17 manual, 6 machine)	Modern management model
Development Method	RAD, web-based	Local database integration
Main Focus	Improved service quality	Adaptation of modern learning models

In table 1. above it is stated that:

Technology Infrastructure: Pondok Pesantren use various information processing tools, including manual and machine tools, to support data management. For example, at Pondok Pesantren Sunan Drajat there are

45 information processing tools consisting of 17 manual tools and 6 manual machine tools.

System Development: The information systems developed are often web-based and use object modeling methods. The Rapid Application Development (RAD) approach is used to speed up the development process. It allows the integration of local databases to enhance the features of the system.

Implementation Strategy: The implementation of SIM in the management of education in boarding schools involves careful planning to improve the quality of services. [15]. This includes collecting and analyzing relevant data to support managerial decisions.

SIM management in boarding schools not only improves operational efficiency but also contributes to the development of a better quality of education.

Implementation of SIM in Islamic Boarding Schools

The implementation of learning management information system (SIM) in boarding schools aims to improve efficiency and effectiveness in education management. The research shows that the implementation of SIM in boarding schools can help in the management of academic data, facilitate access to information, and improve the quality of educational services.

Table 2. Implementation of SIM in Islamic Boarding Schools

Year	Author and Article Title	Research Results
2023	Krisna Erwintha Putra Implementation of Sim in Supporting Islamic Boarding School Learning during the Pandemic Period	Atlas App 3 factors are applied: SIM application, information management, learning SIM
2023	Maimunah Implementation of Academic Information Systems in Islamic Boarding Schools	TOGAF-ADM framework, blueprint Blueprint testing was conducted using FGDs with stakeholders
2024	Muchammad Ibnu Muzakir Implementation of Reward and Punishment in the Learning Management System at Pondok Pesantren Az-Zikra Bogor	Reward, Punishment The purpose and function of punishment implementation is in the form of warnings and advice, memorization of lessons and prayers of the Sunnah of the
		Prophet, summoning parents, notes on report cards and black lists for the heaviest offenders.
2020	Argiyan Dwi Pritama Web-based Information System for Az Zahra Al Gontory Modern Cottage Using Bootsrap	Bootstrap Website The website is implemented at the Az Zahra Islamic boarding school, namely to provide access to the community and prospective satri / pesantren quickly and easily.
2023	Ilyas Darmawan Utilization of Management Information Systems in Modern Islamic Boarding Schools	Youtobe portal website, faceebook, twitter Exploring boarding school information system activities

In table 2 it is explained that in the Klaten boarding school the implementation of its learning SIM uses the Atlas application with 3 factors that are carried out, namely: SIM application, Information Management and Learning SIM [16]. In Pondok Pesanren Riau, implementing SIM to help manage it is by developing enterprise architecture using the TOGAF ADM method which aims to create a blue print process that can produce business models, data architecture and technology architecture and proposals from technology for each modeling. [17]. The application of rewards and punishments carried out at Pesantren Az-Zikra Bogor greatly influences the behavior of students and functions in the form of warnings and advice, memorization of lessons and prayers of the Prophet's Sunnah prayers, summoning parents, notes on report cards and black lists for the heaviest offenders. [18]. Web-based Az Zahra Al Gontory Modern Cottage Information System is a system that makes it easier for the public in general and prospective students and parents of students in particular to get to know and know the cottage profile as a whole. [19]. The results of his research are as follows. (1) Implementation of media team activities as a forum for information systems (2) Web-based boarding school information systems and applications. This application consists of teacher attendance and teaching notes. [20].

Table 3. Challenges in SIM Implementation

Challenge	Description
Human Resources	Lack of training for staff in using the SIM.
Technology Infrastructure	Limited internet access and hardware in some pesantren.
Cultural Adaptation	Resistance to change from traditional methods to modern systems.

Some pesantren have successfully implemented SIM with positive results, such as at Pondok Pesantren Al-Azhaar, which showed improvements in the management of academic and administrative activities. In addition, research at Pondok Pesantren Lirboyo shows that despite maintaining the traditional model, they are open to more efficient modern management.

The implementation of SIM in boarding schools not only improves education management but also contributes to the overall development of education quality.

Benefits of Management Information Systems in Islamic Boarding Schools

1. Data Management: SIM enables integrated management of student data, curriculum, and academic activities, making decision-making easier.
2. Service Improvement: With a fast and accurate system, SIM supports better services to students and parents.
3. Operational Efficiency: SIM implementation can reduce administrative burden and increase focus on learning activities.

Management Information System (MIS) in Islamic boarding schools provides many great benefits in improving the quality of management and operations of the institution. One of the main benefits of SIM is its ability to manage data in an integrated manner, including student data, curriculum, and academic activities. With this system, the decision-making process becomes faster and more precise. In addition, SIM also contributes to improving the quality of services to students and parents. With the efficiency of the existing system, information regarding academic activities and various pesantren activities can be delivered more quickly and accurately.

IV. CONCLUSION

Based on the findings in the research on the implementation of management information systems (SIM) in Islamic boarding schools, it can be concluded that SIM has a very important role in improving the efficiency and quality of education management in this Islamic education institution. This study identified three main themes, namely the components of SIM management, the implementation of SIM, and the benefits derived from the use of SIM, which can be summarized as follows:

SIM in Islamic boarding schools is designed to advance the quality of education services by utilizing information technology. The system facilitates the integrated management of academic data, attendance, class scheduling, and curriculum administration. In addition, the SIM also helps improve transparency and accountability and supports more precise and efficient data-based decision-making.

The implementation of SIM in Islamic boarding schools has proven to be effective in assisting academic data management, accelerating access to information, and improving the quality of education services. Some pesantren, such as Pondok Pesantren Sunan Drajat and Lirboyo, have successfully integrated modern management systems, although they still face various challenges, such as limited human resources, technological infrastructure, and resistance to cultural change. Nevertheless, the successful implementation of SIM has had a positive impact on operational efficiency and education management.

The use of SIM provides many benefits, including more integrated data management, improved services to students and parents, and reduced administrative burden. It also speeds up the decision-making process and improves operational efficiency, allowing greater focus on learning activities and developing the quality of education.

Overall, SIM contributes significantly to the advancement of education in pesantren by simplifying management, improving service quality, and supporting better education planning in the future. Despite challenges in its implementation, SIM shows great potential in optimizing educational and academic management, which in turn plays a role in improving the quality of education in pesantren.

especially in the field of education management in Islamic boarding schools, and become a useful reference for interested parties.

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Integration of Islamic Values and Ecological Awareness in Pesantren

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Abstract-This research analyzes the literature on Pesantren in Indonesia which has a strategic role in shaping the character of the younger generation, especially in the context of ecological awareness. The research used a Systematic Literature Review approach with the stages of determining themes, searching, selecting literature, analyzing and interpreting, preparing drafts, and disseminating results. The focus of the study is on 3 things, namely effectiveness, implementation, and challenges. The results of this study show that; In the midst of an increasingly urgent environmental crisis, pesantren can be at the forefront of instilling Islamic values that support environmental conservation. This research uses a qualitative method with a literature study approach to explore the integration of Islamic values and ecological awareness in pesantren. The results of the study show that although many pesantren have not optimized environmental education in their curriculum, there is great potential to develop Islamic value-based programs that can increase the ecological awareness of santri. However, challenges such as diverse understanding, limited resources, and traditional customs need to be overcome. With collaboration between pesantren, the community, and the government, this integration can create a generation that is not only faithful, but also concerned about the environment, so that pesantren can function as effective agents of change.

Keywords-integration, ecological, pesantren

I. INTRODUCTION

Pesantren, as Islamic-based educational institutions in Indonesia, have an important role in shaping the character of the younger generation. In the midst of an increasingly worrying global environmental crisis, pesantren can be at the forefront of efforts to instill ecological awareness based on Islamic values. The current condition of the environmental crisis is very urgent, as evidenced by data showing that Indonesia contributes around 56.6 million tons of waste per year, with 15.3 million tons of them in the form of plastic waste which has a negative impact on marine and terrestrial ecosystems. [1].

Islam, with its principle of khalifah fil ardh (God's representative on earth), teaches that humans have a great responsibility to preserve the environment. This principle is in line with the teaching of balance (mizan) and the prohibition of doing damage on earth (fasad). Therefore, the integration of Islamic values in ecological awareness in pesantren is a relevant step to support sustainable environmental education.

Despite the great potential, several studies have shown that many pesantren are still not optimal in integrating environmental education in their curriculum. That less than 30% of pesantren in West Java have special programs related to environmental management, and most are limited to sporadic activities such as community service without sustainable implementation. [2]. This shows the need to develop a more structured approach in teaching ecological awareness, which is not only limited to daily activities, but also integrated in formal learning that supports the strengthening of Islamic values related to the environment.

It also underlines that environmental awareness among santri and ustaz is still low, largely due to the lack of access to information and the lack of training programs on conservation. [3]. In fact, pesantrens have great potential to become ecology-based learning centers through an Islamic approach that not only educates students, but also sets a real example to the surrounding community.

Thus, pesantren need to adopt a comprehensive approach that integrates Islamic values with environmental education to support the ecological awareness of santri and the surrounding environment. This will not only support environmental conservation, but also strengthen the role of pesantren as adaptive and relevant educational institutions in this era of global environmental crisis.

II. METHOD

Systematic Literature Review (SLR) is used in this study with the aim of obtaining a description and data

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about a variable that is studied explicitly, accountable and can be accounted for. [4].

The data sources in this research come from scientific papers, such as articles, journals, books, notes, and various reports relevant to the problem to be solved.

The literature review was carried out in stages 1) Classification and Determination of approaches, 2) Article search, 3) Article selection, 4) Data analysis and interpretation, 5) Draft article, and 6) Dissemination of results. In the initial stage, it was determined that the focus of the study on the theme of Integration of Islamic Values and Ecological Awareness in Pesantren included three things, namely effectiveness, implementation, and challenges.

The results of the article search on the website section (google scholar, sinta, and other sources) obtained 24 articles which were further selected based on the criteria of publication year and article indexing. The results of screening and selection obtained 15 articles that became the material for literature review. The articles that have been selected are followed up by analyzing and interpreting the data so that a conclusion is obtained about the theme studied.

III. RESULTS AND DISCUSSION

The results and discussion of this research are based on the results of a systematic literature review with a focus on three themes, namely, the effectiveness of ecological value integration in the formation of santri character, the implementation of Islamic value-based environmental programs in pesantren and the challenges of integrating Islamic values and ecological awareness in pesantren.

Here's an explanation of these three things:

Table 1. Effectiveness of Ecological Value Integration in Santri Character Building

Year	Author and Article Title	Research Results
2022	Khotimah Fauziah, AbdulAziz The effectiveness of dormitory management communication patterns in shaping the personality of female santri at the amirussalam sambirejo bangorejo Banyuwangi Islamic boarding school.	Students' communication patterns can be seen from how caregivers instill religious values.
2019	Rudi Hadi Kusuma Effectiveness of a pesantren values-based group counseling model to improve students' self-regulation in an east Kalimantan boarding school	Differences in self-improvement are caused by two factors: external and internal factors.
2024	Muh. Mujaddidi Ainul	Environmental

Year	Author and Article Title	Research Results
	Yakin, Usman Usman, Salimul Jihad Improving the character of environmental care in salaparang boarding school kediri west lombok	care character in pesantren, using plant names as dormitory names
2023	Mukhlis The main components of the Islamic education curriculum in the pesantren environment as a form of character and religion of students	The pesantren component is key in forming students who are noble, and able to contribute to society.
2022	Debi fajri habibi, Ayi yusri ahmad tirmidzi Boarding school and development of environmental awareness: Climate change mitigation efforts	Pesantren eco-education is a form of environmental education carried out in pesantren.

Based on table 1, the communication pattern in the pondok pesatren can be seen from how a leader and board of the cottage in instilling religious values for his students. Understanding of patterns is a form, example, and example to exemplify something real. In other words, a caregiver and boarding school administrator is something that is very influential for the continuity of the personality of students [5].

From the researcher's analysis of the effectiveness of learning in Darunnajah boarding school is caused by several factors, one of which is the presence of senior santri. These senior santri are able to provide guidance not only in the educational aspect but in all aspects of life in the boarding school.

وَمَا كَانَ الْمُؤْمِنُوْنَ لِيَنْفِرُوْا كَاۤفَّةًۗ فَلَوْلَا نَفَرَ مِنْ كُلِّ فِرْقَةٍ مِّنْهُمْ طَاۤىِٕفَةٌ لِّيَتَفَقَّهُوْا فِى الدِّيْنِ وَلِيُنْذِرُوْا قَوْمَهُمْ اِذَا رَجَعُوْٓا اِلَيْهِمْ لَعَلَّهُمْ يَحْذَرُوْنَ

Meaning: it is not proper for the believers to go all out (to war). why not go from each group among them a few men to deepen their knowledge of religion and to warn their people when they return to them, so that they may protect themselves. (At-taubah: 122)

Thus the effectiveness of learning in Darunnajah Islamic boarding school both from the results of data processing and observation results is categorized as quite good.

Based on the implementation process of the counseling model, differences in the improvement of self-regulation of each individual are caused by two factors: external factors and internal factors. [6]. External factors affect self-regulation in at least two ways. First, external factors help assess how we behave. Environmental factors and personal influences interact and shape individual standards for evaluation. Second, external factors influence one's ability to self-regulate by providing support. External rewards are

also needed to help individuals solve problems encountered. Every individual needs external encouragement that is more than just self-satisfaction.

There are unique things in the pesantren, one of which is that the names of the dormitories are taken from the names of plants, this not only shows love for the environment, but also becomes a means of teaching the values of the importance of protecting the environment. For example, bawak putik dormitory means "under the banana", bawak paok dormitory means "under the mango", and bawak sukun dormitory means "under the breadfruit". The three names are the names of plants that grow in each dormitory and are always maintained so that they continue to grow. The names are not only meant to make the place easier to recognize, but also to show the residents' love for the plants that provide protection in the place where they live, which is the gift of God.

Pesantren as an Islamic educational institution has key components in its curriculum, the main focus of the pesantren curriculum is the Quran and hadith which provide a strong foundation. The Fiqh and Aqidah components provide the foundation of Islamic law and basic beliefs, while general subjects such as math and science are taught with an Islamic perspective to combine religious knowledge with the modern world. [7].

Character building involves improving moral and ethical values, as well as learning practical skills such as agriculture or crafts. Traditional teaching such as sorogan and recitation of the yellow book is very important. In addition, attention is also paid to the psychological aspects and mental well-being of learners. Pesantren also encourage active participation in religious activities, teach Islamic history, and involve teachers as moral examples. Assessment of teaching methods, support to the local community, and the application of entrepreneurial values are also very important. [8].

As an Islamic educational institution, pesantren has an important role as a center for Islamic education and development. Education in pesantren aims to educate the nation's successors by shaping intellectual intelligence, morals, character, and progressive-revolutionary character towards environmental issues. One way the government can maximize the potential of pesantren in environmental preservation is by implementing the ecopesantren program.

Ecopesantren is a form of effort from Islamic educational institutions that are known as "environmentally friendly" and play a role in protecting nature and protecting the environment. [9]. Islamic boarding schools do not only focus on the religious field, but also must play a role as a social institution that participates in overcoming the surrounding problems, including environmental awareness. This means that ecopesantren requires a transformation of the function of pesantren, which is not only a religious education, but also a pioneer of environmental awareness in pesantren and the wider community.

Implementation of Islamic value-based environmental programs in pesantren

Nature conservation efforts carried out by pesantren will be very helpful in developing understanding and increasing public awareness related to the environment. This program was developed with a method of cooperation between various parties who have the same interests. The method used involves socialization and participation of the pesantren community together with related institutions. The steps to involve the community began with conducting field research related to the economy, social, and culture of the pesantren as well as environmental management. [10]. The next step is to share knowledge by transferring knowledge such as how to implement the green Pesantren concept through waste bank management, hygiene and health campaigns, land exploration for productive and medical plants, and green curriculum programs.

Islam not only teaches human relations with the Creator Allah SWT (hablum minallah) and human relations with fellow humans (hablum minannas), but also human relations with nature or the environment (hablum min 'alam) by prospering and preventing damage to the earth. [11].

Implementing environmental values in pesantren is important to increase the ecological awareness of students, familiarize them with environmentally friendly behavior, and integrate Islamic teachings with responsibility for nature. In this way, pesantren can be a place where students learn to respect and preserve the environment as part of practicing Islamic values.

The role of pesantren in shaping the character of students is very important. Pesantren is not only a place to seek religious knowledge, but as an institution responsible for character building, the role of pesantren in shaping the character of students:

1. Habituation of moral values: Pesantren is very concerned about the character building of students by teaching and applying Islamic moral values in daily life. The students are invited to understand and practice Islamic teachings on honesty, patience, compassion, and justice through various activities, such as worship, religious studies, and service to others.
2. Habituation of ethics and adab: Pesantren that educate students about Islamic sacred texts also make ethics and manners in social interactions a priority. Santris learn to respect others, appreciate differences, and behave politely in various situations, both in pesantren and in the community.
3. Social Skills Development: Pesantren is a place where students can improve their social skills, such as leadership, cooperation, and empathy. By doing group activities such as gotong-royong, discussions, and social activities, santri learn how to communicate, cooperate, and care about the needs of others.
4. Strengthening Islamic Identity: Pesantren helps strengthen santri's Islamic identity through consistent and in-depth practice of religious

teachings. By teaching compassion and love for Islam, pesantren help santri to understand and appreciate Islamic values in life so that they can become individuals who are strong in faith and responsible in practicing religious teachings. The role of pesantren in shaping the character of santri does not only focus on religion, but also includes morals, ethics, social, and Islamic identity.

Supporters of the process of character education based on pesantren traditions in special religious program students are the pesantren environment, dormitories, ustadz-ustadzah, parents, and the intention of the students themselves. [12]. What is meant here is that the pesantren environment is the center of all teaching and learning activities of the students.

The Challenge of Integrating Islamic Values and Ecological Awareness in Pesantren

The integration of Islamic values and ecological awareness in pesantren is an important effort to create a generation that not only believes, but also cares about the environment. However, there are several challenges that need to be faced in this process.

1. Diverse Understanding of Islamic Values
   a. Different Interpretations
      There are variations in the understanding and interpretation of Islamic values among pesantren. Some pesantren may focus more on the ritual and worship aspects, while others may be more open to social and environmental issues. [13].
2. Lack of Emphasis on Ecology
   Many pesantren curricula have not included in-depth environmental education, so students lack an understanding of the importance of protecting the environment from an Islamic perspective. [14].
3. Limited Resources
   a. Facilities and Infrastructure
      Many pesantren have limited facilities and infrastructure to implement environmentally friendly practices, such as waste management, renewable energy use, and sustainable agriculture.
   b. Human Resources
      Limited knowledge and skills among teachers and students regarding environmental issues may hinder the integration of ecological values in education. [15].
4. Culture and Customs
   a. Traditional Habits
      Some traditional habits that are not environmentally friendly are still practiced in pesantren, such as the use of single-use plastics and poor waste management.
   b. Resistance to Change
      There is a tendency to maintain old ways of environmental management, which can hinder the adoption of more sustainable practices.

5. Community Engagement
   a. Lack of Collaboration
      The integration of Islamic values and ecological awareness requires collaboration between pesantren and local communities. However, there is often a lack of communication and cooperation between pesantren and the surrounding community.
   b. Community Role
      The surrounding community also needs to be involved in environmental programs held by pesantren so that the impact is wider and more sustainable.
6. Government Policy and Support
   a. Unfavorable Policies
      Government policies that are less supportive of environmental initiatives in pesantren can be a barrier. Regulations are needed that encourage pesantren to integrate environmental education in their curriculum.
   b. Financial Support
      Limited funding for environmental programs in pesantren is also a challenge. Financial support from the government and private institutions is needed to implement environmentally friendly initiatives.

The integration of Islamic values and ecological awareness in pesantren faces various challenges, ranging from diverse understandings, limited resources, to traditional habits that are difficult to change. To overcome these challenges, collaborative efforts between pesantren, communities, and the government are needed, as well as an emphasis on environmental education based on Islamic values. Thus, pesantren can act as agents of change in creating ecological awareness in the community.

IV. CONCLUSION

The integration of Islamic values and ecological awareness in pesantren is an important step in creating a generation that cares about the environment. By adopting Islamic principles that respect nature and create harmony between humans and the environment, pesantren can serve as effective agents of change. Environmental education based on Islamic values not only increases students' awareness of the importance of maintaining the ecosystem, but also encourages them to act sustainably. Through this approach, pesantren not only educate students in spiritual aspects, but also prepare them to become responsible leaders in protecting the earth and its natural resources. Thus, this integration is key in realizing a better and sustainable future.

hopefully this article can provide benefits and inspiration for all of us.

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VanMoT Development in Physics Learning

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Abstract--- The development research aims to produce a product in the form of an animaker video with a treffinger learning model (VanMoT) in physics learning, as well as to find out the response of teachers and students to the developed animaker video. The type of research carried out is research & development with 3D models adapted from 4D. The subject of this study is class XI students in one of the madrasas in Garut Regency, lecturers to find out the feasibility of the learning media developed. The types of data produced are qualitative and quantitative data that are analyzed with the guidelines of assessment criteria to determine product quality and the data collection techniques carried out in this research are qualitative and quantitative data collection techniques. Data collection techniques are in the form of interviews and questionnaires. Animaker videos with the Treffinger learning model (VanMoT) in physics learning received good scores with an overall percentage result of 80% in the feasible category. The response from students and teachers to the Animaker Video with the Treffinger learning model (VanMoT) in physics learning received a very good score with an overall percentage of 83.06667%. Therefore, the Animaker Video with the Treffinger learning model (VanMoT) is suitable for use in physics learning, especially physics learning.

Keywords: animaker video, treffinger learning model and physics learning

I. INTRODUCTION

The development of the times in the renewal of the world of education, this concerns improving the quality of the learning process, which also includes the use of information and communication technology in learning so that the quality of learning is achieved optimally.

ICT was originally a tool to convey information messages and was widely used in various fields. After extensive research, it is clear that the media has a wide range of benefits and can be used as a means of delivering learning materials. Advances in science and technology are rapidly having an impact on life, including the world of education [1]. Where today's education uses a lot of ICT in learning, one of which is learning with videos.

Video learning is the delivery of knowledge and skills using video that contains at least two elements: images and audio. Learning with videos also has benefits such as clearer and more interesting learning, a more interactive learning process, and more time-saving and energy-saving

to support teachers in a more positive and productive direction [2]. Based on the results of interviews that have been conducted at one of the aliyah madrasas in Garut regency, during the learning process, teachers still use conventional media due to a lack of understanding of what media must be used for students so that learning does not look monotonous. And teachers do not use any media in learning, only using package books and LKS books, due to the limitations of the media used. Based on the results of the interview, teachers must be more creative and understand how to make learning not monotonous. One of them is the use of learning media.

Learning media is a learning tool that provides knowledge and information so that learning becomes effective and efficient. Learning media is also a medium that can help make it easier to solve problems because many learning media today are equipped with various software programs that are growing rapidly [3] [4]. One of the software programs that helps make classroom learning more interesting and varied is Animaker.

Animaker is an animation video creation application in which you can create innovative and interesting videos and there are features used such as beautifying videos, characters, backgrounds, text, audio, dubbing and transitions [5][6]. In addition to the development of varied learning media, a learning model is also needed that emphasizes students to think creatively in learning, one of which is the treffinger learning model.

The Treffinger learning model is a model that encourages students to think creatively when facing problems [7] and is also a model that is development-oriented and emphasizes the process aspect The

benefits obtained from applying the treffiger learning model include giving a problem, making students active during learning, developing students' thinking skills because they are presented with problems at the beginning of learning and giving flexibility to Students to find their own solutions, hypotheses and experiments to solve problems, so that students can apply the knowledge they already have into new situations [8].

Based on the background given, although animaker videos and treffinger learning models have their own advantages, no one has integrated animaker videos with treffinger learning models in physics learning. Therefore, this researcher conducted a study entitled "Development of Animaker Videos with Treffinger Learning Model on Physics Learning".

II. METHOD

This study uses R&D (Research and Development) research with a mixed method. According to Sugiono, the Mixed Method is a research method between qualitative and quantitative methods to be used together in research activities, so that more comprehensive data is obtained, this mixed method refers to the 3D development method which is reduced from the 4D method proposed by Thiagarajan (1974). The 3D stages are Define (needs analysis), Design (Initial design of media production), and Development (Validation, revision). The research population in this study is all class XI students totaling 141 people in one of the Aliyah madrasas in Garut district. The sample taken was 1 class with a total of 23 students. The type of data used is in the form of qualitative and quantitative data, and the resources are primary data, namely physics teachers, and secondary data, namely validation sheets. Data collection techniques in the form of interviews, questionnaires (questionnaires of teacher and student responses).

III. RESULTS AND DISCUSSION

A. Analyze the results data
Define

At this stage, the researcher conducts a needs analysis (Define) by conducting a literature study, namely in the form of a journal study and a preliminary study in the form of an interview. Literature studies that have been carried out from several journals state that the learning media carried out so far by educators is still convertive, this is supported by the lesson plans that have been used so far by referring to the curriculum used. Learning media makes learning look monotonous and in this case, students' understanding of concepts and creative ways of thinking is lacking, especially in abstract learning such as physics lessons.

In the preliminary study, the researcher made observations in the form of interviews that referred to the interview guidelines. Interviews were conducted with one of the teachers (educators) and several students at the research site. This interview was conducted with the aim of obtaining information about how teachers and students responded to the media used during learning, the results of the teacher's observation can be concluded as follows: Based on the results of interviews that have been conducted in one of the Madrasah aliyah in Garut district, during the learning process teachers still use conventional media due to a lack of understanding of what media should be used for students so that learning does not look monotonous. And teachers do not use any media in learning, only using package books and LKS books, due to the limitations of the media used. In this madrasah school, they also do not use any videos because the teachers in the madrasah are mostly old so they do not understand technology such as videos. The obstacles found based on the results of the observations made are that students find it difficult to understand the material delivered during learning, especially abstract learning because the teacher only explains without giving real examples or related to current phenomena or events, if the media used can attract their attention more so that they are more focused on carrying out learning, lack of learning media in accordance with the needs of students.
Desain

At this stage, the design of making an animaker video with a treffinger learning model was carried out. The results of the product are presented in the form of videos and media developed containing temperature and heat material for class XI. This media has several primes, namely titles, learning objectives, learning outcomes, stages of the Treffinger learning model and closing.
Development Stage

At this stage, the author made improvements to the Animaker video with the Treffinger learning model that was developed, at this stage product feasibility validation, instrument validation, teacher response questionnaire and student response to the video developed
1. Product validation results

Assessment by validators is the process of providing score assessments and providing comments on the validation sheet of learning media in the form of video assessments, which plays a role in improving the quality of the education system by providing feedback which builds up to researchers. The researcher validates the feasibility to several experts who are experts in their fields to find out whether it is feasible or not. The following are the eligibility results as follows.

Table 1. Content eligibility results

Interpretation	∑S	n(c-1)	V	%	Category
Content eligibility					
1	17	20	0,85	85	Very Worthy
2	17	20	0,85	85	Very Worthy
3	17	20	0,85	85	Very Worthy
4	15	20	0,75	75	Worthy
5	14	20	0,7	75	Worthy
6	16	20	0,8	80	Worthy
7	14	20	0,7	70	Worthy
8	14	20	0,7	70	Worthy
Average				78,125	Worthy

In accordance with table 1 above, it shows that the validation results from the validator team include the feasibility aspect of the content with 8 statements obtained, the average score of 78.1% is in the feasible category [9].

Table 2. Media eligibility results

Interpretation	∑S	n(c-1)	V	%	Category
Content eligibility					
1	18	20	0,9	90	Very Worthy
2	17	20	0,85	85	Very Worthy
3	18	20	0,9	90	Very Worthy
4	16	20	0,8	80	Very Worthy
5	15	20	0,75	75	Worthy
6	15	20	0,75	75	Worthy
7	13	20	0,65	65	Worthy
8	16	20	0,8	80	Worthy
9	15	20	0,75	75	Worthy
Average				79,4	Worthy

In accordance with table 2 above, it shows that the validation results from the validator team include the feasibility aspect of the content with 9 statements obtained, with an average score of 79.4% in the feasible category [9].

Tabel 3. Language Eligibility result

Interpretation	∑S	n(c-1)	V	%	Category
Language Eligibility					
1.	17	20	0,85	85	Very worthy
2.	18	20	0,9	90	Very worthy
3.	17	20	0,85	85	Very worthy
Overall Average				80	worthy

In accordance with table 3 above, it shows that the validation results of the validator team include the feasibility aspect of the content with 3 statements obtained with an average score of 86.7% in the feasible category [9].

Based on some of the validation results above, there are several revisions from all validators, the validation is

Based on the first validator, the lack of media presented can improve problem solving and the media presented can increase students' creative thinking in concluding the material, in this case the researcher makes improvements by improving the problems presented so that they can increase creative thinking in concluding material and solving problems. Based on the second validator, in the video, the quality of the displayed video was corrected and the sound in the video was amplified because it was too small. In this case, the researcher made improvements by clarifying the video quality and strengthening or adding sound video to the video.
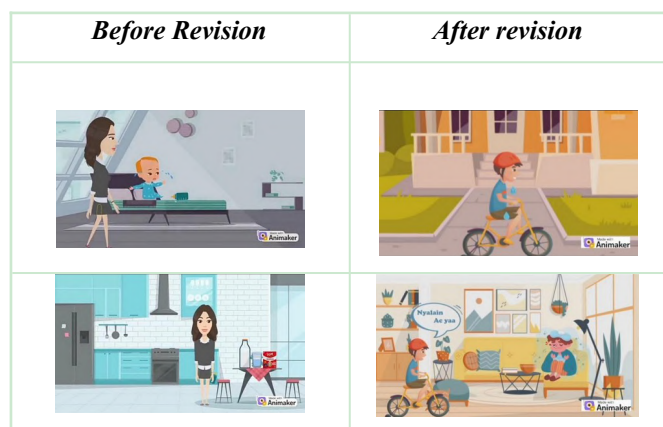
Tabel 4. Revisi pertama

Before Revision	After Revision

Tabel 5. Second revision
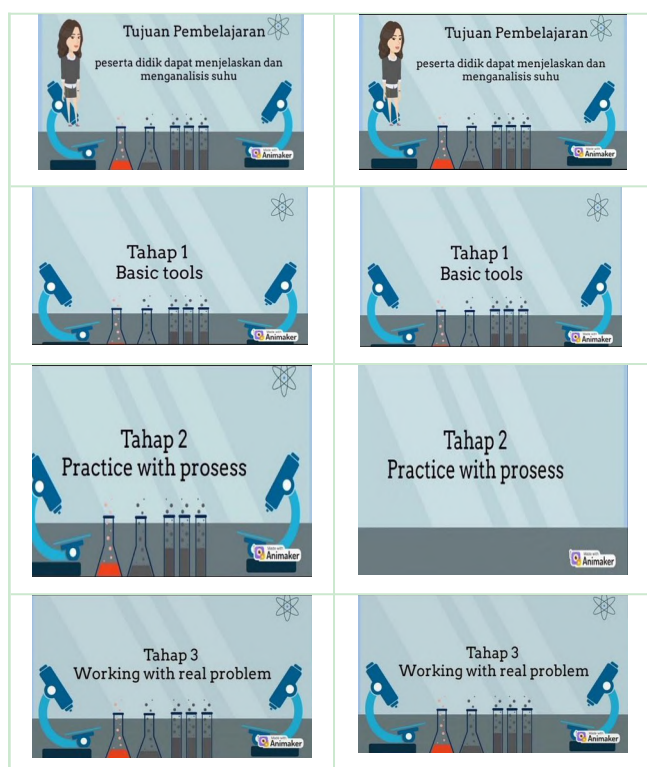
Before Revision	After revision

From several feasibility hadils, it can be concluded that the overall result of the validator was 80% with the feasible category. So the Animaker video with the Treffinger learning model is worth testing and using to students with some of the revisions or improvements above.

2. Instrument validation analysis

Instruments are tools that are selected and used by researchers in their data collection activities to organize and facilitate their data collection activities more [10]. An instrument that cannot be used directly must first be checked for its validity [11]. Therefore, a validation test of the instrument in the form of a questionnaire was carried out as many as 3 validators and 9 statements.

Table 6. Instrument Validation Results

Interpretation	Persentase	Category
1.	84%	Very Good
2.	84%	Very Good
3.	84%	Very Good
4.	78%	Good
6.	82%	Very Good
7.	78%	Good
8.	92%	Very Good
9.	78%	Good
10.	84%	Very Good
11.	90%	Very Good
12.	90%	Very Good
13.	80%	Very Good
14.	80%	Very Good
15.	84 %	Very Good
Average	83,1%	Very Good
Interpretation	**Persentase**	**Category**

The table above shows that of all the statements related to the validation of the instrument reviewed from the 3 intended reviews, namely content, construction and language. The validation statements of this instrument received an average of 86% with the feasible category according to [12]. This validation process is carried out once, because in the validation process the results are not revised, and there is no comment at all, meaning that the instrument made is suitable for use.

3. Results of teacher and student response questionnaires

Dalam mendapatkan data yang akurat terkait student response and teacher response. The questionnaire given has gone through a validation process. The validation aims to ensure that the validated questionnaire is a legitimate and reliable tool to measure their views. This questionnaire was carried out with 10 people responding to teachers and 23 people for students. The following are the results of the questionnaire of teacher and student responses

1. Results of the teacher's response

The results of the teacher's response are as follows

Table 7. Results of the teacher's response

Interpretation	Persentase	Interprestasi
1.	80%	Worthy
2.	80%	Worthy
3.	87%	Very Worthy
4.	87%	Very Worthy

Interpretation	Persentase	Interprestasi
5.	73%	*Worthy*
6.	80%	*Worthy*
7.	93%	*Very Worthy*
8.	100%	*Very Worthy*
9.	93%	*Very Worthy*
Average	*86%*	*Very Worthy*

Based on table 7 above of all statements related to teachers' responses to learning videos, there are 15 statements with each having an answer option. Overall, the average was 83.1% with the category of very good according to [13].

The teacher's response was several comments from several respondents to the Animaker video that was made, here is a description of the comments of each respondent

The first comment, the whole is good, but for the narrator's voice, the volume is quite small, my suggestion is that the volume can be enlarged again and for animation it is good. The second comment, the animation video should not only have the image displayed but there must be clear animation such as a moving image or something else. The third comment, the media used is good. Fourth comment, for the video transition, it can be changed to the right so that students can see clearly.

Based on the results of the teacher's response and suggestions, the development of the Animaker video with the Treffinger learning model has been very good and several comments were made to improve the video developed by the next researcher.

2. Results of student responses

The following are the results of the students' responses as follows

1. Satisfaction Results Table Satisfaction Results Table

Table 8 satisfaction results

Interpretation	Persentase	Categori
1	86,09%	Very Good
2	80,87%	Very Good
Average	**83,48%**	Very Good

From table 8 above, it shows that the satisfaction of students with the animated video given is 83.48% in the very good category, meaning that students are very satisfied with the video given. It is also seen directly at the time of the research that students feel satisfied when they see the learning videos given, but it is also seen that there are some students who are not satisfied with the videos provided because the students are less interested if the material is given through videos, the students are interested in learning if the material is given directly by the teacher or in conventional form and there are also some students who are interested in learning by reading books.

2. Comprehension table

Table 9 Results of Understanding

Interpretation	persentase	Categori
1	89,57%	Very Good
2	85,22%	Very Good
3	86,96%	Very Good
Average	87,25%	Very Good

The table above shows that students' understanding of the animated video received a score of 87.2% in the very good category, meaning that students understood the material provided through the video. It is also seen that at the time of the research students understand the learning material by using the animated videos provided but there are some who do not understand it, the students always ask so they have to explain again, the students may not watch the video seriously or the students do not understand the material by watching the video and understand the material must be by conventional methods in lectures, There are also some students who do not understand the material by watching videos they understand the material by reading books. It was also seen at the time of the study that students were indeed good at understanding the material using the videos provided.

3. Attraction table

Table 10 Results of Interest

Interpretation	*persentase*	*Categori*
1	*89,57%*	*Very Good*
2	*85,22%*	*Very Good*
3	*86,96%*	*Very Good*
Average	*87,25%*	*Very Good*

The table above shows that the results of the student response questionnaire in the interest category received a high score of 84% with the very good category. Seen directly at the time of the research, students were interested in seeing the video they were given, they felt happy with the video, but there were some students who were less interested in the video given for the reason that it was not interesting and less interested if learning using video because each student was different in interest.

4. Clarity table

Tabel 11. Kejelasan

Interpretation	Persentase	Categori
1	85,22%	Very Good
2	80%	Very Good
Average	**82,61%**	**Very Good**

The table above shows that the clarity of the animated video is very clear and gets a result of 82.6% of the very good category. It was also seen that during the research the students felt clear about the use and display of the video presented, the researcher also asked all students during the study about the clarity of the video and the students' responses simultaneously stated that the video presented was very clear. There may be some students who are lacking in responding to videos or can be called slow in understanding.

So it can be concluded that students feel satisfied, clear, understand and are interested in the animated videos provided even though there are some students who are not satisfied, lack understanding, lack interest and lack clarity on the learning videos, because each student is different in understanding the material at the time of learning, some students understand it by reading and some also understand it by way of lecture methods.

V. CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that the video animaker with the Treffinger learning model (VanMoT) in physics learning is as follows.

Animaker videos with the Treffinger learning model (VanMoT) in physics learning received good scores with an overall percentage result of 80% in the feasible category. Responses from students and teachers to Animaker videos with learning models Treffinger (VanMoT) in physics learning received very good scores with an overall percentage of 83.06667%. Therefore, the Animaker Video with the Treffinger learning model (VanMoT) is suitable for use in physics learning, especially physics learning.

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Literature Study: Project Based Learning (PjBL) in the Constructivism Paradigm

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Abstract— This research aims to identify the alignment of the Project-based learning model in the constructivism paradigm. The research method used is a literature study, which involves collecting, analyzing and synthesizing from various relevant literature sources, such as scientific journals, books and other academic publications. Constructivism and Project-based learning (PjBL) are closely related as both support active, collaborative and experiential learning. Constructivism is a learning theory that states that individuals construct knowledge through experience and interaction with their environment.

Keywords—Project Based Learning, Constructivism Paradigm, Literatur study

I. INTRODUCTION

In the era of rapid technology and globalization, education at the primary level is faced with the desire for students to be equipped with the skills needed to face future challenges. These skills include critical thinking, creativity, collaboration and communication skills [1]. Primary education is a very important period in shaping character and sustainable basic skills. So the selection of methods in learning becomes very important in improving critical thinking, creativity, collaboration and communication skills. The Project Based Learning (PjBL) model is one method with a learning process that emphasizes contextual and meaningful, which provides opportunities for students to learn through projects by involving critical thinking, problem solving and cooperation to make learning more effective and meaningful [2].

Constructivism is one of the theories that support the educational process. The view of constructivism on the development of student knowledge is an active subject in forming cognitive structures through its interaction with the environment [3]. Constructivism is an approach that motivates students to be more active and involved in learning by developing skills and knowledge that are refined or modified by the teacher by designing various kinds of tasks, questions or even other actions that can arouse students' curiosity in carrying out the tasks they must complete [4].

Based on existing theories, it is believed that constructivism has a role in the development and use of the Project Based Learning method. Constructivism emphasizes independence, in accordance with PjBL which provides opportunities for students to engage in planned activities. Independence in PjBL can be seen when students carry out practical activities in accordance with the planned product. The benefits obtained from this process of constructivism and PjBL are concrete experiences between teachers and students when carrying out the project [5]. Although this method has many benefits, its application at the basic education level, often faces obstacles, such as teacher skills in facilitating PjBL according to the principles of constructivism and challenges in creating a learning environment that supports projects.

Previous research on PjBL from the perspective of the constructivism paradigm shows that PjBL provides students with opportunities to participate in authentic and relevant learning experiences. This method encourages students to actively develop knowledge through hands-on experience, interaction with peers, and problem solving in a real-world context. This finding is in line with Dewey's view that underlines the importance of "learning through practice" as a constructive process in education. In addition, research shows that the PjBL environment can enhance students' positive attitude towards learning, as well as increase the effectiveness and meaning of the learning process, ultimately preparing students for future careers. The PjBL method also allows students to display their knowledge, increase self-confidence, and strengthen independence. Overall, PjBL as a method that reflects constructivist principles is able to assist students in constructing knowledge based on their own experiences [6].

Based on this, the purpose of this study is to identify the alignment of the Project-based learning model within the constructivism paradigm. This research is expected to provide an in-depth overview of how the principles of constructivism can be effectively applied in PjBL. The findings of this study are expected to provide practical guidance for teachers and policy makers in planning more contextualized and meaningful learning, as well as encouraging the development of students' cognitive, social and emotional skills in accordance with the demands of modern education.

II. METHOD

The research method applied is a literature study, which involves collecting, analyzing and synthesizing from various relevant literature sources, such as scientific journals, books and other academic publications. The literature selection process is carried out systematically using this method to obtain appropriate and relevant references to the context that can be reviewed. This analysis allows researchers to identify, understand and radiate meaning and information in the data systematically so that the results obtained are more accurate [7]. The literature selection process was conducted systematically, using specific keywords and predetermined criteria. Each source was evaluated based on its quality and relevance to ensure that the information obtained was accurate and supported the research objectives.

Researchers draw conclusions based on several previous articles and journals that have a connection between the topic and the research title raised. These articles and journals were chosen because of their relevance to the topic being researched, so that they can provide a strong theoretical basis and enrich understanding of the research problem. Through this review, researchers can formulate supporting concepts and perspectives, resulting in a clearer and more directed framework in researching the topic.

III. RESULTS AND DISCUSSION

This section presents the results and discussion of the literature study on project-based learning in the constructivism paradigm that emphasizes the importance of direct experience and social interaction in building knowledge.

Research result

Article Representation of Project Based Learning Model (PjBL)

The following are the findings of several studies on the PjBL learning model:

Tabel 1 Article Representation of PjBL Learning Model

No	Author	Reseach Result
1	[8]	This method is one of the effective methods to improve cognitive, affective and psychomotor skills. students play an active role, while the teacher acts as a facilitator. PjBL is also able to develop students' social skills, sense of responsibility and motivation to learn through direct involvement in the learning process. The findings of this study show a significant increase in students' learning response according to PjBL standards, measured through observation of students' active participation in each stage of the project
2	[9]	PjBL method significantly improves students' interest and learning outcomes by encouraging active engagement, critical thinking and cooperation through contextualized projects. PjBL is also effective in developing problem-solving and collaboration skills, while strengthening students' understanding and long-term memory due to direct involvement in learning activities.
3	[10]	PjBl is proven to improve students' independence, interest and learning outcomes. It creates an active, collaboration-based learning environment where students solve complex problems and develop skills. PjBL also reinforces understanding through real-life contextualized projects.
4	[11]	PjBL has a positive impact on student learning outcomes especially in primary education. This method allows students to enhance deeper understanding. In addition, its application creates a dynamic learning atmosphere, encourages student engagement and increases learning motivation.
5	[12]	The PjBL method is able to increase student involvement physically, mentally and cognitively which in turn encourages learning motivation, decision-making skills and the ability to think critically and innovatively in solving problems. However, there are some disadvantages, such as the need for a lot of time, high costs and challenges in group management that can cause some students to be less active

Article Representation of Constructivism Paradigm

Articles that represent the Constructivism Paradigm can be seen in the table below:

Table 2 Representation of Constructivism Paradigm articles

No	Author	Research Result
1	[13]	Constructivism is able to overcome the limitations of a behavioristic understanding of learning. Its main findings include active learning, where students are directly involved in the learning process and the application of relevant contexts allows students to connect new knowledge with personal experiences.
2	[14]	The application of constructivism can increase student engagement in the learning process. This approach gives students the freedom to explore and improve their learning abilities which contributes positively to learning outcomes.
3	[15]	The application of constructivism in basic education is very important to encourage students to be active in learning activities. This theory asserts that knowledge is constructed by students through experience and interaction.
4	[16]	The application of constructivism in basic education in the era of globalization provides significant benefits. Among them, students more

No	Author	Research Result
		easily remember information, connect concepts and easily learn new material. Constructivism not only improves academic skills, but also prepares students to face future challenges.
5	[17]	Constructivism in basic education shows that this theory is very relevant to the current independent curriculum. The main goal of constructivism is to motivate learners to make learning a responsibility, develop a thorough understanding of concepts and improve independent thinking skills.

Aligment of PjBL Learning Model in Construktivism Paradigm

The PjBL model and the constructivism paradigm are closely aligned in their goals and approach to learning. Both encourage active, collaborative, contextual and student-centered learning. By implementing PjBL in education, students are given the opportunity to build deeper and more meaningful understanding, while developing essential skills for their future lives.

The following table represents the findings:

Table 3 Representation of Alignment of PjBL Learning Model with Constructivism Paradigm

No	Author	Research Result
1	[18]	The PjBL method is in line with constructivism, particularly Vygotsky's views. In PjBL, students are actively involved through steps such as observation, questioning, experimentation, reasoning and communication that create an interactive and collaborative learning environment. PjBL emphasizes the role of the teacher as a facilitator who assists students in finding their own meaning in accordance with the principles of student-focused learning.
2	[19]	PjBL is closely aligned with constructivism. Constructivism emphasizes that knowledge is built by students through experience and active interaction in the learning process. This provides opportunities for students to be independent, conduct investigations and produce real products that are in line with the principles of constructivism that encourage active participation of students in learning.
3	[20]	PjBL is in line with constructivism whichemphasizes the formation of student knowledge through direct experience. This method encourages students to actively participate in the learning process, hone critical thinking skills and practice problem solving.
4	[21]	The PjBL method is in line with constructivism which focuses on learning through hands-on experience and problem solving. This method encourages students to actively construct knowledge. In addition, this method is also proven to improve skills that are crucial in the 21st century era.
5	[22]	PjBL supports constructivism, where students actively build knowledge independently. In PjBL, students work collaboratively in completing projects, which provide opportunities to formulate ideas, analyze and reflect on problems. The teacher's role in the qini method is as a facilitator who guides students in forming understanding.

No	Author	Research Result
6	[23]	PjBL contributes to significantly improving students' cognitive ability and inventiveness, in accordance with the principles of constructivism that emphasize active and collaborative learning. Students who learn with the PjBL method show better results than the traditional method with increased aspects of creativity such as fluency, flexibility, elaboration, originality and evaluation.
7	[24]	The PjBL model is successful in encouraging students' creativity skills. PjBL focuses on problem solving through projects done individually or in groups which is in line with the characteristics of constructivism.

Discussion

Project-based learning (PjBL) model is a student-centered learning approach, where students independently carry out learning activities to create a project. Through the PjBL learning model, students not only gain new knowledge and improve skills, but also experience a more meaningful and relevant learning process. This approach is designed to actively participate in the learning process [25]. PjBL also means an imaginative learning model, where this approach emphasizes the process of situational learning through various complex activities [26]. PjBL divides the learning stages into three main syntaxes, including: (1) planning, is a very important stage in the learning process where the objectives and steps of the project are carefully planned; (2) implementation, this stage has several important steps, namely (a) preparing all the resources needed (b) explaining the project assignment (c) grouping students (d) working on the project; (3) evaluation of planning and implementation, this is the last stage that is important to assess the effectiveness of the project strategy [27].

In the implementation of project-based learning, PjBL has specific characteristics that make it an effective learning method. The main characteristics of PjBL include several aspects including: (1) motivating students to explore ideas; (2) a learning journey that starts from curiosity; (3) making learning relevant to students' daily lives; (4) providing opportunities for students, where they independently create products and present them; (5) equipping students with skills needed in the 21st century; (6) making learning more meaningful by connecting real life [28].

The challenges and obstacles in implementing PjBL in basic education include several factors that interfere with the smooth learning process. One of them is time constraints that make it difficult to complete the project within the specified timeframe. In addition, the lack of active involvement of students in the project, where some students tend not to participate optimally, thus reducing the quality of project results. The inequality of

students' abilities in the group is also an obstacle, because not all group members can contribute equally. To overcome this, teachers are advised to adjust the duration of the project to the time available, provide stricter supervision and motivate students to be more active in collaboration [29].

The PjBL Learning Model has been proven effective in developing students' cognitive, affective and psychomotor skills, by placing them in an active role and the teacher as a facilitator. Through real-world projects, PjBL encourages students to develop critical thinking, collaboration and problem-solving skills. This model improves students' interest, motivation and learning outcomes due to direct involvement in contextualized learning and relevance to daily life.

In addition, PjBL creates a dynamic and collaborative learning environment. It allows students to develop deeper understanding, social skills, independence and decision-making ability. However, this method has some disadvantages, such as higher time and cost requirements as well as challenges in managing groups that can lead to some less active students.

The constructivism paradigm is an approach to teaching and learning based on the premise that learning (cognition) is the result of "mental construction". That is, students learn things by combining new information with existing knowledge. Constructivists argue that the learning process is influenced by the context in which ideas are taught, as well as students' beliefs and attitudes. As a learning theory derived from psychology, constructivism explains how people acquire knowledge and learn, so it has direct application in the world of education [30]. Constructivism has several main characteristics, namely: (1) active learning, students play an active role in the learning process and are also directly involved in activities that allow them to build their own understanding; (2) authentic and situational learning, students are involved in learning activities that are relevant to real situations to help students interpret learning more meaningfully; (3) interesting and challenging learning activities, learning is designed to attract attention and provide challenges for students in order to motivate students and develop critical thinking skills; (4) bridging process, students are able to convey new information with the knowledge they already have and strengthen their understanding of the information; (5) Knowledge Reflection, students are encouraged to reflect on what they have learned, this helps them recognize their strengths and weaknesses in understanding; (6) teacher as a facilitator, the teacher acts as a guide, supporting students in building their knowledge; (7) scaffolding, the teacher provides the necessary assistance or support to help students in the learning process gradually [31].

In constructivism, learning is understood as an active process where students construct knowledge by connecting new experiences with existing understanding. Jean Piaget stated that children's knowledge is formed through the process of assimilation, which integrates new information, and accommodation, which adjusts existing understanding so that understanding will continue to develop. Lev Vygotsky emphasized the importance of social interaction in learning through the concepts of Zone of Proximal Development (ZPD) and scaffolding. ZPD is the ability of students to complete tasks under the guidance of more expert people, while scaffolding is the provision of gradual assistance that decreases as students' abilities increase [3].

The constructivism paradigm provides a more efficient approach to learning than behavioristic theories by emphasizing active learning. Students do not just passively receive information, but are directly involved in the learning process, connecting new knowledge with their personal experience. The application of constructivism provides opportunities for students to explore their own ideas, develop understanding and solve problems. This theory is very much in line with the current independent curriculum, as it encourages students to develop a thorough understanding and improve their independent thinking skills. With this theory, students not only focus on academic results, but are also equipped with the skills needed to face various challenges in the future.

Thus, PjBL is in line with the paradigm of constructivism, especially Vygotsky's ideas that focus on learning through experience and active interaction. In PjBL, students actively participate through activities such as observation, questioning, experimentation, reasoning and communication. With a student-centered learning approach, the teacher becomes a companion who helps students discover their own understanding. PjBL encourages students to conduct research and produce real products, building knowledge from knowledge from hands-on experience. This method not only develops critical thinking and problem-solving skills but also reinforces important for the 21st century.

The constructivism paradigm and PjBL are closely related as both support active, collaborative and experiential learning. Constructivism is a learning theory that states that individuals construct knowledge through experience and interaction with their environment. This theory emphasizes that students are not passive recipients of information, but actively build their own understanding based on experience and existing knowledge. PjBL is a learning method that is in accordance with the principles of constructivism because it allows students to learn through real projects that are relevant to everyday life. In PjBL, students are invited to complete projects within a certain period of time, explore problems and challenges and produce real solutions or products. This process involves skills that

are in line with the principles of constructivism by encouraging active and contextualized learning. Constructivism and PjBL in particular support deeper understanding and application. Through projects, students learn to put theory into practice thus reinforcing a more meaningful understanding of concepts. Projects designed in PjBL also allow students to experiment, dare to try and reflect on their learning process, all of which are in line with constructivism's view of how knowledge is formed.

IV. CONCLUSION

Based on the discussion above, it can be concluded that: Constructivism and Project-based learning (PjBL) theories are closely related because both support active, collaborative and experiential learning. Constructivism is a learning theory that states that individuals construct knowledge through experience and interaction with their environment. Project-based learning is the realization of constructivism theory in learning practice, as it allows students to learn through projects that are relevant to everyday life. Through projects, students learn to apply theory to practice, thus strengthening their understanding of concepts in a more meaningful way. Projects designed in PjBL also allow students to experiment, dare to try and reflect on their learning process, all of which are in line with constructivism's view of how knowledge is formed.

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Cultivation of Gotong Royong Character Value in Indonesian and Malaysian Primary Schools

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Abstract- This article discusses the cultivation of gotong royong character values in shaping the moral and ethical foundations of primary school learners in Indonesia and Malaysia. The author emphasizes the importance of character education, especially the character of gotong royong in shaping the future behavior of learners. This article also discusses the effectiveness of gotong royong character education in primary schools in both countries, including the role of the curriculum in instilling the gotong royog character. This research uses a descriptive qualitative method, using observation and interviews as data collection techniques. The results of this study show that character education, especially the value of gotong royong character, plays an important role in helping learners establish friendships, control emotions and cooperate with others. Although there are some obstacles such as learners' discomfort with their group mates, the proposed solution is to create motivation, opportunities for learners to deepen their knowledge, and encourage cooperation with their group members. We hope this article can help strengthen character education, especially the character value of gotomg royong in primary schools and provide guidance to education policy makers, teachers, parents and other stakeholders.

Keywords- Primary School; Gotong Royong; Curriculum

I. INTRODUCTION

Character education is one of the fundamental elements in shaping the moral and ethical foundations of students as the nation's next generation. School is a place to educate young people who are good in academic and non-academic fields, have noble character, ethics, and personality that are beneficial to the nation, state, and religion. [1]. In addition, elementary schools have a strategic initial role in building the basics of character values that will guide the behavior of students in the future. Indonesia and Malaysia, as two countries with similar cultures and education systems, have a strong focus on the cultivation of character values in primary schools, and one of them is the cultivation of gotong royong character values.

According to [2] in Indonesia gotong royong is a process of cooperation to achieve the desired results. Whereas in Malaysia, gotong-royong has a similar meaning, namely the spirit of cooperation and mutual assistance in carrying out various activities for the common good. One of the characters that has been embedded and ingrained in Indonesian and Malaysian culture is none other than gotong royong, therefore the values of gotong royong character need to be instilled in children from an early age, including children of primary school age, the aim is that children can work together with others, build relationships as a team and achieve common goals. The behavior that children see in working together shows the relationship of giving and receiving from each other in order to achieve the desired goals together. Through the cultivation of the character of gotong royong at elementary school age, students will learn to form a positive relationship, collaborate in problem solving, contribute to the group, and help each other.

In facing the dynamics of changing times, various issues arise regarding the application of gotong royong values in Indonesian and Malaysian primary schools. The fundamental question arises as to how traditional character values can be internalized effectively, given that the development of science and technology, when

viewed from a negative perspective, can lead to children's egocentrism and individualism so that they are reluctant to cooperate and join with their peers. In addition, the legacy of social values is quickly displaced by new values that adopt modern western culture. [3]Furthermore, the effectiveness of the curriculum along with character teaching methods and strategies as well as the role of teachers and parents in this process are also aspects that must continue to be considered. In response to this, many stakeholders, especially in the world of education, have stated how important it is to implement and instill character education as a way out. [3].

According to [4] strengthening character education in Indonesia has five principles including; nationalism, integrity, independence, mutual cooperation and religion. Of the five principles, the character of mutual cooperation is one of the important elements that is a driving factor in strengthening the character education of students, besides that the value of this mutual cooperation character is being strengthened and instilled by the Indonesian Government at various levels of formal education, one of which is at the elementary school level. Meanwhile, according to [5]. Malaysia has implemented 16 values in character education which are often referred to as 16 pure values, these values include virtue, independence, nobility of character, respect, compassion, justice, freedom, courage, physical and spiritual health, honesty, perseverance, cooperation, simplicity, gratitude, intelligence and the spirit of mutual cooperation. So it can be seen that the value of the spirit of mutual cooperation in Malaysia is also one of the important aspects in developing the character of its students.

The most important objective in this program of strengthening character education through the values of gotong royong is to implement the values of national character in Indonesia and Malaysia through an educational institution effectively, which makes the process as learning, understanding, understanding, and practice, so that gotong royong character education is able to change behavior, ways of thinking and acting as the nation's generation to be better and have integrity [5]. [5]. This is in accordance with the culture of mutual cooperation that has been embedded in one of the elementary schools in Indonesia, namely SDIT Atikah Musaddad Garut, where the values of mutual cooperation have been internalized in one of the school programs that refers to the Pancasila student profile, and has become an element in the independent curriculum that applies in Indonesia.

The phenomenon is in line with the results of observations at Sekolah Rendah Kebangsaan Pos Bersih Malaysia. Where the school has implemented the cultivation of the character of gotong royong through one of the school activities and daily habits and has been included in the moral values contained in the Malaysian curriculum.

Thus, based on the explanation above, the author intends to carry out this research with the title "Cultivation of Gotong Royong Character Values in Indonesian and Malaysian Lower Schools". The purpose of this study is to describe how the activities of cultivating the value of the character of gotong royong in the lower schools of both countries, the teacher's strategy to maintain and improve the collaborative nature of students, then how the curriculum participates in the cultivation of the character of gotong royong in the primary schools of both countries, and this research has the potential to make an important contribution in strengthening character education in primary schools. The findings of this study are expected to serve as a guide for education policy makers, teachers, parents, and those involved in shaping a young generation that is noble and competitive in the midst of global change.

II. METHOD

The method used in this research is qualitative descriptive method. Qualitative research is research that aims to describe and analyze phenomena, events, social activities, attitudes, beliefs, perceptions and thoughts of individual and group qualitative research methodologies [6]. [6]. Descriptive means explaining something in clear and detailed words. Descriptive qualitative research describes what sentences the research subject experiences, some researchers interpret it as behavior. The research describes the cultivation of gotong royong values in elementary schools in Indonesia and Malaysia. In this study, the authors chose a research location at SDIT Atikah Musaddad Garut and Sekolah Rendah Kebangsaan Pos Bersih Malaysia.

According to [7] Data collection techniques are methods used to collect information or facts from an event. Data collection in this qualitative research was carried out using observation and interview techniques. This observation technique is used to collect direct data on how the value of mutual cooperation is applied in one of the elementary schools in Indonesia and Malaysia. The interview technique was carried out by the author on the supervising teachers as well as the principal and students who were present at the time of observation, with the aim of collecting general field data and then refining it more clearly on the issues to be raised based on the design carried out. Data analysis of this research was carried out after collecting field data. The data from field research was processed and analyzed descriptively and qualitatively. Qualitative data analysis of the research findings was used to identify how to implement and foster an ethos of mutual collaboration.

III.   RESULT AND DISCUSSION

Based on the results of observations and interviews of the two countries, it is explained that the relationship between personality and gotong royong is closely related. Gotong royong is a form of activity carried out jointly both at school and outside the school environment to achieve common goals. Meanwhile, the value of mutual cooperation will emerge from the personality of a person who continues to be trained and instilled with the values of mutual cooperation. The results of observations that the author observed that the cultivation of mutual cooperation values was categorized as good in both countries.

Cultivation of Gotong Royong Character Values in the Implementation of Pancasila Profile Strengthening Project learning in Indonesian Elementary Schools

Based on the results of observations and interviews with fourth grade homeroom teachers and school principals, the form of Pancasila Student Profile Strengthening Project activities carried out at SDIT Atikah Musaddad, located at JL. Ciledug No. 107, regol, Kec. Garut Kota, Garut Regency, one of which is the cultivation and development of the value of mutual cooperation through observing garbage in the school environment. The development of the character of mutual cooperation in the project of strengthening the pancasila learner profile has been successful because the teacher provides an understanding of the character of mutual cooperation, where students must work together without discriminating against their groupmates, which will affect the behavior of students and the way they think about their own group, because this project activity is one of the means of achieving the pancasila learner profile as a character strengthening process with the theme of Sustainable Lifestyle, there are changes in the character of students, especially the character of mutual cooperation where students can process waste properly and correctly, which will increase their knowledge and change the character of these students.

The activities at school that are applied to students during the project, aim to foster the character of mutual cooperation, namely students can collect garbage and throw it in the trash, students can learn in groups with friends, and with this project activity fosters cooperation in students. What inhibits the development of the character of mutual cooperation in learning projects to strengthen the profile of Pancasila students carried out in groups is where there are still students who are uncomfortable with their own groupmates and there are several groups that have difficulty in working on projects in a group way. In this case the teacher must carry out his role by including character values in the learning process not only in learning activities because the teacher has his role to be able to overcome the obstacles that occur during the activity so that the activity continues to run well.

Three solutions to the obstacles that occur in the Pancasila Learner Profile Strengthening Project as seen from gotong royong in class IV students are given motivation that all learners can do every activity or task carried out in groups, so that it will make learners have an increase to do the task well, the implementation of P5 provides an opportunity for learners to increase their knowledge about waste, which is also a process for strengthening character as well as an opportunity for learners to learn in their school environment, besides that learners can show collaboration with their group friends which will foster the ability to work together by doing activities together without discriminating against each other. The flow of each project is detailed in the project-based plan and is arranged according to the stages or stages of learner development, taking into account the theme and topic of the project and based on the development of learners and sub-elements based on the topic of the project theme carried out together. The flow of the project in question is as follows:

Table 1. Project Flow of Strengthening the Profile of Pancasila Students

Phase B	Dimension P5	Targeted sub-elements
Theme: Sustainable Lifestyle Topic: Waste is a shared responsibility Total time: 126 JP	● Have faith and devotion to the almighty god ● Mutual cooperation ● Critical reasoning	● Understand the connectedness of terrestrial ecosystems ● Protecting the natural environment ● Collaborate and communicate to achieve common goals

The following is related to the documentation of the activities of instilling the character value of mutual cooperation at SDIT Atikah Musaddad Garut.
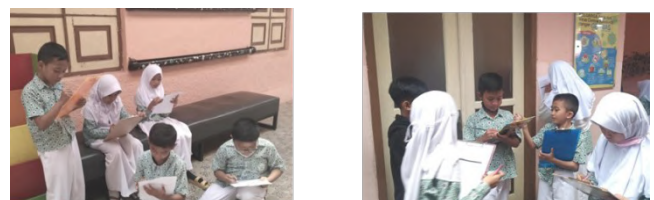
Figure 1. Waste observation activity at school

Figure 2. Sorting waste according to its type

Figure 3. Group presentation of observation results and activity P5

Cultivating the Character Value of Gotong Royong in Malaysian Primary Schools through School Library Arrangement Activities Pos Bersih Malaysia

One of the most valued characters in Malaysian culture is gotong royong, which reflects the spirit of togetherness, cooperation, and mutual help. The author's second research subject is Sekolah Kebangsaan Pos Bersih. Sekolah Kebangsaan Pos Bersih Ulu Slim, 35800 Slim River Perak Malaysia is one of the lower level national schools located in Ulu Slim. Based on the results of observations and interviews, the researcher obtained information related to the cultivation of gotong royong character in low-level school students who have been well implemented. Considering that if we look at the Malaysian curriculum that enforces and instills moral values, which includes the value of the gotong royong character. So even though Sekolah Rendah Kebangsaan (SRK) POS Bersih Malaysia is part of the national education system, which has the responsibility to integrate the values of gotong royong into learning and daily activities. one of them is through Library Arrangement activities.

Where the Pos Bersih national school has a 6x7 meter library and there are more than 200 books in it, consisting of fiction books, children's books, motivational books, comics, magazines, and storybooks that contain teaching. With a large library with many varied books, it is necessary to organize the library in order to preserve the library. Library organization activities at Sekolah Kebangsaan Pos Bersih Malaysia are often held every year, which often involve library staff, teachers and students. With this activity, it is hoped that it can improve the character of gotong royong for students, help in increasing students' enthusiasm for reading, and increase students' critical thinking on how to organize the library so that it is beautiful to look at and comfortable to live in.

In addition, according to teacher 1 as the observer activity, there are several other activities that arearrangement the starting point as a support for mutual cooperation activities such as daily group assignments in scheduled classes such as sweeping, throwing garbage and other class management activities so that over time they are accustomed to activities that involve mutual cooperation. In addition to library structuring activities and daily assignments, the school also provides reading book facilities to support students learning about mutual cooperation, the school also provides facilities to be able to display cartoon stories such as upin ipin to help build student character. This library arrangement activity is a relevant activity to apply the character of mutual cooperation for low-level students. Library arrangement activities as a place to instill and build the spirit of mutual cooperation of students can be seen in the picture below.

Figure 4. Group presentation of observation results and activity P5

Figure 5. Book Arrangement in the New Library

Figure 5. Library view after being organized

The Role of Curriculum in Gotong Royong Character Education in Indonesian and Malaysian Primary Schools

It can be said that both Indonesia and Malaysia have incorporated character education into the education programs implemented at various levels of education. In Malaysia, the current curriculum is the national curriculum, which must be used by all schools in Malaysia. This is based on the Malaysian Education Act 1996. [8]which reads "The Minister shall establish a curriculum known as the National Curriculum which, subject to subsections, shall be used by all schools in

the National Education System" (1996). More than that in (Buku Pendidikan Kebangsaan) Kurikulum Kebangsaan is an educational program that includes educational programs and activities that include all knowledge, skills, standards, values, cultural elements, and beliefs. The aim is to support the comprehensive physical, mental, spiritual and emotional development of learners as well as to instill and enhance the moral values expected in imparting knowledge.

With regard to character education in the national curriculum at the lower education level, there is an implementation strategy that states the points of improving mastery of 3M manaakul (reasoning) skills, social skills and computer basics skills. Based on the points of mastery of these skills, there is a social skill, which is important in instilling character education, one of which is gotong royong. In the Malaysian curriculum, there is a statement stating the Spirituality, Attitude and values component which emphasizes learning areas whose main focus is the appreciation of religious practices, beliefs, attitudes and values. The disciplines in this component include Islamic education for Muslim learners and moral education for non-Muslim learners (2011) Therefore, moral education is given to non-Muslim learners when Muslim learners study Islamic subjects. Through the implementation of the Secondary School Unified curriculum, moral education began to be provided at the elementary to secondary school level. [5]. According to Rahman Chang, moral education in Malaysia is implemented through social interaction in the school environment and outside the school environment. Social relations within the school are carried out during the classroom learning process. Moral education is internalized with direct learning methods. Besides through subjects, moral education is implemented by subject teachers through the integration of values in each subject. [3].

In Indonesia, character education is used as one of the educational strategies organized by educational units (schools) with the main objective of strengthening the character of students. In its implementation, character education is wrapped in a curriculum that is currently called the independent curriculum. As stated in Law Number 20 of 2003 concerning the National Education System Article 4 which states that education is organized as a process of civilizing and empowering learners throughout life (2003). In line with this, the Ministry of Education, Culture, Research and Technology has authorized the independent curriculum as a foundation in the process of civilizing and empowering learners and the main concepts of this independent curriculum include simplifying the curriculum, providing creative and flexible space for each student and teacher in managing learning.

In its implementation, this independent curriculum is carried out through several principles including the principle of exemplary, increasing motivation, and increasing the creativity of students in learning, through its main program, namely the implementation of P5 (Pancasila Student Profile Strengthening Project) which includes six aspects, namely: 1) faith, fear of God Almighty, and noble character, 2) independent, 3) mutual cooperation, 4) global diversity, 5) critical reasoning, 6) creative (Hadi et al., 2022). So when viewed from these six aspects, mutual cooperation is one of the controls in creating good student character. As the decision of the Ministry of Education, Culture and Research of the Republic of Indonesia No. 56 / M / 2022 concerning Guidelines for curriculum implementation in the context of learning recovery which places the project of strengthening the Pancasila student profile as the main activity in the curriculum structure in primary and secondary education (2022). Therefore, the characteristics of the Student Profile refer to the spirit of lifelong learners. These characteristics are characteristics that lead to competence, character and behavior in accordance with the noble values of Pancasila. This is in line with the views of Ki Hajar Dewantara who stated that education cannot be separated from the character, physical and mental values of students who will later become citizens. [9]One of the characters mentioned is the character of gotong royong which has become the main value for both sides of the country.

Values Contained in Mutual Cooperation Character Education

Gotong royong can be interpreted as a form of social concern for individuals who are social creatures. The sensitivity to carry out mutual cooperation activities arises from the awareness that is owned. Awareness arises from a sense of empathy from one human being towards another. [10]. Therefore, the character of mutual cooperation needs to be maintained in order to remain sustainable, one of which is through education. Education is a fundamental life factor for the development of a nation. As in Law No.20 of 2003 concerning the national education system (2007: 8) explains that the function of a national education is to improve the ability, shape the character, and create a dignified civilization in order to educate the nation's life, and aims to develop the potential of students to become human beings who have faith and devotion to God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent and become democratic and responsible citizens.

This is in line with the opinion of [5] 16 values in character education that have been implemented by Malaysia. These values are pure values which include: kindness, independence, nobility of character, respect, compassion, justice, freedom, courage, physical and

spiritual health, honesty, perseverance, cooperation, simplicity, gratitude, resourcefulness and a spirit of mutual cooperation, and are rooted in religious values, traditions, customs of the community and consider universal aspects. All these values are closely related to daily life.

According to Pearl [11] this gotong royong character value as a profile of Pancasila students will direct students to become social beings with a humble attitude and help each other. The value contained in gotong royong is a character value that focuses on an act of helping each other in a good way and having sensitivity to the surrounding environment. This cooperative behavior is very crucial to be instilled in elementary school students so that they are able to cooperate with others and be able to build friendship relationships and achieve certain goals together. The attitude of willingness to work together shows a relationship of give and take in order to achieve the desired goals together [2]. [2]. Through this mutual cooperation attitude, it is hoped that it can help students to establish family relationships between friends and give a positive response in controlling their emotions. The attitude they apply at school can be carried over when they interact in the home and family environment. Therefore, it is important for education units to play a strategic role in instilling a collaborative attitude, especially the value of the character value of gotong royong with the aim of making students good, caring and responsible citizens. [11].

IV. CONCLUSION

Character education, especially the value of gotong royong, plays an important role in shaping the moral and ethical foundation of primary school students in Indonesia and Malaysia. In this article, the author highlights the value of gotong royong as a character trait that needs to be instilled in learners. Gotong royong is a form of cooperation that aims to achieve common goals, including helping and caring for others. In the Indonesian context, the cultivation of the value of gotong royong is implemented through waste observation activities at school. While in Malaysia, the cultivation of the character value of gotong royong is carried out through library arrangement activities at Sekolah Kebangsaan Pos Bersih Malaysia. Both countries realize the importance of character education and have incorporated character education into their curriculum. In Indonesia, character education is implemented through the Merdeka program, while in Malaysia, character education is implemented through the Kebangsaan curriculum.

Character education helps learners to build family relationships in friendships, control emotions, and cooperate with others. Although there are still some obstacles in its implementation, there are solutions that can overcome these problems, such as creating motivation, opportunities for learners to deepen their knowledge, and encouraging cooperation with friends in groups. The author hopes this article can help strengthen character education in primary schools and provide guidance to education policy makers, teachers, parents and other stakeholders.

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Global and Multicultural Education
(Definition, Purpose, Object and Scope)

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Abstract- The Indonesian nation must be able to maintain morals and behavior as a human being with character in this era of globalization. Nowadays, there are so many things that can change the way of behavior, if you are not able to sort out which things are worth doing and which things are not worth doing. With the existence of education that still wants to create a nation's successor who always carries out the identity of the nation, external values that want to enter and damage local values are not taken for granted. We as the future of the nation must be able to implement the moral values taught in the world of education. Multicultural education is the process of developing all human potential that respects plurality and heterogeneity as a consequence of cultural, ethnic, tribal, and religious diversity. Multicultural education emphasizes a philosophy of cultural pluralism into the education system based on the principles of equality, mutual respect and acceptance, understanding and moral commitment to social justice.

Keywords-Education, Global, Multicultural

I. INTRODUCTION

At-tarbiyah, al-ta'lim, al-ta'dib or education is an effort to develop the potential of human resources in order to obtain high social skills in the optimal development of individual learners and be able to interact with other individuals, diverse communities and the surrounding cultural environment. More than that, education is a conscious and planned effort to realize the learning process so that students actively develop their potential to have religious spirituality, self-control, personality, intelligence, noble character, and skills needed for themselves, society, nation and state.

Humans today live in a global and multicultural era that is facilitated by advances in science and technological sophistication, certainly affecting human lifestyle and behavior in all aspects of life. This influence applies thoroughly and applies to every nation regardless of ethnicity, nation, or religion. [1]. Therefore, education has an important role to keep human character superior in this era of globalization and multicultural times.

Multicultural education is a necessity in the era of globalization to date. Multicultural education is also a paradigm, method, and ideology that is seen to explore the diversity of the potential of the nation's plurality, both language, ethnicity, religion, culture, and other social pluralities.[2]. The main concept of Multicultural education is to offer an alternative through the application of educational strategies and concepts based on the diversity that exists in society, especially those of students such as ethnic diversity, culture, language, religion, social status, gender, ability, and age [3].

In addition, the rampant globalization that has long been present in every line of life cannot be ignored. In fact, the process of globalization does have many impacts, both positive and negative. Accepted or not, we must familiarize ourselves with these conditions. To face the increasingly widespread globalization, the Indonesian people must prepare for it, one of which is the existence of global education.

Global education is an alternative effort to instill a view *(perspective)* of the world by emphasizing the interconnectedness between cultures, humanity and the condition of the planet earth, the focus of the substance of global education is derived from global matters that are increasingly characterized by pluralism, independence and change. [4].

Global and multicultural education plays a very important role in improving the quality of human resources. Qualified human resources are expected to be able to compete in the midst of the globalization era. The era of globalization brings new challenges that must be answered by education. Global changes require changes in the management of life and society including in the field of education. Changes in the vision and strategy of education in order to prepare Indonesian humans to be able to provide answers to global challenges and global opportunities have become a necessity.

With global and multicultural education, the quality of human resources is expected to improve. Education is no longer teacher-centered but student-centered. So that the output of education will be able to improve its quality and be able to compete in the midst of the globalization era.

II. METHOD

This research uses the *library research* method, namely by looking at and studying references or bibliography taken from books, journal articles and other information that supports the interests of writing. library research is not only an activity of reading and recording the data that has been collected. But more than that, researchers must be able to process the data that has been collected with the stages of library research.

III. RESULTS AND DISCUSSION

The development of education in Indonesia cannot be separated from the influence of globalization, where science and technology are developing rapidly. The free market era is also a challenge for Indonesian education, because there are opportunities for educational institutions and educators from abroad to enter Indonesia. To face the global market, national education policy must be able to improve the quality of education. Education plays a very important role in preparing humans to enter the future, where each process has a different transformation every time. Globalization has penetrated into all aspects of life that cannot be avoided. Therefore, strategies in the world of education are needed to increase public knowledge in responding to this. In addition to being able to respond to these changes and developments, people are also expected to be able to compete and compete. As we know, with the development of globalization that is increasingly advanced, more and more people also want to know about something. Advances in technology and science have their own impact on the world of education. [5].

1. Definition of Global and Multicultural Education

Global education is defined as an effort to instill a view of the world that is taught to students by linking between cultures, the human condition and planet earth. With global education, students are emphasized to be able to think critically about the focus of the study of all things global characterized by change, independence, and pluralism.

The objectives of global education include developing the knowledge, skills and attitudes necessary to live effectively in a world of diminishing natural resources characterized by ethnic diversity, cultural pluralism and growing interdependence. [6]. Learners will be developed knowledge, attitudes, and skills that are tailored to be able to live effectively in a world that has natural resources that are depleting day by day. Global education strongly utilizes global advantages in various aspects, such as human resources, language, cultural arts, economy, information and communication technology, ecology, and so on, which are included in the education curriculum.

Globalization is a process in which individuals, groups and countries interact, depend, relate and influence each other across national borders. In many ways, globalization shares many characteristics with internationalization and the two terms are often interchangeable. Some people often use the term globalization in association with the diminishing role of the state or national borders. J.A. Scholte concluded that there are at least five categories of definitions of globalization commonly found in the literature. The five categories of definitions are related to each other and sometimes overlap, but each contains distinctive elements.

a. Globalization as internationalization
   With this understanding, globalization is seen as merely an adjective to describe the cross-border relations of countries. It describes the growth in international exchange and interdependence. The greater the volume of trade and capital investment, the more the economies of countries are integrated into a global economy where distinctive national economies are absorbed and re-articulated into a system through international processes and agreements.

b. Globalization as liberalization
   In this sense, "globalization" refers to a process of removing government-imposed barriers to mobility between countries to create an open and borderless world economy. Those who argue for the removal of trade barriers and capital controls usually take refuge under the mantle of globalization.

c. Globalization as universalization
   In this concept, the word global is used with the understanding that the process of going global and globalization is the process of

spreading various objects and experiences to everyone to all corners of the world. The classic example of this concept is the spread of computer technology, television, internet, etc.

d. Globalization as westernization or modernization (more in the Americanized form)

Globalization in this context is understood as a dynamic, in which the social structures of modernity (capitalism, rationalism, industrialism, bureaucratism, etc.) are spread throughout the world, which in the process tends to destroy established local cultures and deprive local people of their right to self-determination.

e. Globalization as the erasure of territorial boundaries (or as the spread of supraterritoriality)

Globalization encourages geographical reconfiguration, so that social-space is no longer solely mapped with territorial areas, territorial distances, and territorial boundaries. In this context, globalization is also understood as a process (or a series of processes) that produces a transformation in the spatial organization of social relations and transactions - in terms of their extensity, intensity, speed and impact that rotate intercontinental or inter-regional mobility and activity networks. Globalization can be considered as (Global Education Based on Local Wisdom).

Multiculturalism is an understanding that emphasizes the recognition of diversity and accepts diversity, so that respect and appreciation between differences are the main keys in the concept. [7]. The root word of multiculturalism is culture. The definition of culture according to experts is very diverse, but in this context culture is seen in the perspective of its function as a guide for human life. In the context of the cultural perspective, then multiculturalism is an ideology that can be a tool or vehicle to improve the degree of human and humanity [8].

Multicultural education can be defined as education for or about cultural diversity in response to demographic and cultural changes in a particular community environment and even the world as a whole. This is in line with Paulo Freire's opinion, education is not an ivory tower that tries to stay away from social and cultural realities. Education, according to him, must be able to create a society that only glorifies social prestige as a result of the wealth and prosperity it experiences. As according to [9] multicultural education is the process of developing all human potential that gives recognition, respect for differences in equality respect for cultural, ethnic, tribal and religious diversity.

The term multicultural education can be used at both descriptive and normative levels to describe educational issues and problems related to multicultural societies. It also includes the notion of considering educational policies and strategies in a multicultural society. In a descriptive context, multicultural education should contain themes on tolerance, ethno-cultural and religious differences, the dangers of discrimination, conflict resolution and mediation, human rights, democratization, plurality, universal humanity, and other relevant subjects. Multicultural education is a progressive approach to educational transformation that thoroughly exposes the shortcomings, failures, and discriminatory practices in the educational process. [10].

The implementation of multicultural education does not have to change the curriculum. Multicultural education lessons can be integrated in other subjects. It's just that guidelines are needed for teachers to implement it. The main thing is that students need to be taught about tolerance, togetherness, human rights, democratization, and mutual respect. This is very valuable for their future life and is very important for the establishment of human values. Schools play an important role in instilling multicultural values in students from an early age. If from the beginning they have had the values of togetherness, tolerance, love of peace, and respect for differences, then these values will be reflected in their daily behavior because they are formed in their personality. If this is successfully owned by our young generation, then future life can be predicted to be relatively peaceful and full of respect between others can be realized. [11]

From some of the definitions above, there are three keywords that mark the existence of multicultural education, namely; first, the process of developing attitudes and behavior, second, respect for cultural differences and diversity. Third, respect for other cultures. These keywords will be the foundation in formulating the Islamic concept in understanding multicultural education. [12].

2. Goals of Global and Multicultural Education

In simple terms, multicultural education can be defined as "education for/about cultural diversity in response to demographic and cultural changes in a particular community or even the world as a whole". This is in line with Paulo Freire's opinion that education is not an "ivory tower" that tries to stay away from social and cultural realities. Education, according to him, must be able to free humans from the various life problems that surround them. Furthermore, Freire said that education is an effort to restore the function of humans to become humans in order to avoid various forms of oppression, ignorance, to the level of backwardness. Because humans are the center of education, humans must make education a

tool of liberation to deliver humans into dignified creatures.

Multicultural education originated from the development of the idea and awareness of "interculturalism" after World War II. The emergence of the idea and awareness of "interculturalism" is not only related to international political developments concerning human rights, independence from colonialism, and racial discrimination and others, but also because of the increasing plurality in Western countries themselves as a result of increased migration from newly independent countries to America and Europe. Regarding the focus of multicultural education, Tilaar revealed that in multicultural education programs, the focus is no longer directed solely to domain or mainstream racial, religious and cultural groups. This focus was once the emphasis of intercultural education that emphasized increasing the understanding and tolerance of individuals from minority groups towards the dominant mainstream culture, which eventually led to people from minority groups being integrated into mainstream society. Multicultural education is actually an attitude of "caring" and understanding (difference), or "politics of recognition" the politics of recognition of people from minority groups.

In connection with the conditions and demands in the era of globalization, global education is very urgent in order to prepare students to survive and compete in the midst of globalization. The concept of global education emphasizes an inclusive way of thinking, if not just wanting to expand information about global linkages. With global education, it is expected that the quality of human resources will improve. Education is no longer teacher-centered but student-centered. So that the output of education will be able to improve its quality and be able to compete in the midst of globalization. The urgency of global education can be described as follows:

a. Global education prepares learners to become autonomous human beings.
b. Global education prepares learners to be responsible people.

The purpose of global education is to develop the knowledge, skills and attitudes necessary to live effectively in a world of diminishing natural resources characterized by ethnic diversity, cultural pluralism and growing interdependence. The need to improve the orientation of students in international outlook is increasingly recognized. Nonetheless, specifically in Indonesia, efforts to improve and expand global understanding in primary and secondary education institutions still need to be empowered. [13]

Conceptually; multicultural education according to Gorsky has the following goals and principles: (a) every student has the opportunity to develop their achievements; (b) students learn how to learn and think critically; (c) encourage students to take an active role in education, by presenting their experiences in the context of learning; (d) accommodate all student learning styles; (e) appreciate the contributions of different groups; (f) to develop positive attitudes towards groups with different backgrounds; (g) to be good citizens in school and in society; (h) to learn how to assess knowledge from different perspectives; (i) to develop ethnic, national and global identities; (j) to develop critical decision-making and analysis skills so that students can make better choices in everyday life.

The principles of multicultural education are: (a) the selection of subject matter must be culturally open based on students. This openness should unite opposing opinions and different interpretations; (b) the content of the selected subject matter should contain differences and similarities across groups; (c) the selected subject matter should be appropriate to the context of time and place; (d) the teaching of all lessons should describe and build on the experiences and knowledge that students bring to class. (e) Education should contain interactive teaching and learning models for easy understanding.

3. Objects of Global and Multicultural Education

Global education is, by its very nature, a change from the conventional education model. Global education encompasses a diverse spectrum of pedagogical practices that utilize digital tools and platforms to foster cross-cultural engagement, collaboration and knowledge acquisition. The fusion of global perspectives with technological innovations has revolutionized the way individuals learn and interact with the world, transcending physical boundaries and enabling a more connected and culturally enriched educational experience. [14].

Global education integrates various disciplines, allowing students to understand the social, cultural, economic, and political context of global issues. It helps students see the connections between local and global issues and understand cultural diversity. [15]

Models of multicultural education that have existed and are being developed by developed countries, known five approaches, namely: First, education about cultural differences or multiculturalism. Second, education about cultural differences or cultural understanding. Third, education for cultural pluralism. Fourth, bicultural education. Fifth, multicultural education as a human moral experience. Multicultural education is a new phenomenon in the association of human beings who crave equal rights, including the right to get the same education for everyone, "Education for All".

Multicultural education is also a response to the growing diversity of school populations, as well as the demand for equal rights for all groups. In another dimension, multicultural education is the

development of curricula and educational activities to include a variety of views, histories, achievements and concerns of non-European people. While broadly, multicultural education includes all students without distinguishing groups such as gender, ethnicity, race, culture, social strata and religion.

Furthermore, James Banks explains that multicultural education has five dimensions that are interrelated and can assist teachers in implementing several programs that are able to respond to differences in learners (students), namely:

a. The content integration dimension. This dimension is used by teachers to annotate the "key points" of learning by reflecting on different materials. In particular, teachers incorporate content into the curriculum in a number of different ways. One common approach was to acknowledge contributions, i.e. teachers worked into their curriculum by limiting facts about the heroic spirit of different groups. In addition, the lesson plans and units of study are not changed. With some approaches, teachers add some units or topics specifically related to multicultural materials.

b. Knowledge construction dimension. A dimension where teachers help students to understand multiple perspectives and formulate conclusions that are influenced by their discipline knowledge. This dimension also relates to the learners' understanding of the changes in their own knowledge.

c. The dimension of prejudice reduction. Teachers do a lot of
efforts to assist students in developing positive attitudes about group differences. For example, when children enter school with negative attitudes and misconceptions about different racial or ethnic groups, education can help students develop more positive intergroup behaviors, provided conditions are established and certain. The two conditions are learning materials that have a positive image of group differences and using these learning materials consistently and continuously. Research shows that students who come to school with many stereotypes tend to behave negatively and have many misconceptions about ethnic and racial groups from outside their group. Research also shows that the use of multicultural textbooks or other teaching materials and cooperative learning strategies can help students to develop more positive racial attitudes and perceptions. These types of strategies and materials can result in students' choice to be more friendly towards other racial, ethnic and cultural groups.

d. The equitable pedagogy dimension. This dimension is concerned with ways of changing learning facilities so as to facilitate the achievement of learning outcomes in a number of students from different groups. Learning strategies and activities that can be used in an effort to treat education fairly include cooperative learning rather than competitive learning. This dimension also involves education that is designed to shape the school environment into many types of groups, including ethnic groups, women, and students with special needs that will provide educational experiences of equal rights and equal learning opportunities.

e. The empowering school culture and social structure dimension. This dimension is important in empowering the cultures that students bring to school from different groups. In addition, it can be used to develop a social structure (school) that utilizes the potential of diverse student cultures as a characteristic of the local school structure, for example with regard to group practices, social climate, exercises, extra-curricular participation and staff appreciation in responding to the various differences that exist in the school.

4. Scope of Global and Multicultural Education

Global education tries to open the barriers between cultures globally, and make them more inclusive. It shows that global education tries not to trigger resistance, but tries to prepare for it. Now for the scope of global education, you can look at each point below.

a. Awareness of a global outlook
b. Understanding of global systems
c. Understanding the history of globalization
d. Mutual understanding of each other's culture
e. By looking at the scope, global education appears to have some good characteristics, as follows. Interconnectedness between people
f. Present global challenges as an exciting arena for learners
g. Teaching materials are accurate and do not contain clichés.
h. Accustoming people to accept all forms of diversity
i. Humans have a responsibility in the future by not propagandizing according to their own views.

The impact of globalization requires schools to organize international standard education in the sense of graduating students who are ready to use both in the world of industry, economy, politics and other sectors whose abilities are recognized by the world. With the existence of professional

certification initiated by the Indonesian government through a special agency, namely the National Board for Professional Certification (BNSP) which aims to produce graduates who are ready to use by making students who have creative skills in addition to the field of science they are working on.

Many schools in Indonesia in recent years have begun to globalize their internal education system. This can be seen in schools known as billingual schools, with the implementation of foreign languages such as English and Mandarin as compulsory school subjects. In addition, various levels of education ranging from elementary schools to universities both public and private that open international class programs. The globalization of education is carried out to answer the market needs for a quality workforce that is getting tighter. With the globalization of education, it is expected that Indonesian workers can compete in the world market. Especially with the implementation of free trade, for example within the scope of ASEAN countries, inevitably the world of education in Indonesia must produce graduates who are ready to work so as not to become "slaves" in their own country. This model of education also makes students acquire complete and detailed technical skills, ranging from foreign languages, computers, the internet to social procedures with foreigners and others. Another positive side of the literalization of education is competition. Schools compete with each other to improve the quality of their education to find students.

In the face of an increasingly connected and complex world, the role of Islamic education and multicultural education in shaping the character and attitudes of students is becoming increasingly important. (journal 10). Multicultural education is an educational approach designed to appreciate and integrate cultural, ethnic, racial and religious diversity in the learning process. In the context of Indonesia, which is known for its cultural diversity, multicultural education becomes very important to build social cohesion and prevent conflicts between groups.

multicultural education has several dimensions that are interrelated with one another, namely: 1. Content Integration, which integrates various cultures and groups to illustrate basic concepts, generalizations, and theories in subjects/disciplines. 2. The knowledge construction process, which brings students to understand the implications of culture into a subject. 3. An equity paedagogy, which adapts teaching methods to the way students learn in order to facilitate the academic achievement of students who are diverse in terms of race, culture, or social. 4. Prejudice reduction, which is identifying students' racial characteristics and determining their teaching methods. Then, training groups to participate in sports activities, interacting with all staff and students of different ethnicities and races in an effort to create a tolerant and inclusive academic culture [16]

IV. CONCLUSION

Global education is education that is based on the principles of global education, namely related ways of thinking, holistic, experience-oriented reflection or history, orientation to action, social harmony, and non-violence. Global education in Indonesia should be implemented without abandoning national identity. Because without identity, we will easily be swept away by the aimless flow of globalization and it is not impossible that we will fall into various forms of formless life, without identity, not even ashamed to be an Indonesian nation without identity. Therefore, even though we follow how the changes and developments of the times, we as Indonesians must maintain our original identity as Indonesians so that the values that have been contained in our culture cannot be eroded by values from other cultures.

Multicultural education is the process of developing all human potential that respects plurality and heterogeneity as a consequence of cultural, ethnic, tribal, and religious diversity. Multicultural education emphasizes a philosophy of cultural pluralism into the education system based on the principles of equality, mutual respect and acceptance, understanding and moral commitment to social justice. Multicultural education originated from the development of ideas and awareness about interculturalism after World War II. The emergence of the idea and awareness of interculturalism is not only related to international political developments concerning human rights, independence from colonialism, racial discrimination, etc., but also because of the increasing plurality in Western countries themselves as a result of increased migration from newly independent countries to America and Europe. Multicultural education is actually an attitude of "care" and understanding (difference) or "politics of recognition" the politics of recognition of people from minority groups. Multicultural education looks at society more broadly. It is based on the basic view that indifference and non-recognition are not only rooted in inequality.

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Digitalization in Primary Education: Challanges and Opportunities Toward 21st Century Learning

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Abstract-This *research* aims to find out the importance of digitalization in education, especially basic education related to opportunities and challenges in the 21st century. The research method used is a literature study, by analyzing relevant sources from textbooks, academic journals, research reports, and other sources. Data collection techniques were carried out through: 1) literature search; 2) selection and synthesis; and 3) literature classification. The data analysis technique in this study was analyzed through the stages of: 1) categorization; 2) comparative analysis; and 3) synthesis. The results showed that there are enormous opportunities in facing challenges in the era of the Industrial Revolution 4.0. Teachers at the basic education level must be skilled in utilizing technology by implementing digital-based learning in order to improve students' digital literacy and have 21st century skills, namely critical thinking, collaboration, creative, communication.

Keywords-Digitalization, Primary Education, 21st century learning

I. INTRODUCTION

Education in the 21st century is experiencing significant changes with the rapid development of digital technology [1] [2]. This digital transformation has penetrated into all aspects of life. [3], including the basic education sector [4] [5] . Digitalization of education, which includes the use of digital devices, the internet, and interactive learning applications [6], is expected to support the development of students' competencies to respond to the challenges of the 21st century. [7] as in many countries in the world such as Sub-Saharan Africa that develop the competencies of students at all levels of education by developing the competencies of creativity, problem solving, and creativity [8]. [8], critical thinking skills, collaboration skills, communication, and digital literacy [9].

The benefits of digitalization in the 4.0 era for quality education must continue to be empowered so that it can remain competitive and can be felt by the world community significantly. [10]It opens up opportunities to increase the creative potential of individuals, and modernize in the form of educational practices. [11]. But at the level of implementation in the field of education, it faces many challenges. The gap in the digitalization aspect of education according to Hasyim (2024) is one of the significant issues in the modern world today, especially among developing and poor countries. [12]. In Indonesia and in various parts of the world, it is still difficult to access adequate technology. Infrastructure gaps related to the integration of digital technology in schools are difficult to implement, as research results (Aesaert et al. 2015; Hnakan digitalauge technology 2014; Håkansson Lindqvist 2015; Glover et al.2016) explain that digitization in education is not based on pedagogical objects and methods so that the use of technology does not result in changes and improvements in educational practices. [13]. In some areas in Indonesia, especially the 3T (Frontier, Remote, Disadvantaged) areas are constrained by access to technology [14]. [14]There is an imbalance in digital infrastructure such as internet networks, availability of digital devices, and limited trained educators, so that the use of technology is a major obstacle in integrating technology in schools [15]. [15]. As in Singapore and Malaysia, digitization in education is not a simple process, the gap occurs because many students who come from small income families do not have adequate devices and internet connections [5]. [5] [16]. In addition, the uneven digital literacy among students and teachers causes the utilization of technology is not optimal. [5][12]. Digitalization of learning that is not accompanied by careful preparation also creates risks such as dependence on devices, misuse of technology, and reduced direct social interaction between students. [17].

In addition to the challenges, digitalization also brings great opportunities in improving the quality of basic education. The use of technology can enable teachers to create more interactive, immersive and relevant learning for students. Online learning platforms, educational videos, and educational games (gamification) can increase students' learning motivation. [18]. Technology also enables

personalized learning, where each student can learn according to their own pace and learning style. [19].

Digitalization of education refers to the use of digital technology in the learning process to improve the effectiveness, efficiency, and quality of education. [13]. Digitalization of education can include various aspects, such as the use of the internet, hardware and software, as well as interactive learning applications that enrich students' learning experience. [20]. Digitalization of education enables more flexible, interactive and personalized learning, and can connect various learning resources previously difficult to access in traditional education environments. In the context of primary education, digitization means the use of technology to introduce students to 21st century skills, such as digital literacy, critical thinking and collaboration abilities. Technology-based learning can also help students to be more actively involved in the learning process by utilizing various applications that support creativity and exploration.

Therefore, it is important to conduct an in-depth study on the digitalization of basic education. This paper is intended to identify the challenges and opportunities that exist in the implementation of technology in basic education and provide recommendations for strategies that can be implemented to optimize digital-based learning. By understanding these challenges and opportunities, it is hoped that the digitization of basic education can be implemented effectively, have a positive impact on the development of 21st century competencies, and make basic education a strong foundation in building the capabilities of future generations.

II. METHOD

This research uses the literature review method. This review is one of the scientific studies that provides an overview of current knowledge. [21] which aims to analyze and summarize the results of previous research and relevant theories [22] about digitalization in primary education. The focus of this study is the opportunities and challenges of digitization in learning at the basic education level in the context of 21st century learning. The data sources in this study were obtained from textbooks, academic journals, research reports, and other sources related to digitization in learning in basic education. Data collection techniques were conducted through: 1) literature search; 2) selection and synthesis; and 3) literature classification. The data analysis technique in this study was analyzed through the stages of: 1) categorization; 2) comparative analysis; and 3) synthesis. Furthermore, to ensure the validity of the data, the sources used were selected from nationally and internationally recognized journals. The literature used was selected based on the time span of the last 5 years to ensure relevance to the current development of digitalization.

III. RESULTS AND DISCUSSION

A. Research results

The following are the results of a literature review obtained from several national and international article reviews related to Digitalization in Basic Education: Opportunities and Challenges in Facing 21st Century Learning.

TABLE 1. DIGITIZATION OPPORTUNITIES IN PRIMARY EDUCATION

No	Digitalization Opportunities in Primary Education		
	Author, Title, and year of Artitkel	*Strategy*	*Results*
1	**Authors**: R. Rahayu, S. Iskandar, and Y. Abidin, **Title**: "21st Century Learning Innovations and Their Application in Indonesia," **Year**: 2022	The application of the Blended Learning Model (MBL) is very suitable to face the challenges of the 21st Century and prepare the learning environment for the achievement of student competencies. Digitalization forces the learning process in schools to follow technological developments. Teachers and students are required to be literate in digital technology	Increased access to training for teachers and students to be tech-savvy so as to improve digital literacy
2	**Authors**: L. Sati, W. R. Jaelani, and Y. T. Herlambang, **Title**: "Digital Transformation in Education: A Review in Philosophical Perspective." **Year**: 2023	The philosophy of progressivism and the pragmatic school are considered to be the main basis for innovation in education.	Digital devices bring significant changes to learning at the primary school level. Technological advances in education are driving the learning process to be more modern and innovative...
3	**Author**: A. & Husnin, **Title**: "Cabaran Guru Mengaplikasikan Pembelajaran Digital Melalui Pelantar Digital Education Learning Iinitiative Malaysia (DELIMa) Dalam Pengajaran Dan Pemudahcaraan (PDPC)," **Year**: 2024	Implementation of DELIMa platform for teachers in Malaysia	Opportunities in digitizing education through DELIMa implementation (Digital Educational Learning Initiative Malaysia)
4	**Author**: F. Pettersson, **Title**: "Understanding digitalization and educational change in schools by means of activity theory and the levels	Conceptualizing digitalization as a gradual process across multiple organizational levels, using CHAT theory and levels of learning to analyze school transformation from technology investment to educational strategic	Digitalization in education will work and the government should invest in developing technology in the education domain

	Digitalization Opportunities in Primary Education		
No	Author, Title, and year of Artitkel	Strategy	Results
	of learning concept" Year: 2021	development.	
5	Authors: Setiabudi, R., Utomo, F. S., & Title: Voice Command Classification System Using Artificial Neural Network in G-MOOC 4D Application Tahyudin, I. Year: 2024	MOOC (Massive Open Online Course) and Artificial Intelligence in learning.	MOOCs and AI increase student engagement in digital learning, but teachers are still needed as facilitators and guides.
6	Authors: Maimun Aqsha Lubis, Siti Hajar Taib, Usiono, Ikhwan Lubis, and Aisyah Sjahrony, Title: "Integration of Science and Innovation of Digital Approaches in Islamic Education Mendepani Era of Industrial Revolution 4.0 at Universiti Kebangsaan Malaysia," Year: 2022	Innovative strategies, approaches, methods, and techniques in education through the use of digital technology, such as blended learning, i-Folio, and Massive Open Online Courses (MOOC), help make teaching and learning easier and more enjoyable.	The use of modern technology must be balanced with the formation of noble morals. Integration of science, pedagogy, and a comprehensive educational approach to achieve learning objectives that include spiritual, intellectual, emotional, physical, and social aspects.

TABLE 2. CHALLENGES OF DIGITALIZATION IN PRIMARY EDUCATION

	Challenges of Digitalization in Basic Education		
No.	Author, Title, and year of Article	Problems	Results
1	Author: S. H. Bayley, Title: "Learning for adaptation and 21st-century skills: Evidence of pupils' flexibility in Rwandan primary schools," Year: 2022	21st century skills in elementary school children need to be improved, especially after the covid-19 pandemic	Not suited to the situation of a poor country like Ruwanda that has limited resources.
2	Author: Subur Subur, Title: "Online Learning on the Covid-19 Pandemic to Create Educational Access Inequality," Year: 2021	This research focuses on the experiences of students from economically disadvantaged families in accessing education.	Limited learning tools, parental support and lack of social interaction affect student motivation and learning effectiveness
3	Author:Ina Murni Hashim,	inequality in the use of and access to technology	The causes of inequality are

	Challenges of Digitalization in Basic Education		
No.	Author, Title, and year of Article	Problems	Results
	Title: "The Digital Divide in the Education Sector: A Systematic Review," Year: 2024	and realizing the phenomenon of digital inequality	socioeconomics, skills and proficiency, infrastructure and facilities, attitudes and behaviors, and sociodemographics.
4	Authors: Khalissafri Mohd Haslin and Mohd Isa HAmzah, Title: "Digitalization of Education : Readiness and Challenges for Students in Learning [Digitalization of Education: Readiness and Challenges for Students in Learning], Year: 2023	Difficulty in accessing learning resources and inadequate internet access.	Education must evolve along with technological advances and the needs of society, ensuring that any changes or innovations in the education system are relevant to the times and can support students' progress in various aspects of life.

B. Discussion

21st century learning demands the importance of adapting to technological developments and global skills. The opportunities for digitization in learning to improve 21st century skills are greater than the challenges faced. This can be seen from the results of the categorization of article findings which explain that opportunities for digitalization in the educational aspect can be implemented based on the philosophical foundations of progressivism, and pragmatism. [2]. In the view of these philosophies, technological advances in education will motivate schools to be more modern and innovative. Digitalization of education certainly has an impact on the proficiency of teachers and students in learning and teaching. Teachers are skilled at teaching through digital applications, students are able to improve their critical thinking, creative, problem-solving, and other 21st century skills [20]. [20]. As with the application of the Blended Learning Model (MBL), this model helps students to gain meaningful learning through flexible online information and communication technology, reduced classroom crowding, and planned teaching and learning experiences. [23]. Through blanded learning, it is expected to be able to prepare a learning environment that can achieve student competencies.

Digitalization can encourage schools to implement digital-based learning to keep up with technological developments. Teachers and students are required to be digitally literate. In Malaysia, learning digilization opportunities are implemented through the implementation of DELIMa (Digital Educational

Learning Initiative Malaysia). [24], MOOC (Massive Open Online Course) and Artificial Intelligence in learning. [25]. In Indonesia, MOOC has also been implemented, as an educational method that utilizes online technology to provide global and open access to learning to a large number of participants. In the Southeast Asian region, with its large population and vast territory, the use of MOOCs offers great potential to expand access to education, especially in a country like Indonesia which has a very large population. [26]

Digitalization of education through MOOC is able to increase access and availability of instructors and learning resources. Through MOOC application technology, learning resources are more extensive to various learning materials. Other online platform technologies such as Khan Academy, Duolingo, and various other learning applications allow students to access learning materials from various quality sources without being limited by time and place.

The use of technology in learning, the personalization of learning, is the ability to tailor learning materials to individual needs. With the use of adaptive software, students can learn at their own pace, thus increasing their understanding and interest in learning and enhancing 21st Century Skills such as collaboration and Global Interaction: Technology enables interaction between students in different parts of the world, opening up opportunities for collaborative learning internationally. For example, the use of collaboration apps such as Google Classroom allows students to work together on projects online, enriching their learning experience.

However, this process is not free from challenges. While digitization offers many opportunities, there are a number of challenges to be faced in its implementation in basic education:

Inequality in access to technology is one of the biggest challenges in digitizing education. There are still many remote areas and families with low economic conditions who find it difficult to provide adequate access to technology for their children. This inequality can exacerbate the education gap between students who have access and those who do not. [23].

Teachers' Digital Competence Limitations, when human resources, especially teachers, are often the main obstacle in the implementation of education digitalization. Many teachers have not been trained in using technology in learning effectively. Although digital devices are available, without adequate skills from teachers, technology cannot be optimally utilized. In addition, inadequate infrastructure such as internet access, inadequate hardware, so without good infrastructure support, digitization of education will not succeed. [5] [27] .

To achieve success in the digitization agenda of education at both primary and secondary levels, teachers are the most important component. Teachers are not only in charge of teaching, but also act as designers, mentors and experts who can be a reference for students in the implementation of the curriculum. Digital learning must be mastered by teachers to meet the needs of modern education. Digital learning should also provide opportunities and space for teachers to further develop their skills and knowledge. Therefore, teachers need to improve their knowledge and skills to apply digital learning. [24].

Innovations in educational strategies, approaches, methods, and techniques using digital technology such as blended learning, i-Folio, and Massive Open Online Courses (MOOC) help make the teaching and learning process easier and more enjoyable. Besides i-Folio and MOOC, online journals are also one of the efforts to complement the implementation of blended learning. [25].

Blended Learning at Universiti Kebangsaan Malaysia is a combination of face-to-face and online learning methods using digital technology as mentioned above. In addition to these two methods, the use of drone technology to record learning activities from different angles and difficult to see by students is also done. Applications such as Zoom and Google Meet also play a role in completing the development towards Industrial Revolution 4.0.

Digitalization in primary schools is a strategic step to prepare future generations who are ready to face the technological era. The implementation involves various approaches, one of which is the use of online platforms to facilitate students' access to teaching materials anytime and anywhere. In addition, teachers' competencies are also improved through training and workshops to ensure they can use technology effectively in the learning process. The school has also started to implement the Smart School concept, which uses information technology to create a modern and adaptive learning environment. The results of this implementation are significant, such as increased student motivation, creative thinking skills and the ability to collaborate. With digitization, learning becomes more flexible and is no longer bound to a specific time and space.

Digital learning oriented towards 21st century skills offers great opportunities. Technology can be integrated into the curriculum to enhance 4C skills (critical thinking, creativity, collaboration, and communication). Critical thinking skills are one of the important skills to develop, because Robert Ennis assumes (Sihotang, 2019) that a person's critical attitude is not enough just to be adept at inferring or arguing, but the ability to evaluate news/information (statements) is also needed. [24]

One of the government's efforts in improving these skills is to improve student literacy and numeracy. In Indonesia, this is implemented through the school

literacy movement (GLS). The School Literacy Movement can play a role in reducing the literacy gap between students. By providing equitable access and fair literacy opportunities for all students, the movement helps to address disparities that may occur due to social, economic or cultural factors. This contributes to inclusion and equity in education. [24].

In addition to 4C skills, through the digitalization of education, good character is developed in students. The importance of being a good citizen, must be able to use technology responsibly. Students must have knowledge, skills and awareness continuously in behaving and behaving to become proactive digital citizens. And the skills are obtained through strengthening digital literacy, in Malaysia implemented through Digital Citizenship Education Indirectly, digital citizenship awareness is a necessity that needs to be nurtured continuously to ensure the welfare of themselves and other digital users when using digital technology. [28]

IV. CONCLUSION

Digitalization in basic education provides significant opportunities to improve the quality of learning and prepare students for the challenges of the 21st century. However, challenges such as inequality in access to technology, limited digital competence of teachers and data security issues need to be addressed to ensure that digitalization can be implemented effectively and inclusively. Further research and collaborative efforts between the government, educational institutions and communities are needed to optimize the potential of digitalization in basic education.

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We suggest that you use a text box to insert a graphic (which is ideally a 300 dpi TIFF or EPS file, with all fonts embedded) because, in an MSW document, this method is somewhat more stable than directly inserting a picture.

Literature Study: Learning Videos as Interactive Learning

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Abstract- **This research aims to collect sufficient information about the development of learning videos as interactive learning media. The method used in this research is a literature study, namely collecting some information related to previous research that aims to answer the topic of developing learning videos as interactive learning media. The results of this study indicate that learning videos are included in interactive learning media and can be used in a variety of lessons and can help understanding, increase students' interest and motivation to learn, besides that they can be reviewed to improve students' understanding wherever and whenever, so they can improve their learning outcomes. This can be seen from the results of research on previously reviewed articles, which show the positive impact of using learning videos as interactive learning media.**

Keywords-Learning Video, Interactive Learning, Literature Study

I. INTRODUCTION

The learning process The learning process can be said to be a series of interactions between educators and students that occur in two directions and through active communication between the two. A process of interaction will run well if accompanied by an intermediary in the form of a tool known as media. What is meant by learning is a process of interaction between educators and students with learning resources. The interaction can be carried out face-to-face or remotely. The lack of learning information sources can hinder the achievement of the objectives of the learning process, for this reason a strategy is needed in the learning process, including by utilizing learning media as a tool in delivering it. [1].

Learning is everything that can be used to channel the sender's message to the receiver, so that it can stimulate the thoughts, feelings, attention and interest of students to learn. The use of appropriate learning media will have an impact on the effective and efficient learning process. therefore, to create optimal learning continuity, interesting and interactive learning media are needed in order to foster student interest and motivation to learn. [2].

Interactive learning media is learning media that can be used to increase learner interaction to be more active in learning activities. The main thing to improve learning media is to utilize technology. Moreover, compared to conventional learning, technology can enable the creation of more effective, enjoyable and efficient learning. Besides the use of learning media that uses technology in the 5.0 era which is the center of attention by students is learning media through a video. [3].

Video is one of the interactive media that can be used in the learning process. Meanwhile, what is meant by interactive learning video is learning media that is presented audio-visually (images and sound) which involves students actively so that students do not just see or listen to the material in the media. [4]. Another understanding of interactive video is learning media in which it combines elements of sound, motion, images, text or graphics that are interactive to connect the learning media with its use [5]. [5]. In interactive videos, as Yahya said, that a medium is said to be interactive if there is involvement between students and the media, so that students do not just see or listen to the material in the media.[5]

The advantages of interactive learning videos are to provide a more realistic model to students so that they are able to play an active role in learning. [4]. Apart from that, children's interest in learning videos will also increase learning motivation in children. Based on previous research, it can be seen in the presentation of interesting media images and animations, making it easier for children to remember the material, children look enthusiastic about learning by using interactive learning multimedia. [6].

So it can be concluded that this learning video media presents visualization and audio that can encourage students to understand a learning message quickly, because indirectly students will be imagined and pictured visually. Learning media using video can be used for various abilities of children in receiving learning, because learning videos present visualization, audio and some movements in certain videos, so that they can be easily understood by students.

Based on this description, through a literature study of learning videos as interactive learning media, it is hoped that learning videos can be an alternative media that can be implemented in any subject and level of education, especially at the elementary school level.

II.   METHOD

The research method in this writing is a literature study that can be from several published journals. Literature study research can be done by collecting several references consisting of previous research, article and journal results, then compiled to draw conclusions. Another understanding of literature study is to look for theoretical references that are relevant to the case or problem found. These references can be sought from books, journals, research report articles and sites on the internet. The output of this literature study is the collection of references that are relevant to the problem formulation. [7]. The results of the research reviewed regarding learning videos as interactive learning media for the last five years (2020-2024).

III.   RESULTS AND DISCUSSION

Learning media are tools, methods and techniques used in order to further streamline communication and interaction between educators and students in the education and teaching process at school. Learning media is something that can convey information or messages conveyed during the teaching and learning process so that it can increase students' understanding. There are so many learning media today, both in using images, visual media, audio media packaged into a learning video. Through the use of learning videos, students will more easily understand the content of learning and be able to improve student learning outcomes. [8].

Video is a technology designed to capture, record, process, transmit and organize the movement of images. A video is an audio-visual form that contains objects and original or transmitted sound. Video has the advantage of clearly depicting moving objects complemented by sound and a unique appeal. Often videos are used as a means of documentation or entertainment, but they can also be used for educational purposes. Videos can also display information, illustrate processes, and explain complex concepts. [3].

Interactive learning is a learning system that emphasizes the process of interaction or reciprocity between educators and students actively during the learning process. Some of the research and development carried out in 2020-2024 that discusses learning videos as interactive learning media will be presented in table. 1 below.

Table.1

No.	Author	Title
1	[1]	Technology-Based Learning Media as a Learning Innovation in the Era of the Industry 4.0 Revolution
2	[9]	Development of Multimedia-based Interactive Video Mathematics Learning Media
3	[4]	Use of Interactive Learning Video Media Based on Nearpod Application on Speed Material in Elementary School
4	[10]	Use of Interactive Video as a Learning Media during Pandemic
5	[11]	Development of Interactive Video Learning Media Based on Sparkol Videoscribe Application on Theme 3 Class III
6	[12]	Utilization of Interactive Video as Learning Media in Online Learning Assistance Activities in the New Order Period
7	[13]	Utilization of Learning Video "Leadership of Khulafaur Rashidin" as Islamic Politics Learning Media for Elementary Students
8	[6]	Interactive Multimedia-Based Learning Video in Improving Early Childhood Listening Skills
9	[14]	Development of Interactive Video Media on the Learning of Spherical Buildings for Elementary Students
10	[15]	Bibliometric Analysis of the Use of Learning Videos in Elementary Schools in 2013-2022 Using VOSViewer Application
11	[16]	Learning Video Media on the Theme of Clean and Healthy Living to Improve Learning Outcomes of Elementary School Students
12	[17]	Application of Video Animation as an Interactive Learning Media for Elementary School Students (Literature Study)

Based on Table. 1 above from the twelve research articles used it can be concluded that learning video media at the elementary school level can be used in a variety of subjects, and a variety of learning models which are certainly useful for facilitating students' understanding and being able to increase students' knowledge.

Learning videos can be said to be an active learning media because they are able to attract students' interest and motivation to learn and are easy to understand and can help students when studying at home [14]. [14]. The scope of learning videos is very broad, with this breadth it is hoped that teachers will be able to choose and sort well the learning videos that are suitable for the subjects that will be conveyed to students.

Technological advances certainly help us in making learning more interesting, one of which we can easily get learning videos from various kinds of social media such as YouTube, Instagram, TikTok and so on. The learning videos intended to create interactive learning can be in the form of animated videos, advice videos, historical videos, videos about nature, videos about

culture and social life in society and many more. This can be utilized well by educators, especially teachers, to convey learning by utilizing the sophistication of today's technology, one of which is learning video media that is easily available.

Research results from learning video articles that have been written previously, state that learning videos are learning media that can facilitate educators and students. For educators, they can easily get good teaching media to create interesting and easy-to-deliver learning, while for students they are able to understand subjects, increase learning interest, motivation and student learning outcomes. Based on the research results of previous articles that show the positive impact of using video media in learning, it can be said that learning video media is favored by students and is widely used by educators because of the convenience and flexibility provided by this learning video media.

IV. CONCLUSION

In a learning process, of course, it will not be separated from a medium, because the media is a means or intermediary for teachers in transferring knowledge to their students. In addition, educators are required to create interesting learning innovations because they adjust to the pace of technological development so that they are able to implement learning media that can adapt to the times, one of which is learning media. This learning video media is very suitable for use especially at the elementary school level to create an interactive learning atmosphere, because learning videos can be easily obtained and easily understood by students and increase their interest in learning and can be understood and learned anywhere and anytime.

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Implementation of character education and its implications for the formation of Indonesian students' character

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Abstract — Character education is the main focus in the Independent Curriculum implemented in Indonesia. This study aims to explore the implementation of character education based on the Pancasila Student Profile and its impact on the formation of students' character values. Through learning methods such as Project-Based Learning (PjBL) and Problem-Based Learning (PBL), students are encouraged to actively participate in the learning process that not only improves academic understanding but also character. The results of the study indicate that the implementation of character education in the Independent Curriculum has a positive impact, including increasing responsibility, cooperation, and empathy among students. However, challenges such as the need for ongoing teacher training and adequate infrastructure support still need to be addressed. Recommendations for further research are also proposed to measure the effectiveness of character education in the context of the Independent Curriculum.

Keywords

Character Education, Independent Curriculum, Pancasila Student Profile, Project-Based Learning, Problem-Based Learning, Student Character Formation.

I. INTRODUCTION

Character education plays a very important role in shaping the morals and ethics of the younger generation. In the context of a society that continues to develop with various social, political, and technological challenges, the need for a generation that is not only intellectually intelligent but also has strong morals and ethics is becoming increasingly urgent. Character education plays a role in shaping individuals with integrity, who are able to work together, have a sense of responsibility, and respect diversity. Through character education, students are invited to understand the noble values that will be their provisions in living life in society.

In Indonesia, the concept of character education has undergone significant development. Since its introduction in the national curriculum, character education has continued to receive special attention from the government as part of a grand vision to build a moral and cultured nation. The 2013 Curriculum, for example, has included character education as one of the main components in developing student competencies. Values such as religiosity, independence, mutual cooperation, and nationality are integrated into various subjects. However, over time, the need has emerged to develop a more adaptive and relevant approach to character education with changing times, especially with the challenges of digital technology developments and the influence of globalization.

This curriculum is designed to support various aspects of education, including in terms of development assessment and character education. The approach applied in the Merdeka Curriculum is more inclusive and contextual, which aims to provide diverse and relevant learning experiences for students. The

goal is to develop student competencies not only in terms of academic knowledge, but also in character building and positive attitudes that they carry into the future (Harahap, Pangaribuan, & Faisal, 2023). Character according to Thomas Lickona is a person's natural nature in responding to situations morally. Character education according to Thomas Lickona is education to shape a person's personality through moral education, the results of which are seen in a person's real actions, namely good behavior, honesty, responsibility, respect for the rights of others, hard work and so on (Lickona, 1991).

Responding to these needs, the Indonesian government introduced the Independent Curriculum, one of the goals of which is to strengthen character education. The Independent Curriculum is designed to be more flexible and student-centered, allowing them to develop their abilities and character through contextual and experience-based learning. One of the important elements in the Independent Curriculum is the *Pancasila Student Profile* , which includes six main dimensions: faith and devotion to God Almighty and noble character, independence, critical thinking, creativity, mutual cooperation, and global diversity. Through this approach, character education is not only applied in learning materials, but also in students' daily activities in the school environment. It is hoped that the Independent Curriculum will be able to produce a generation that is not only competent, but also has a strong character as a reflection of the values of Pancasila (Rosa, Destian, Agustian, & Wahyudin, 2024).

Although several previous studies have explored the implementation of character education in the 2013 Curriculum, most of these studies have focused on an integrative approach in subject learning, without discussing in depth the impact of the curriculum on the formation of students' character outside the classroom. In addition, most previous studies have not investigated how the implementation of character education in the Independent Curriculum specifically plays a role in shaping the character dimensions contained in the Pancasila Student Profile. The lack of studies on the challenges of implementing character education in the context of the Independent Curriculum, especially in various regions with diverse socio-cultural backgrounds, also highlights the need for further research.

As research conducted by (Kadek, 2024)him concluded the Independent Curriculum adopts a holistic approach in assessment that supports students' personal growth. Character education is an essential component in this curriculum to foster positive values and student behavior in everyday life. However, there are challenges such as the need for teacher training for effective and consistent integration of Character Education in the learning and assessment process.

In Indonesia, the Independent Curriculum is an adaptive response to the rapidly changing dynamics of education (Thana & Hanipah, 2023). This curriculum is designed with the main objective of accommodating various aspects of learning, including developmental assessment and character education. The approach taken by the Independent Curriculum is broader and contextual, with the aim of creating diverse and relevant learning experiences for students. This curriculum seeks to develop students' competencies not only in terms of academic knowledge, but also in forming strong character and positive attitudes (Harahap et al., 2023).

This study aims to fill this gap by comprehensively examining how the implementation of character education in the Merdeka Curriculum can influence the formation of students' character in Indonesia. In addition, this study will identify the challenges faced in implementing the Merdeka Curriculum, as well as provide recommendations for improving character education more effectively in the future.

II. RESEARCH METHOD

This study uses a qualitative method with a case study design. According to Bogdan and Taylor in the book (Bado, 2022), qualitative methodology is a research procedure that describes descriptive data in the form of written or spoken words from people or observed behavior. The selection of this qualitative method is based on the purpose of the study, namely to analyze how the implementation of Education

Charact... ...riculum ...this study us... ...is met... and Huberman model, which involves four interrelated processes: data collection, data reduction, data presentation, and drawing conclusions (Sugiyono, 2013).
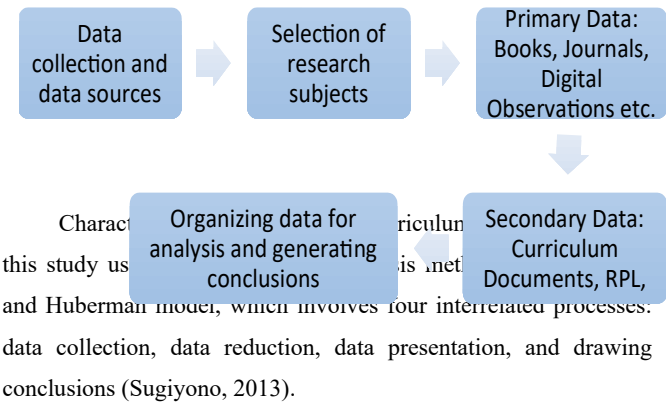
This diagram explains the flow of data collection methods used in research, starting from the planning stage to the final stage, namely data organization for analysis. The following is an explanation of each step in the diagram. The first stage is to identify relevant data sources for the research. These data sources

include various types of information needed to answer the research questions. Once the data sources are identified, the researcher selects the research subjects, namely individuals or groups who will be the main sources of information in data collection. The selection of these subjects is usually based on criteria that are relevant to the research objectives. Primary data is obtained directly from original sources, such as books, journals, or observations.

Digital observation refers to data collection conducted through digital media, which may involve online interviews or observation of online activities. Secondary data is data obtained from existing documents or reports, such as curriculum documents or Learning Implementation Plans (RPL). This data is used to provide additional context and strengthen the results obtained from the primary data. Once the primary and secondary data have been collected, they are organized so that they can be analyzed. This organization involves classifying, arranging, and preparing the data to produce conclusions that are relevant to the research objectives.

III. RESULTS AND DISCUSSION
Implementation of Character Education in the Independent Curriculum

Character education in the Independent Curriculum is a strategic step to form students who are not only academically intelligent but also have integrity and positive values. In this context, the integration of character values in every subject and school activity is very important. Teachers are expected to be able to prepare learning plans that emphasize character values, not only focusing on academic material alone. For example, in the Indonesian language subject, students can be invited to read and analyze texts that contain moral values, such as honesty, cooperation, and responsibility. Class discussions can be directed to discuss how these values can be applied in everyday life (Ministry of Education and Culture, 2021).

A multidisciplinary approach is also needed to integrate character education. In Natural Science (IPA) lessons, for example, students can learn about biodiversity and the importance of protecting the environment as part of social responsibility. This not only teaches scientific concepts but also instills ecological awareness as part of the desired character (Prasetyo, 2022). In addition, co-curricular and extracurricular activities play an important role in strengthening character values. Activities such as scouts, sports, and arts can teach students about cooperation, discipline, and leadership. Through interaction in these various activities, students are expected to internalize character values that are in line with the formal education they receive.

Furthermore, the use of character strengthening projects through project-based learning activities (PBL) is an effective method in implementing character education in the Merdeka Curriculum. Through this project, students can learn actively and collaboratively, and apply character values in real contexts. For example, students can be divided into groups to carry out projects related to social issues in their environment, such as raising awareness about environmental cleanliness or fundraising programs to help underprivileged communities. In this project, students not only learn about social responsibility, but also about cooperation, communication, and empathy (Thomas, 2000).

Holding community service activities as part of the curriculum can also be an effective means of shaping students' character. Activities such as social service, teaching underprivileged children, or greening programs in the surrounding environment can provide students with direct experience of the importance of giving and sharing. This strengthens the sense of social concern and solidarity that are part of character education (Mardiana, 2023). In addition, Thomas Lickona (1991) stated the importance of character education that focuses on developing moral values as part of a holistic education. After completing a project, it is important for students to reflect and discuss the experiences they have had. This helps them understand how the character values they have learned can be applied in everyday life. This discussion also creates a space for students to share views and learn from each other's experiences, thereby deepening their understanding of good character (Dewi, 2020).

Thus, the implementation of character education in the Merdeka Curriculum through the integration of character values in each subject and the use of character strengthening projects is a very strategic step to form a generation that is not only academically intelligent, but also has a strong character. Success in implementing character education requires commitment from all parties, including teachers, students, parents, and the community, to create an environment that supports positive character development.

Learning Strategies That Support Character Education

Character education in the Independent Curriculum is greatly influenced by the learning methods used. Two methods that have strong potential in encouraging the formation of student character are **Project-Based Learning (PjBL)** and **Problem-Based Learning (PBL)** .

1. **Project Based Learning (PjBL)**

Allows students to engage in real-world projects that require them to collaborate and apply a variety of skills to achieve a specific goal. Through this process, students learn to manage responsibilities, work in teams, and solve problems—all important aspects of good character. Involvement in projects also gives

students the opportunity to explore their interests and develop personal initiative (Thomas, 2000).

2. **Problem Based Learning (PBL)**

invites students to solve problems that are relevant to everyday life, which encourages them to think critically and creatively. In PBL, students learn to collaborate and communicate with their peers, which can improve their social skills and help them understand the importance of empathy and cooperation (Prasetyo, 2022).

In addition, experiential learning is essential in internalizing character values. By engaging directly in meaningful activities, students can feel the impact of their actions and more easily understand the values being taught.

Development of Character Education in Schools

The development of character education in schools in Indonesia shows varying levels of acceptance and readiness for the new approach of the Merdeka Curriculum. Several schools have shown high enthusiasm for adopting this curriculum, given its relevance to current educational needs.

Infrastructure support and teacher training also play an important role in strengthening students' character values. Schools that have adequate facilities and provide training for teachers to implement the new curriculum tend to be more successful in integrating character education into daily learning. This training not only helps teachers understand the curriculum, but also provides them with the skills to apply methods that support students' character development.

Implications of Independent Curriculum on Student Character Formation

The Independent Curriculum has a positive impact on the formation of students' character, including:

a. **Positive Impact**

   o Increased student responsibility and initiative through more independent learning. Students are encouraged to take an active role in the learning process, which increases their self-confidence and responsibility for their own learning.

   o Development of social skills such as cooperation, communication, and empathy, which are very important in building interpersonal relationships and forming a harmonious society (Mardiana, 2023).

b. **Challenge**

   o The challenge for teachers is to change teaching methods to be more flexible and responsive to students' needs. This requires training and adaptation that is not always easy to implement.

   o Limited resources and facilities in some schools can hinder the optimal implementation of character education. Schools in remote areas often have difficulty in providing adequate facilities to support project-based learning.

   o Differences in adaptation between urban and rural schools can also affect the effectiveness of the Merdeka Curriculum implementation. Schools in urban areas may have more access to resources and support, while schools in rural areas often struggle with significant limitations.

The Role of Teachers, Parents, and the School Environment in Character Formation

The formation of student character is not only the responsibility of the school, but also involves the important role of teachers and parents. Collaboration between teachers and parents in supporting the development of student character is very important. Good communication between the two parties allows for harmony in teaching character values both at school and at home.

In addition, a conducive school environment functions as a support for character formation. Schools that create a positive atmosphere and support cooperation and respect for differences will help students develop positive values needed in everyday life. By creating an inclusive and supportive learning community, schools can contribute significantly to the development of student character (Dewi, 2020).

IV. CONCLUSION

Character education is one of the most important aspects in shaping the nation's next generation. In this context, **the Independent Curriculum** plays a crucial role in strengthening students' character education. By integrating character values into the learning process, the Independent Curriculum not only focuses on academic achievement, but also forms students' characters in accordance with the Pancasila Student Profile. The implementation of character education based on Pancasila values has shown a positive impact on the formation of students' character, by increasing their sense of responsibility, cooperation, and empathy among them.

However, to achieve optimal results, more sustained efforts are needed. Therefore, some recommendations can be proposed:

1. In order for teachers to implement character education effectively, ongoing training programs are needed. This training should include learning strategies and methods that support student character development, so that teachers can better implement the curriculum.

2. Support from the government in terms of providing facilities and assistance during the implementation of the Merdeka Curriculum is very important. Investment in educational infrastructure, as well as adequate resources, will support the success of character education in schools.

3. Further research is needed on measuring the effectiveness of character education in the Independent Curriculum. This research will help in evaluating the impact of character education and provide useful information for future curriculum improvement and development.

By implementing these recommendations, it is hoped that character education in the Merdeka Curriculum can be more optimal, so that it can produce students who are not only academically intelligent, but also have strong characters and are ready to face challenges in the future.

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DEVELOPMENT OF TEST ASSESSMENTS TO MEASURE HIGHER ORDER THINKING SKILLS (HOTS) OF HIGH SCHOOL STUDENTS

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Abstract—**This research aims to determine the results of the instrument needs analysis, the feasibility category of the Higher Order Thinking Skills assessment instrument reviewed from expert validation and instrument trial results, and to ascertain the level of higher-order thinking skills of students measured using the Higher Order Thinking Skills assessment instrument. (HOTS). The data collection techniques used are qualitative and quantitative data collection techniques. Participants included 243 students from high schools and equivalent institutions in Garut Regency. This research produces 2 authentic assessments, namely critical thinking and creative thinking, which have expert validity in terms of content, construct, and language that are suitable for use. For critical thinking, it consists of 10 items categorized as valid, with a Cronbach's alpha of 0.808 and 0.567, indicating very high and moderate reliability, respectively. The discrimination power is mostly categorized as good, and the difficulty level is mostly categorized as easy. For creative thinking, out of 8 items, most are valid, with a Cronbach's alpha of 0.653 and 0.427, indicating high and moderate reliability, respectively. The discrimination power is mostly categorized as good, and the difficulty level is mostly categorized as moderate.**

Keywords— Development, Test Asssessment, High level thinking

I. INTRODUCTION

The importance of higher-order thinking skills is expressed by Fensham and Alberto (2013) as essential for competing in the workplace and personal life. Therefore, one of the indicators of educational success is that students possess good higher-order thinking skills [1]. 21st-century learning must train students to possess 4 competencies (4C), namely critical thinking, communication, collaboration, and creativity, which are expected to serve as a foundation for students in continuing their lives after completing their education in school [2].

The main goal of 21st-century learning is to develop and enhance students' higher-order thinking skills [3]. One indicator of improving human resources (HR) in the education system is students with good HOTS, as the main objective of 21st-century learning is to develop and enhance students' HOTS [4]. HOTS has several aspects, including applying, analyzing, evaluating, and creating [5]. Additionally, critical and creative thinking skills also fall under HOTS and problem-solving [6].

Evaluation is very important to determine the extent to which learning objectives have been achieved in education [7]. Assessment instruments are the most crucial part to understand the quality of learning and to measure students' skills [8]. High-level thinking skills can be cultivated by having students work on evaluation questions to stimulate their thinking abilities, enabling them to solve problems encountered in the learning process and even in daily life [9].

The ability of Indonesian students to solve problems that measure higher-order thinking skills is very lacking [10]. Besides low learning outcomes, the learning process that does not reveal students' higher-order thinking skills is one of the problems that often arises in physics education. As a result, students are unable to compete in the field of science to generate new ideas [11].

Students who are trained to think critically through good assessments will enhance their problem-solving skills, thereby improving their overall quality [12]. The capacity to link, and transform prior information and experiences to think critically and creatively in order to solve issues in novel contexts is know as higher order thinking skill or HOTS [13]. HOTS assessment is an evaluation that presents test questions at a high cognitive level to students, thereby enhancing their critical and creative thinking abilities [14]. Barnett and Francis state that the provision of HOTS questions can help students understand the material presented in greater depth [16].

The use of the HOTS assessment tool can be used as a means of improving students' comprehension of the material and as a tool for teachers to assess students' learning [17]. Stiggins also explains that assessment, or asesmen, is a process, a student's learning outcome, and a kemajuan. On the other hand, Kumano Asasmen describes this as "the process of collecting data with shows the development of learning." Accordingly, it can be said that asasmen is a suitable method for evaluating the student learning process. Tes yang baik doesn't have to be a regular employee; it also needs to be tenaga, leisurely, mketelitian, and ketakunan. Tes hendaknya is conducted well and has a strong connection to the goal of education or learning, whether as a subject that needs to be discussed or as a lesson that has to be taught [18].

II. METHOD

The research methodology used is a mixed method, whereby qualitative research serves as an example of ahli validation while quantitative research serves as the results of student assessments following research. Participation in the study is carried out by two groups: 102 students for the first group and 141 students for the second group. The instrument used in this study is the validity of the lembar. The data analysis techniques used in this study are validity, reliability, diferentianting power, and difficulty level.
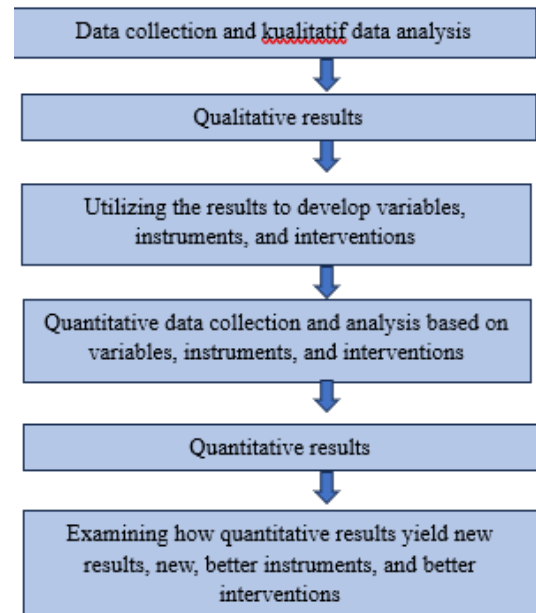
Picture 1. 1 Method of diagram mixing

III. RESULTS AND DISCUSSION

This study uses the campuran (mixed method) approach, which aims to improve the students' critical thinking skills. Data is derived from the results of the uraian test that the students took. The purpose of the uji ahli (validator) is to determine if the instrument being used is valid or not before the test results are analyzed. The seven people who make up the validator are the doctor and the guru. Two types of uji coba are conducted here: small-scale and large-scale. There are ten soal tes.

- Critical Thinking
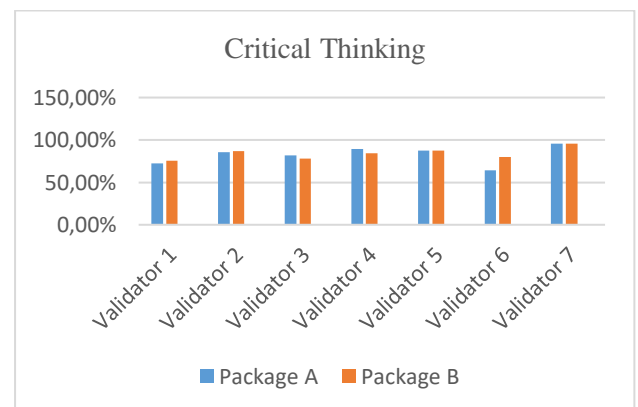
- Thinking Creatively
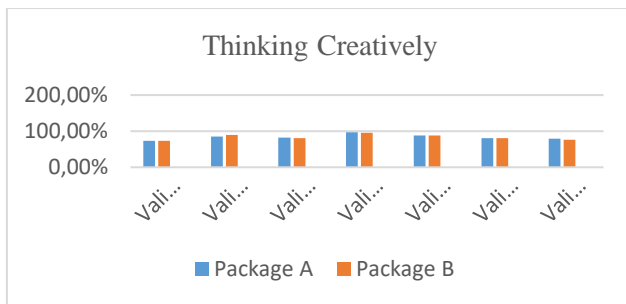
Picture 1. 2 Validation results from the validator Critical Thinking and Thinking Creatively

According to the diagram above, there are indicators that do not yet explain daily phenomena, concepts and writing are sound, and they can be used to resume writing.

1. **Small field trial**

The results of the small-scale test by distributing critical thinking skills test questions for 11th-grade students, totaling 102 students. The obtained scores will be tested for validity and reliability, discrimination power, and difficulty level.

a. Validity test

Validity testing is a measurement or observation that signifies the principle of instrument reliability in data collection. Validity testing is intended to measure how accurately a test performs its function, whether the measurement tool that has been developed truly measures what needs to be measured [19].

-   Critical Thinking
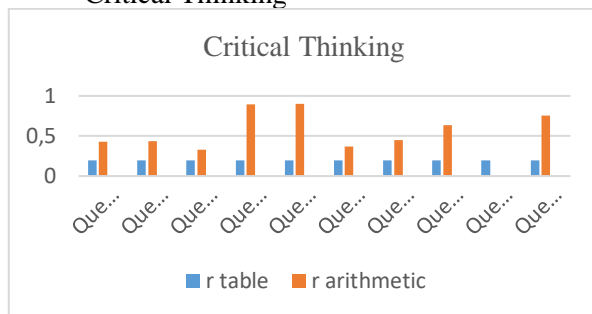
-   Thinking Creatively
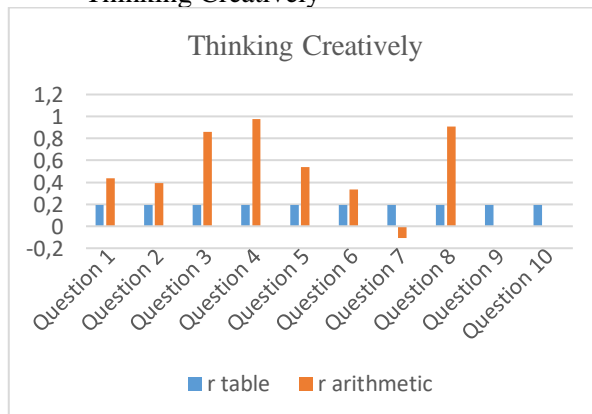
Picture 1. 3 Validity test Crtical Thinking &

Thinking Creatively

b. Reliability test

Reliability is the consistency of measurement or observation results when facts or realities of life can be measured or observed repeatedly at different times. The most commonly used reliability test is the Cronbach's Alpha coefficient. A good reliability test is recommended to have a Cronbach's alpha value of 0.6 or higher [20].

Table 1. 1 Reliability test Crtical Thinking & Thinking Creatively

-   Critical Thinking

PACKAGE A	PACKAGE B	N of Items
Cronbach's Alpha	Cronbach's Alpha	5
0,692	0,747	

-   Thinking Creatively

PACKAGE A	PACKAGE B	N of Items
Cronbach's Alpha	Cronbach's Alpha	4
0,552	0,328	

c. Differentiating Power

The distinguishing power in a test aims to identify the differences in students' abilities. The higher the index possessed by a test item, the better the test item is because it has the ability to differentiate between the abilities of smart and less smart students [21]. Conversely, if the index possessed by a test item is lower, then the item is less effective at distinguishing between the abilities of smart and less smart students [22].

-   Critical Thinking
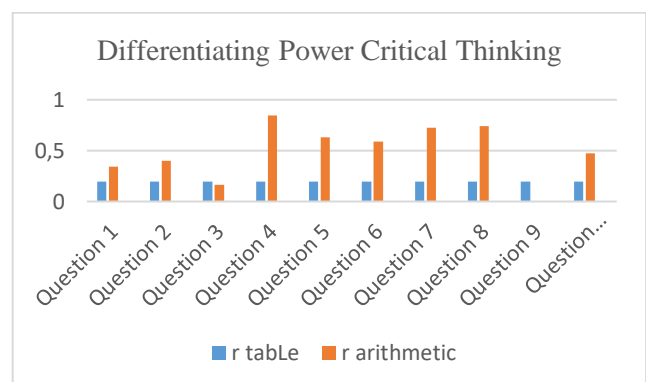
-   Thinking Creatively
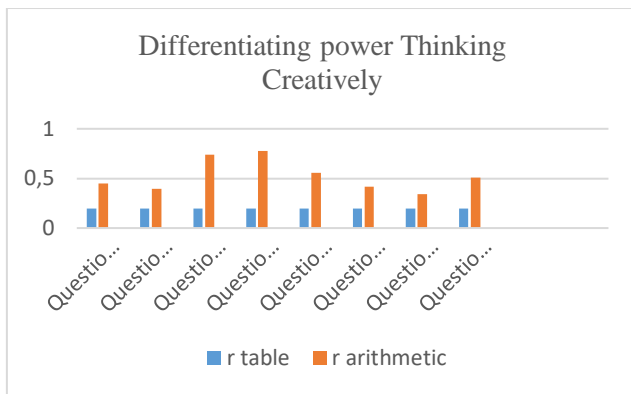
Picture 1. 4 Differentiating Power Crtical Thinking & Thinking Creatively
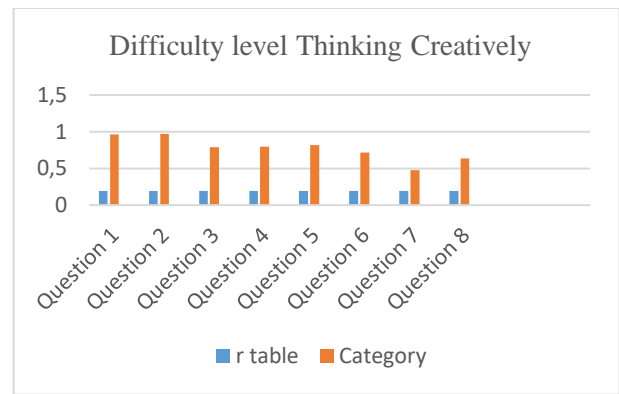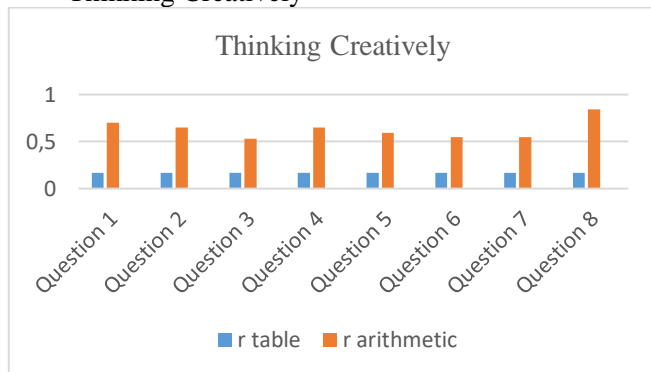

Picture 1. 5 Difficulty Level Crtical Thinking & Thinking Creatively

d. Difficulty level

The difficulty level of a test item or question (symbolized by P) is the proportion of all students who answer correctly on that test item or question. The difficulty level is a ratio or parameter that describes how difficult the test question is for the examinees to provide a correct answer to a particular question [22].The point biserial correlation coefficient essentially shows the relationship between the scores of an item. A high coefficient value indicates that students can correctly answer a question. Conversely, a low coefficient value indicates that the item cannot be answered correctly. A higher biserial correlation coefficient value indicates that an item has a good difficulty index [23].

- Critical Thinking
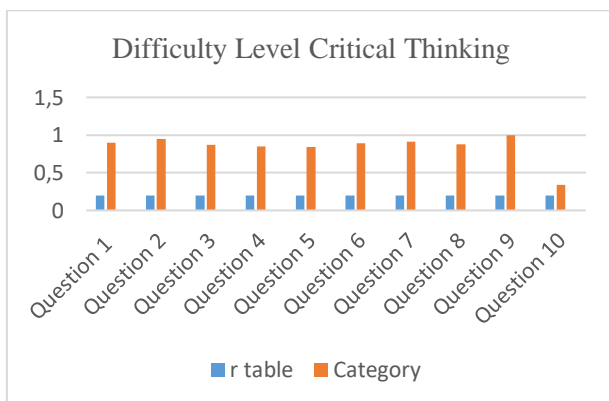
- Thinking Creatively

2. Large-scale field trial

The results of the small-scale test by distributing the Critical Thinking Skills test questions for 11th grade students amounted to 141 students. The obtained scores will be tested for validity and reliability, discriminative power, and difficulty level.

a. Validity test

Validity testing is a test that functions to determine whether a measuring instrument is valid (accurate) or not valid. The measuring instrument referred to here consists of the questions included in the questionnaire [24]. If the questions on an instrument may provide information about what the instrument is considered valid [24]. The purpose of the validity test is to determine the extent to which the actual data occurring in the object aligns with the data reported by the researcher. If every item on a questionnaire can be utilized as a bridge to expose and comprehend what the questionnaire is asking, then the validity test of the questionnaire can be deemed valid [25].

- Critical Thinking
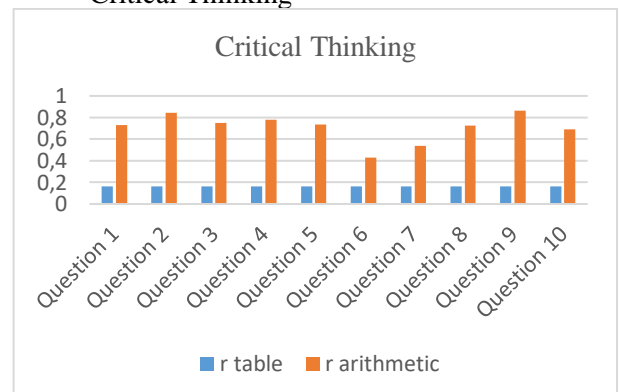
- Thinking Creatively
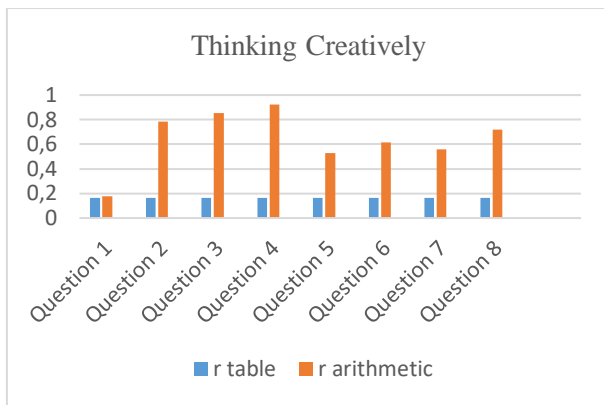
Picture 1. 6 Validity test Crtical Thinking & Thinking Creatively

b. Reliability Test

Table 1. 2 Reliability test Critical Thinking & Thinking Creatively

- Critical Thinking

PACKAGE A	PACKAGE B	N of Items
Cronbach's Alpha	Cronbach's Alpha	5
0,808	0,567	

- Thinking Creatively

PACKAGE A	PACKAGE B	N of Items
Cronbach's Alpha	Cronbach's Alpha	4
0,653	0,427	

Measurements that can generate trustworthy data are considered to have high reliability [26]. When an instrument can produce reliable data, it is considered dependable [27]. Reliability which is closely connected to consistency of repetitio, is the degree to which the measurement of a phenomenon or data gives stability to the results Reliability concerns the extent to which the measurement of a phenomenon or data provides stability to the results. For instance, if retesting under various circumtances still produces the same result, the test is considered reliable [28]. A measure of a measuring device's reliability indicates how useful it is. This demonstrates how consistent data measurement result are when they are conducted twice or more on the same data using the same measuring device [29].

c. Differentiating Power

The purpose of the discrimination power test is to determine whether a test can show differences between students in the upper class and those in the lower class. The assumption of the discrimination power test is that questions that can be answered by students in the upper class should not be answerable by students in the lower class [30].

- Critical Thinking
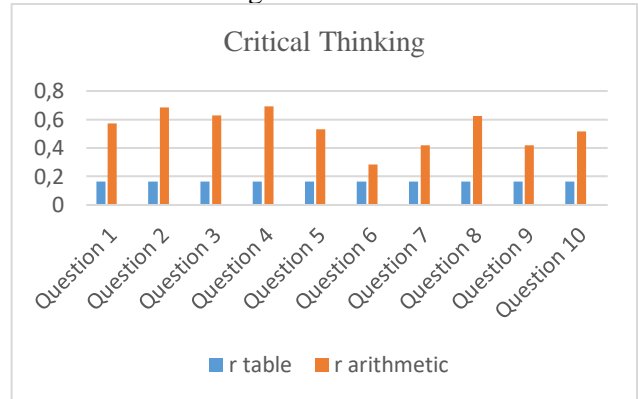
- Thinking Creatively
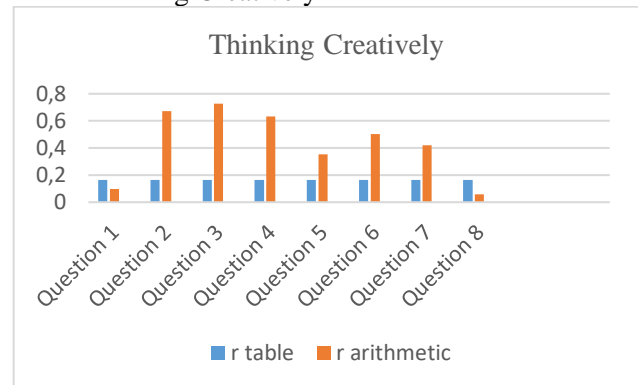
Picture 1. 8 Differentiating Power Crtical Thinking & Thinking Creatively

d. Difficulty level

One of the efforts to obtain good test items is by considering the balance of the number of questions based on their difficulty levels. The balance of the questions is reviewed based on the presence of relatively easy, moderate, and difficult questions [31]. The difficulty level of a question can be assessed based on the students' ability to answer, not from the teacher's perspective as the question maker, because what is easy for the teacher may not be easy for the students. The analysis of the question difficulty level reviews each question item based on its difficulty, whether it falls into the easy, medium, or hard category [31]. In line with Rajagukguk (2023), who stated that question difficulty refers to how easy or difficult a question is for students. A question can be considered good if it is neither too easy nor too difficult.

- Critical Thinking

Critical Thinking

- Thinking Creatively
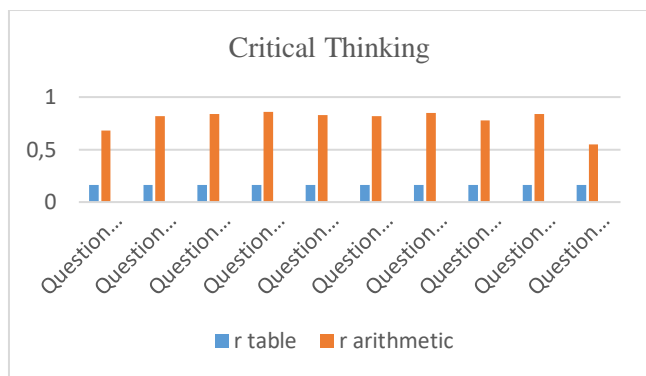
Thinking Creatively

Picture 1. 9 Difficulty Level Critical Thinking & Thinking Creatively

The calculation of the difficulty level of a question is a measure of how difficult a question is. If a question has a balanced (proportional) difficulty level, it can be said that the question is good [32].

Based on the results and categories of Students' Critical Thinking Skills overall, Package A obtained a total of 11378 with an average of 80.69, categorized as "Very Good," while Package B obtained a total of 11236 with an average of 79.68, also categorized as "Very Good." The results and categories of Students' Creative Thinking Skills overall, Package A obtained a total of 9295 with an average of 65.92, categorized as "Very Good," while Package B obtained a total of 10039 with an average of 71.19, categorized as "Good."

IV. CONCLUSION

This development research produces descriptive tests for critical thinking and creative thinking. This research was conducted in the XI IPA class of a high school. The feasibility of the developed product was validated by validators, obtaining final results with an average percentage of 72.61 - 100%. The research trials were conducted twice, once on a small scale with 102 students and once on a large scale with 141 students. The large-scale validity test of critical thinking skills, which contained 10 questions, was categorized as valid, while the reliability test of critical thinking packages A and B was categorized as very high and moderate. Out of the 10 critical thinking

questions, 9 were declared valid and suitable for use. The results of the validity and reliability tests in the research can be concluded to be in the very feasible category, making it suitable for trials. The overall results of the students' critical thinking response calculations received an average percentage score of 80.69 with the category "very good," while package B received a percentage score of 79.68 with the category "very good." The overall results and categories of Students' Creative Thinking Skills were obtained in Package A with a total of 9295 and an average of 65.92 with the criteria "Very Good," while Package B had a total of 10039 and an average of 71.19 with the criteria "Good."

ACKNOWLEDGMENT

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Strategy For Strengthening Literacy Programs In An Effort To Optimize Rapor Pendidikan In Elementary Schools

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Abstract— The purpose of this study is to determine the strategy of SDIT Al Bayyinah in efforts to optimize quality learning so that they get a good Rapor Pendidikan. This study uses a descriptive method with a qualitative approach. The data collected are analyzed inductively and the results are presented in descriptive form, namely in the form of a series of sentences that describe the real conditions in the field. This study emphasizes the process of collecting research data used to describe the real state of the phenomena in the field. This study only captures what happens in the field, which is then presented in the form of a report as it is. This study aims to describe a situation, describe and illustrate literacy strengthening strategies in an effort to optimize national assessment activities. This research was conducted at SDIT AL Bayyinah Garut, West Java. The data collection techniques used in this study were by conducting observations, interviews, and documentation. The informants were the Principal, grade 5 teachers. While the data analysis techniques used in this study were: data reduction, data presentation, and data analysis. Result are Rapor Pendidikan is indeed not a report on the achievements of the educational unit, but a representative picture of the educational unit, at least the school can be measured whether its learning has made students understand or not. The results of this Rapor Pendidikan are certainly inseparable from the various efforts that have been made by SDIT Al Bayyinah in its learning, also in terms of developing its literacy program, this is also one of the supporting factors for its educational success which is shown by getting good grades on its education report card.

Keywords—Asesmen Kompetensi Minimum, Rapor Pendidikan

I. INTRODUCTION (HEADING 1)

The Ministry of Education and Culture implemented a new program in 2021, namely the Asesmen Nasional, which is a program to assess the quality of each school, madrasah, and equivalency program at the elementary and secondary levels. The purpose of this national assessment is to improve the quality of education, this is assessed based on the basic learning outcomes of students including basic literacy and numeracy competencies. Minister of Education and Culture (2020).

Assessment is an evaluation of the process and learning abilities of students, which can provide continuous feedback for improving student learning (Hifdzil et al., 2022). The National Assessment is an evaluation for mapping the quality of the education system at the elementary and secondary education unit levels using minimum competency assessment instruments, character surveys, and learning environment surveys (Ministry of Education, Culture, Research, and Technology, 2021). The National Assessment also aims to develop student competencies and character (Hidayah et al., 2021).

National Assessment consists of three instruments, namely Asesmen Kompetensi Minimum (AKM) which measures students' reading literacy and mathematical literacy (numeracy). AKM is intended to measure competency in depth, not just content mastery. Through AKM activities, students are expected to be able to improve their critical thinking skills through various texts and high-quality questions that are not just about mastering the material. The questions on the AKM exam have the highest level of difficulty or what is commonly called HOTS (High Order Thinking Skills) for both literacy and numeracy questions. This is a

challenge for both students and teachers to understand, work on, and teach the questions.

The second assessment is the Character Survey which measures attitudes, values, beliefs, and habits that reflect student character and the third assessment is the Learning Environment Survey which measures the quality of various aspects of input and the teaching and learning process in the classroom and at the education unit level.

The results of the assessment, the Education unit will receive an Rapor Pendidikan (Education Report Card). The Ministry of Education, Culture, Research and Technology officially launched the Rapor Pendidikan Platform in April 2022. The Rapor Pendidikan is a platform that provides data on evaluation results of the education system. Rapor Pendidikan itself has various benefits for teachers, schools, and education stakeholders. The benefits of the Rapor Pendidikan include: 1. The main reference as a basis for analysis, planning, and follow-up to improve the quality of education; 2. A platform to view the results of the National Assessment; 3. An objective and reliable data source where reports are presented automatically and integrated; 4. A measurement instrument that is useful as an evaluation of the education system as a whole for both internal and external evaluations; 5. A measuring instrument that is oriented towards the quality and equity of learning outcomes (output); 6. A centralized data presentation platform for education units. So that education units do not need to use various applications to view the data presented. https://www.detik.com/edu/sekolah/d-6302032/apa-itu-rapor-pendidikan-ini-pengertian-fitur-dan-cara-aksesnya.

Implementation in the field certainly experiences many obstacles, ranging from unpreparedness of facilities (computers), availability of internet networks, and understanding of human resources related to AKM. Various strategies are carried out by education providers, who do not have the means to borrow from teachers, parents of students and even rent from other schools, not to mention in remote areas, many students are not yet able to use IT. Moreover, the impact of the pandemic has also made student literacy low. However, because the impact of this assessment is quite influential, starting from getting BOS performance, even the results of this assessment are also correlated with accreditation scores. Thus, it is necessary to implement a national assessment optimization strategy so that education units can show their best quality and so that they can get optimal education report card results. That is why researchers are interested in studying school strategies in efforts to optimize national

assessment results properly and researchers conducted research at SDIT Al Bayyinah Garut because it is one of the schools with a fairly good education report card score and even received BOS Kinerja in 2023. The purpose of this study is to determine the strategy of SDIT Al Bayyinah in efforts to optimize quality learning so that they get a good Rapor Pendidikan.

II. METHOD

This study uses a descriptive method with a qualitative approach. The data collected are analyzed inductively and the results are presented in descriptive form, namely in the form of a series of sentences that describe the real conditions in the field. This study emphasizes the process of collecting research data used to describe the real state of the phenomena in the field. This study only captures what happens in the field, which is then presented in the form of a report as it is. This study aims to describe a situation, describe and illustrate literacy strengthening strategies in an effort to optimize national assessment activities. This research was conducted at SDIT AL Bayyinah Garut, West Java. The data collection techniques used in this study were by conducting observations, interviews, and documentation. The informants were the Principal, grade 5 teachers. While the data analysis techniques used in this study were: data reduction, data presentation, and data analysis

III. RESULTS AND DISCUSSION

A. SDIT AL Bayyinah Literacy Program
The results of this study indicate that SDIT Al Bayyinah is quite focused on literacy programs, even the excellence of this school is in its literacy program. The purpose of the SDIT Al-Bayyinah Literacy program is as an effort to increase interest in reading and develop character. With a good interest in reading is the first step to be able to master various other aspects. In addition, with the strengthening of the literacy program, it is hoped that all SDIT Al-Bayyinah residents can become literacy movers at school, at home, and in their environment.
The target of the School Literacy Movement is all SDIT Al-Bayyinah residents with the vision of GLS SDIT Al Bayyinah as a literate, noble, and intellectual school. The SDIT Al Bayyinah literacy program is as follows:
1. Daily habituation program: 15 minutes of reading before learning activities
2. Readathon: held once a month, attended by all school residents and held on the school field for 45 minutes
3. Making various works: scarptbooks, journal books, literacy trees, dioramas
4. Active in various literacy communities
5. Collaborating with the Regional Library and Archives Service of Kab. Garut: library visits, mobile cars

6. Participating in the 2021 and 2023 GLN Gareulis Jabar literacy challenges
7. Joining the Nyalanesia literacy community
8. Publishing reading books, poems and stories by students and teachers and with ISBN
9. Extracurricular "literacy club"
10. Cultural literacy by visiting cultural sites
11. Selection of Literacy Ambassadors
12. Implementing active learning, so that students are actively and critically involved
13. Practicing High Order Thinking Skill (HOTS) questions in mid-semester and final semester exam activities
14. Implementing P5 projects with various themes.

All program shows that various literacy programs are developed by the "SDIT Al-Bayyinah Literacy Development Team", then the program is arranged based on the ability level of each student, there are programs that are implemented by all students and teachers, and there are also those that are only carried out by several students.

B. AKM Results and Rapor Pendidikan SDIT AL Bayyinah

Fig. 1

SDIT Al Bayyinah education report card report for 2023

From the picture above, it can be seen that SDIT Al Bayyinah received a good literacy achievement (88.67) and has increased from the previous year. This shows that learning at SDIT Al Bayyinah is good and the literacy skills of its students are also good.

Fig. 2

Rapor Pendidikan

From the Education report card poster above, it can be seen that all assessment areas are green or in the good category, meaning that learning at SDIT Al Bayyinah is good and shows that the literacy skills of its students are also good. The results of this report card are of course used as data for improving the next program, schools must be able to analyze and make it a data-based reference in order to improve the quality of education as a whole. What needs to be done by SDIT Al Bayyinah in the future according to the direction of the Ministry of Education, Culture, Research and Technology is that schools only need to improve the results of indicator assessments by making new innovations to improve the assessment results in the following year.

The Education Report Card is indeed not a report on the achievements of the educational unit, but a representative picture of the educational unit, at least the school can be measured whether its learning has made students understand or not. The results of this education report card are certainly inseparable from the various efforts that have been made by SDIT Al Bayyinah in its learning, also in terms of developing its literacy program, this is also one of the supporting factors for its educational success which is shown by getting good grades on its education report card.

IV. CONCLUSION

Rapor Pendidikan is indeed not a report on the achievements of the education unit, but a representative picture of the education unit, at least the school can be measured whether its learning has made students understand or not. Schools also can use the Rapor Pendidikan as a reference in identifying problems, reflecting on their roots, and then improving the quality of education as a whole. In addition, the public can also

access the Rapor Pendidikan as an effort to work together to improve the quality of education.

Therefore, it is time for schools and teachers to innovate on learning components that can improve student learning outcomes which will affect the improvement in the quality of education expected through improving literacy and numeracy skills. One innovation that can be done by teachers is to develop and update learning methods that support the national assessment program.

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Literature Study: Learning Videos as Interactive Learning

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Abstract- **This research aims to collect sufficient information about the development of learning videos as interactive learning media. The method used in this research is a literature study, namely collecting some information related to previous research that aims to answer the topic of developing learning videos as interactive learning media. The results of this study indicate that learning videos are included in interactive learning media and can be used in a variety of lessons and can help understanding, increase students' interest and motivation to learn, besides that they can be reviewed to improve students' understanding wherever and whenever, so they can improve their learning outcomes. This can be seen from the results of research on previously reviewed articles, which show the positive impact of using learning videos as interactive learning media.**

Keywords-Learning Video, Interactive Learning, Literature Study

I. INTRODUCTION

The learning process The learning process can be said to be a series of interactions between educators and students that occur in two directions and through active communication between the two. A process of interaction will run well if accompanied by an intermediary in the form of a tool known as media. What is meant by learning is a process of interaction between educators and students with learning resources. The interaction can be carried out face-to-face or remotely. The lack of learning information sources can hinder the achievement of the objectives of the learning process, for this reason a strategy is needed in the learning process, including by utilizing learning media as a tool in delivering it. [1].

Learning is everything that can be used to channel the sender's message to the receiver, so that it can stimulate the thoughts, feelings, attention and interest of students to learn. The use of appropriate learning media

will have an impact on the effective and efficient learning process. therefore, to create optimal learning continuity, interesting and interactive learning media are needed in order to foster student interest and motivation to learn. [2].

Interactive learning media is learning media that can be used to increase learner interaction to be more active in learning activities. The main thing to improve learning media is to utilize technology. Moreover, compared to conventional learning, technology can enable the creation of more effective, enjoyable and efficient learning. Besides the use of learning media that uses technology in the 5.0 era which is the center of attention by students is learning media through a video. [3].

Video is one of the interactive media that can be used in the learning process. Meanwhile, what is meant by interactive learning video is learning media that is presented audio-visually (images and sound) which involves students actively so that students do not just see or listen to the material in the media. [4]. Another understanding of interactive video is learning media in which it combines elements of sound, motion, images, text or graphics that are interactive to connect the learning media with its use [5]. [5]. In interactive videos, as Yahya said, that a medium is said to be interactive if there is involvement between students and the media, so that students do not just see or listen to the material in the media.[5]

The advantages of interactive learning videos are to provide a more realistic model to students so that they are able to play an active role in learning. [4]. Apart from that, children's interest in learning videos will also increase learning motivation in children. Based on

previous research, it can be seen in the presentation of interesting media images and animations, making it easier for children to remember the material, children look enthusiastic about learning by using interactive learning multimedia. [6].

So it can be concluded that this learning video media presents visualization and audio that can encourage students to understand a learning message quickly, because indirectly students will be imagined and pictured visually. Learning media using video can be used for various abilities of children in receiving learning, because learning videos present visualization, audio and some movements in certain videos, so that they can be easily understood by students.

Based on this description, through a literature study of learning videos as interactive learning media, it is hoped that learning videos can be an alternative media that can be implemented in any subject and level of education, especially at the elementary school level.

II.   METHOD

The research method in this writing is a literature study that can be from several published journals. Literature study research can be done by collecting several references consisting of previous research, article and journal results, then compiled to draw conclusions. Another understanding of literature study is to look for theoretical references that are relevant to the case or problem found. These references can be sought from books, journals, research report articles and sites on the internet. The output of this literature study is the collection of references that are relevant to the problem formulation. [7]. The results of the research reviewed regarding learning videos as interactive learning media for the last five years (2020-2024).

III.   RESULTS AND DISCUSSION

Learning media are tools, methods and techniques used in order to further streamline communication and interaction between educators and students in the education and teaching process at school. Learning media is something that can convey information or messages conveyed during the teaching and learning process so that it can increase students' understanding. There are so many learning media today, both in using images, visual media, audio media packaged into a learning video. Through the use of learning videos, students will more easily understand the content of learning and be able to improve student learning outcomes. [8].

Video is a technology designed to capture, record, process, transmit and organize the movement of images. A video is an audio-visual form that contains objects and original or transmitted sound. Video has the advantage of clearly depicting moving objects complemented by sound and a unique appeal. Often videos are used as a means of documentation or entertainment, but they can also be used for educational purposes. Videos can also display information, illustrate processes, and explain complex concepts. [3].

Interactive learning is a learning system that emphasizes the process of interaction or reciprocity between educators and students actively during the learning process. Some of the research and development carried out in 2020-2024 that discusses learning videos as interactive learning media will be presented in table. 1 below.

Table.1

No.	Author	Title
1	[1]	Technology-Based Learning Media as a Learning Innovation in the Era of the Industry 4.0 Revolution
2	[9]	Development of Multimedia-based Interactive Video Mathematics Learning Media
3	[4]	Use of Interactive Learning Video Media Based on Nearpod Application on Speed Material in Elementary School
4	[10]	Use of Interactive Video as a Learning Media during Pandemic
5	[11]	Development of Interactive Video Learning Media Based on Sparkol Videoscribe Application on Theme 3 Class III
6	[12]	Utilization of Interactive Video as Learning Media in Online Learning Assistance Activities in the New Order Period
7	[13]	Utilization of Learning Video "Leadership of Khulafaur Rashidin" as Islamic Politics Learning Media for Elementary Students
8	[6]	Interactive Multimedia-Based Learning Video in Improving Early Childhood Listening Skills
9	[14]	Development of Interactive Video Media on the Learning of Spherical Buildings for Elementary Students
10	[15]	Bibliometric Analysis of the Use of Learning Videos in Elementary Schools in 2013-2022 Using VOSViewer Application
11	[16]	Learning Video Media on the Theme of Clean and Healthy Living to Improve Learning Outcomes of Elementary School Students
12	[17]	Application of Video Animation as an Interactive Learning Media for Elementary School Students (Literature Study)

Based on Table. 1 above from the twelve research articles used it can be concluded that learning video media at the elementary school level can be used in a variety of subjects, and a variety of learning models which are certainly useful for facilitating students' understanding and being able to increase students' knowledge.

Learning videos can be said to be an active learning media because they are able to attract students' interest and motivation to learn and are easy to understand and can help students when studying at home [14]. [14]. The scope of learning videos is very broad, with this breadth it is hoped that teachers will be able to choose and sort

well the learning videos that are suitable for the subjects that will be conveyed to students.

Technological advances certainly help us in making learning more interesting, one of which we can easily get learning videos from various kinds of social media such as YouTube, Instagram, TikTok and so on. The learning videos intended to create interactive learning can be in the form of animated videos, advice videos, historical videos, videos about nature, videos about culture and social life in society and many more. This can be utilized well by educators, especially teachers, to convey learning by utilizing the sophistication of today's technology, one of which is learning video media that is easily available.

Research results from learning video articles that have been written previously, state that learning videos are learning media that can facilitate educators and students. For educators, they can easily get good teaching media to create interesting and easy-to-deliver learning, while for students they are able to understand subjects, increase learning interest, motivation and student learning outcomes. Based on the research results of previous articles that show the positive impact of using video media in learning, it can be said that learning video media is favored by students and is widely used by educators because of the convenience and flexibility provided by this learning video media.

IV. CONCLUSION

In a learning process, of course, it will not be separated from a medium, because the media is a means or intermediary for teachers in transferring knowledge to their students. In addition, educators are required to create interesting learning innovations because they adjust to the pace of technological development so that they are able to implement learning media that can adapt to the times, one of which is learning media. This learning video media is very suitable for use especially at the elementary school level to create an interactive learning atmosphere, because learning videos can be easily obtained and easily understood by students and increase their interest in learning and can be understood and learned anywhere and anytime.

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Implementation of Sport Education Model Learning in Schools

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Abstract- This research seeks to examine the implementation and strategies of the Sport Education Model (SEM), focusing on three key aspects: (1) the application of the Sport Education Model, (2) the impact of the Sport Education Model on student learning, and (3) the benefits of the Sport Education Model in relation to students' mental and emotional well-being. The primary goal of this study is to investigate how the use of this model can significantly improve mental health by reducing stress, enhancing self-confidence, and fostering the development of social skills in children. The Sport Education Model provides children with the opportunity to engage in healthy competition, appreciate team roles, and cultivate empathy toward others. The research findings demonstrate that the Sport Education Model is a highly effective strategy for promoting children's mental health, especially in terms of improving social relationships and emotional stability. In addition, this study emphasizes that the model not only enhances physical abilities but also creates an environment that nurtures the overall personal development of students. Given these findings, it is recommended that the Sport Education Model be more widely adopted in schools to foster better character development and mental health among children.

Keywords-Sport Education Model, Social Skills, Mental Health, Character Development

Abstract-This research aims to analyze the application and strategy of sport education model by focusing on three main aspects, namely: (1) the application of sport education model, (2) the impact of learning sport education model (3) the benefits of sport education model related to mental and emotional aspects of learners. The main objective of this research is to investigate more deeply how the application of this model can make a significant contribution to the improvement of mental health, such as stress reduction, increased self-confidence, as well as the development of children's social skills. sport education model provides opportunities for children to participate in healthy competition, learn to appreciate roles in teams, and build empathy for others. The results showed that the sport education model is an effective approach in supporting children's mental health, especially in improving the quality of their social relationships and emotional stability. In addition, the study also highlighted that the application of this model not only strengthens physical skills, but also creates an environment that supports children's overall personal development. Based on these findings, it is recommended that the sport education model be implemented more widely in schools to support character building and better mental health for children.

Keywords- Sport Education Model, Social Skills, Mental Health, Character Development.

II. I. INTRODUCTION

Physical education is one of the important elements in the school curriculum that aims to improve students' physical fitness. Physical fitness is a very important factor in human life. With a healthy physical condition, a person will find it easier to carry out daily activities, both those related to physical aspects and those related to mental and emotional aspects. [1]. But also to develop social skills, values, and positive attitudes. In this context, the Sport Education learning model emerges as an innovative approach that provides a more meaningful and comprehensive learning experience for students. The model is designed to create a learning atmosphere that supports active participation, collaboration and the development of leadership skills among students. By emphasizing authentic learning experiences, the Sport Education Model provides opportunities for students to engage directly in the learning process.

The Sport Education model emphasizes organizing sport experiences that resemble real competition structures, where students not only play the role of players, but also as managers, coaches, and leaders in the team. This approach emphasizes the importance of developing a sense of responsibility, cooperation and understanding of sporting values. Through these diverse roles, students are invited to understand team dynamics and the importance of individual contributions in achieving a common goal. By integrating these elements, this model not only contributes to the mastery of physical skills, but also to the formation of students' characters, so that they can become more empowered and responsible individuals in society.

One of the key aspects of the Sport Education Model is the emphasis on comprehensive learning experiences. Through structured sports activities, students learn not only about game techniques and strategies, but also about values such as sportsmanship, honesty and mutual respect. This creates a positive atmosphere where students feel valued and motivated to contribute. Thus, this model not only develops physical skills, but also builds a strong foundation of character among students.

The implementation of the Sport Education Model in schools brings both challenges and opportunities. On the one hand, educators need to understand and adapt the principles of this model into their teaching practices. This requires sufficient training and professional development for teachers to effectively manage the classroom and create a supportive atmosphere. [2]. On the other hand, students are expected to actively participate and contribute to the learning process. Research shows that implementing this model can increase students' motivation, engagement and achievement in physical education, as well as help them develop important social skills for daily life.

However, the challenges in implementing the Sport Education Model cannot be ignored. Some teachers may have difficulty in changing their traditional teaching approach, and there is a need for adequate resources, including supportive facilities and equipment. In addition, it is important to ensure that all students, regardless of their physical abilities, feel involved and have the opportunity to contribute. Therefore, inclusive and adaptive strategies must be implemented to ensure the success of this model in various school contexts. [3].

Against this backdrop, it is imperative to further explore how the Sport Education Model can be effectively implemented in schools, and its impact on students' physical and social development. Further research is needed to identify best practices and strategies that educators can use in implementing this model. Through a deeper understanding of this model, it is hoped that physical education in schools can become more relevant and beneficial to the holistic development of students, creating a generation that is not only physically healthy, but also has strong social skills and good character.

Finally, the implementation of the Sport Education Model in schools focuses not only on academic outcomes or physical skills, but also on the overall development of the individual. By creating a supportive and inclusive environment, it is expected that students can learn to value cooperation, respect others, and build self-confidence. Through this approach, physical education can serve as a powerful tool to shape character and prepare students for future challenges, both on and off the field.

III. METHOD

The systematic literature review (SLR) method is used in this study to obtain a description and data on the variables under study in an explicit, structured, and accountable manner, namely conducting a study of various reference works and previous studies that have similarities. This method aims to obtain a theoretical basis relevant to the problem being studied through a review of books or other sources. The main objective is to find a more in-depth discussion of a topic or issue that is in accordance with the topic discussed in the article.

The data sources in this study come from scientific papers, such as journal articles, books, notes, and various reports relevant to the problem to be solved. The literature review was carried out in stages 1) Classification and Determination of approach, 2) article search, 3) Article selection, 4) data analysis and interpretation, 5) draft article, and 6) dissemination of results. At the initial stage, the focus of the study was determined on the theme of the implementation of the sports education model which includes three things: implementation, impact and benefits. [4].

In the implementation process, article searches were conducted through various sources such as Google Scholar, Sinta, and other sources, which resulted in 30 initial articles. These articles were then filtered based on the criteria of year of publication and indexation. After the screening and selection process, 15 or more articles were obtained that were used as literature review materials. These selected articles were further analyzed, and the data were interpreted to get an overview and conclusions on the themes discussed.

IV. RESULTS AND DISCUSSION

The results and discussion of this study are based on the results of a systematic literature review with a focus on three main themes, namely: First, the implementation of sport eduction in the school learning process in school learning activities has shown a significant increase in the level of student involvement in physical activity. This model provides a more systematic structure in the delivery of sport lessons, by providing opportunities for students to act out various roles within a team, such as players, coaches or managers. Through this division of roles, students can experience a range of responsibilities, which increases their sense of ownership and participation in learning. In addition, this variety of roles enriches students' learning experience, allowing them to contribute according to their individual interests and abilities. As a result, students' participation and motivation in sports learning increases as they feel valued and more involved in the achievement of team goals. [5].

The sport education model also has a positive impact on the development of students' social skills. In a learning context that emphasizes teamwork and communication, students are taught to collaborate in designing strategies, organizing roles and resolving challenges that arise in sports activities. This not only strengthens their interpersonal skills, but also enhances students' ability to adapt to various social situations. [6]. Students who previously tended to lack confidence or were withdrawn began to show positive changes in their interactions with classmates. This collaboration-based approach teaches students to value others' contributions, listen to peers' opinions, and resolve conflicts constructively, which contributes to the development of better social skills [7]. [7].

Table 1: Implementation of the sport education model.

Year	Author and Article Title	Research Results

2018	Evangelio et al, The Sport Education Model In Elementary And Secondary Education: A Systematic Review	It can meet students' basic psychological needs, developing more competence, autonomy and relatedness.
2023	Anugrah et al, Implementation of Hybrid Learning Models Teaching Games For Understanding and Sport Education Models on PJOK Learning Motivation	intrinsic motivation, identified regulation, introjection regulation, external regulation, and amotivation, have significant differences
2024	Zhang et al, The effect of the Sport Education Model in physical education on student learning attitude: a systematic review	enrich the understanding of SEM influences, identify gaps, and drive progress in physical education pedagogy.

Table 1 explains that the sport education model can fulfill students' basic psychological needs, developing more competence, autonomy, and relatedness. [8]. intrinsic motivation, identified regulation, introjection regulation, external regulation, and amotivation, have significant differences. [9]. enriching understanding of the influence of SEM, identifying gaps, and driving progress in physical education pedagogy. [10].

This study shows that the application of the sport education model (SEM) can be implemented well in the learning process at school. The model proved to be effective in increasing students' participation in physical activities as well as having a positive impact on their attitudes and motivation towards physical education. The results revealed that SEM creates a more structured and enjoyable learning experience, where students feel more valued and motivated to actively participate. Furthermore, the study also proved that the sport education model contributed to the development of students' social, emotional and character skills, which overall supported the formation of positive attitudes towards sport and physical activity. Thus, these findings underscore the great potential of SEM to be applied more widely in physical education curricula, in order to achieve more thorough and effective learning objectives.

The Impact of Implementing the Sport Education Learning Model

The application of the Sport Education Model (SEM) in physical education learning has a significant impact not only on improving students' physical quality, but also on their social and emotional development. By prioritizing a team-based learning approach, this model provides opportunities for students to assume various roles, such as players, coaches, managers, and officials. Through these roles, students gain a broader understanding of the various aspects of sporting activities, as well as learn important values such as responsibility, cooperation and how to interact with others in a supportive atmosphere. This allows students to develop important social skills, including effective communication and the ability to collaborate in groups, which are much needed in everyday life.

One of the main elements in the sport education model is the increased involvement of students in the learning process. A clear and structured division of roles allows each student to contribute according to their interests and abilities. For example, a student who may not have strong physical skills can still play an important role in the team, for example as a coach or manager. In this way, the sport education model creates a more inclusive atmosphere where every student feels valued and their contributions are considered important in the team's success. This involvement in turn increases students' self-confidence [11]because they feel respected and accepted, not only based on their physical abilities, but also based on the roles they take on. This suggests that the sport education model serves as a tool to empower students to be more actively involved in learning.

In addition to increasing student engagement, the Sport education model also has a significant impact on the development of students' social skills. The model encourages students to work together to plan strategies, share ideas, and solve problems collectively. [12]. Thus, students not only learn about sport, but also very important social skills, such as effective communication, the ability to listen, and appreciate the contributions of others. During this process, students learn how to resolve conflicts in a constructive way and develop more harmonious relationships between them. Therefore, the sport education model not only emphasizes on improving physical skills, but also on strengthening essential social values, such as fair play, honesty, and mutual respect, which are beneficial in their social life outside school.

Another significant impact of implementing the sport education model is the development of students' leadership skills. The model provides students with opportunities to lead in teams, either as captains, coaches or managers. Through these roles, students learn to make decisions, motivate team members, and plan and execute effective strategies. Leadership in the context of SEM goes beyond leading in physical activities, but also includes the ability to manage group dynamics, listen to others' ideas, and ensure that each team member feels valued. By developing these leadership skills, students not only become good leaders on the sports field, but also in their daily lives, with the ability to lead thoughtfully and empathetically.

The application of the sport education model also contributes positively to the mental health of students [13]. Involvement in healthy competition and team-based learning teaches students how to manage the stress, pressure and expectations they face. The reflection process integrated in this model allows students to evaluate their progress, identify strengths and areas for improvement, and celebrate their achievements. This process contributes to students' increased self-confidence and emotional stability. In addition, the mutual support and respect built within the team teaches students how to cope with failure in a more positive way, which directly strengthens their mental resilience. Thus, the sport education model not only improves physical skills, but

also plays a role in strengthening students' mental health, making them better prepared to face challenges in life.

In addition to the social and emotional impact, the Sport education model also focuses heavily on developing students' overall physical skills. It bases its learning on a progressive and continuous approach, where students not only participate in games or competitions, but are also given the opportunity to systematically hone techniques and strategies. Each student can learn and develop in their chosen sport, deepening related aspects such as game tactics, basic techniques, and ways to improve performance both individually and as a team. With this structured approach, students can experience tangible improvements in their physical abilities, which in turn boosts their confidence and motivation to continue practicing and competing.

The sport education model also allows for a more inclusive and equitable learning environment. By providing a variety of roles within the team, the model provides opportunities for students who may not excel in physical sports to still contribute and feel valued. It creates a supportive atmosphere and encourages active participation from all students, regardless of their physical skill level. This allows each student to develop according to their interests and abilities, while creating a more equitable atmosphere in the physical education learning process. Thus, the sport education model plays a role in creating a more inclusive environment, where every student has equal opportunities to participate and develop.

Overall, the implementation of the sport education model not only improves the quality of physical education learning but also has a wider impact on students' social, emotional and physical development. By creating a more holistic and structured learning experience, the model helps students to develop character, social and leadership skills that are crucial in their lives. [14]. Therefore, the sport education model has great potential to be applied more widely in the physical education curriculum in schools, to create a healthier, more skillful, and more caring generation. With wider application, SEM can be a solid foundation for the formation of individuals who not only excel in sports, but also in their social and emotional lives.

Benefits of the Sport Education Model in Schools

The Sport Education Model (SEM) in schools provides extensive benefits and positively influences the development of students. The model not only improves physical sport skills, but also influences other aspects such as students' social, emotional and character skills. With its structured and team-based approach, SEM creates a more well-rounded learning experience that supports students to develop interpersonal skills, enhance leadership abilities and build strong and positive character.

Table 2: Benefits of the Sport Education Model

Aspects	Benefits	Impact on Students
Physical	Improve sports skills and physical fitness through organized practice	Improve physical ability, endurance, and encouragement to train harder.
		and healthy competition.
Social	Develop social skills through team collaboration, effective communication and joint problem solving.	Strengthen relationships between students, creating a more inclusive and supportive atmosphere.
Emotional	Helps students manage stress, pressure and failure in a healthy way, while increasing self-confidence and emotional stability.	Increase mental resilience, self-confidence, and the ability to cope positively with failure.
Character	Teach values such as fair play, discipline, respect and responsibility through sports activities.	Strengthens integrity, respect for others, and builds positive character.
Leadership	Provide opportunities for students to lead, make decisions and motivate in teams.	Enhance leadership skills that are beneficial both on and off the field.
Social Skills	Team-based learning encourages students to cooperate, communicate and collaborate with other team members.	Improve the ability to interact in groups, solve problems together, and enhance cooperation.
Inclusivity	Provide an equal role for all students, including those who underachieve in physical sports.	Helps create a sense of being valued and increases the participation of students from different skill backgrounds.

Table 2 states that the benefits of the sport education sport model are Improving sports skills and physical fitness through organized practice and healthy competition. Develops social skills through team collaboration, effective communication and joint problem solving. Helps students manage stress, pressure and failure in a healthy way, while increasing self-confidence and emotional stability. Teaches values such as fair play, discipline, respect and responsibility through sports activities. Provides opportunities for students to lead, make decisions and motivate in teams. Team-based learning encourages students to cooperate, communicate and collaborate with other team members. Provides equal roles for all students, including those who underachieve in physical sports.

Thus, it can be seen that the sport education model provides significant benefits in improving, developing and

helping children in various aspects, including physical, social, emotional, character and mental. This model allows students to experience the various advantages gained through the application of Sport Education in their learning process. [15].

V. CONCLUSION

The implementation of the Sport Education Model (SEM) in physical education at school has a significant positive impact on students' development, both in physical, social, emotional and character aspects. This model is not only effective in improving students' sports skills, but also plays an important role in shaping their social and emotional skills. By using a team-based approach, SEM allows students to take on different roles, such as player, coach or manager, leading to an increased sense of responsibility and engagement in learning. The clear division of roles makes each student feel valued and motivated to actively participate, according to their interests and abilities, which in turn increases team spirit in achieving a common goal.

In addition to the physical benefits, SEM also plays a major role in the development of students' social and emotional skills. Learning that emphasizes teamwork and effective communication allows students to collaborate in designing strategies, solving challenges together, and learning to support each other. This process not only improves students' ability to interact and listen, but also helps them to resolve conflicts in a constructive way. Moreover, SEM teaches important values such as fair play, discipline and responsibility, which have a positive impact on students' social lives both inside and outside of school.

In addition, the implementation of the Sport Education Model supports students' mental health by giving them the space to compete healthily and learn to manage stress and pressure. The model also provides opportunities for students to develop leadership skills, such as the ability to make decisions, motivate teams and manage group dynamics wisely. By creating an inclusive environment where every student, regardless of physical ability, can actively contribute, SEM not only improves students' physical skills, but also builds their character and mental resilience. Overall, this model has great potential to be applied more widely in the physical education curriculum, to support the formation of a healthier, more skillful, and more caring generation.

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The Effect of Drill Training on Passing Skills in Futsal Extracurriculars at SMPN 4 Tarogong Kidul

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Abstract— This study aims to determine whether the effect of drill training on passing skills in extracurricular futsal at SMPN 4 Tarogong Kidul has a significant effect. The problem contained in this study is that there are still many futsal extracurricular students who fail to pass futsal correctly. The research method used was an experiment with a one group pretest and posttest design. The test instrument used in this research was a 30 second passing test. The research population used was students who participated in extracurricular futsal at SMPN 4 Tarogong Kidul as many as 15 students. The data analysis technique used is the prerequisite test, namely the parametric statistical formula to test normality, and the t-test to test the hypothesis with a level <0.05 (5%). The results of the passing test research show that there is a significant influence or improvement with the drill training method on extracurricular futsal students, with a t-count value of 5.874> t-table (1.701) df 28, and a significance value (0.000) <0.05 with an average value of 29.53.

Keywords— Drill Training, Passing, Futsal

I. INTRODUCTION

In national education, sport has a unique place, function, and an inseparable part of the curriculum. At all levels of education, activities Sports must be carried out in the form of extracurricular activities and not just as a curriculum component that must be followed by all students. Sports are a way for students to channel their interests, talents, potential, creativity and thoughts into various useful activities [1].

Extracurricular activities at school are extracurricular activities, which can be carried out both inside and outside school, intended to complement intracurricular activities to achieve national education goals and meet students' needs to gain knowledge and experience in various subjects [2].

Futsal is a form of soccer that can facilitate social interaction between players on one team, players on another team, and between opposing teams [3].

To pass the ball correctly to teammates, futsal players must have good passing. Futsal players who do not have good passing skills will not be able to play well [4]. One important technique in playing futsal is passing, which every player must have. Strong and accurate passing is necessary because the ball often moves parallel to the player's heel on small, flat fields. Because the futsal field is flat and small, every player requires hard passing and accurate. There are three types of passing based on distance: short passing, medium passing, and long. Passing used almost during futsal games [5].

States that training is a training plan that is systematically designed to develop an athlete in an effort to achieve maximum performance. The purpose of training, namely to help athletes improve their performance as much as possible, is the goal of training. The athlete's training process can improve the quality of play and consistency in training so that athletes can play in matches with strong physical strength and skill abilities [6].

Drill training is a technique that is carried out with systematic and repetitive movements [7]. Judging from the futsal game, passing is the most frequently used technique. This is due to the fact that the playing field is relatively small, so the game is often played by passing. Extracurricular participants will be able to build team collaboration through good and accurate passing, and athletes will also be able to build team collaboration through good and accurate passing. The drill method has a positive impact on the game of futsal, namely when players make passes.

The statement above provides clarity that to master passing skills requires good passing practice, because without good passing, the passing results will be

inaccurate and undirected. This will be successful if it is supported by passing practice including drill practice.

II. METHOD

An appropriate research method is very important for solving problems because this method solves problems by looking at various symptoms in the past, present, and future. This method helps researchers collect data about their problem or research question. The existence of a method allows researchers to process and analyze data to produce answers or conclusions that are appropriate to the question.

Research is a process of choosing a title, formulating a problem, and then collecting, processing, presenting and analyzing data using effective and systematic scientific methods. The results can be used to study the state of affairs in the process of scientific development or to make decisions about solving problems." The research method used is experimental [8].

Experiments are a technique for testing certain theories by looking at the relationships between variables; These variables are measured usually with research instruments, so that data consisting of numbers can be analyzed using statistical techniques [9]. Therefore, the method that is suitable for the author to use in this research is to use research methods experiment. The reason the author uses this method is because the aim is to compare the effects of a particular treatment with another, different treatment. Based on the theory above, experimental research requires the existence of a component that is tested in this research, namely passing.

Research Design is a plan on how to collect, process and analyze data in a systematic and directed manner so that research can be carried out efficiently and effectively in accordance with the research objectives. In this research, a One Group Pretest-Posttest Design was used. This design has no control group, and subjects are not randomly assigned. Before the researcher conducts research, the researcher will give a pretest to the sample with the aim of finding out the sample's initial abilities before receiving treatment

Population is a source of data in certain research that is large and extensive [10]. The population in this study is futsal extracurricular students at SMP N 4 Tarogong Kidul. A sample is a part of a population, meaning there would be no sample if there were no population. In this research, researchers used purposive sampling technique as the sampling technique. Purposive sampling is a technique for determining samples for certain purposes only. This method can be applied to a variety of populations, but is more effective with smaller samples and more homogeneous populations. Therefore, this sample consisted of 15 extracurricular students at SMPN 4 Tarogong Kidul.from the

researcher. Treatment was given by researchers 16 times. After carrying out the treatment, the researcher conducted a final test or posttest to find out whether there was an effect or not. The reason for using this design is so that one group receives intense and planned training, so that the results obtained can be maximized.

01	X	02
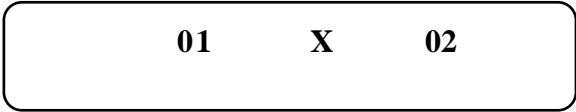
Information :

01 : Pretest

X : Treatment

02 : Postest

The data collection technique used in this research is the test technique. The test used in this research was a passing test which was carried out on the pretest and posttest. The test data was analyzed using statistical methods. The assessment instrument used is a 30 second passing test [11].

III. RESULTS AND DISCUSSION

The subjects in this research were futsal extracurricular students at SMPN 4 Tarogong Kidul and the researchers used a sample of 15 research samples. Pretest data collection was carried out on August 25 2024 and posttest on October 6 2024. The training/treatment program was carried out twice a week on Friday and Sunday in the school field at SMPN 4 Tarogong Kidul.

The research sample was given treatment in 16 meetings, where this treatment was given twice a week which was carried out every Friday and Sunday at 13.00 – 14.00. Treatment is given with several variations in training, to avoid boredom in the training phase.

Data on the pretest passing results of futsal extracurricular students at SMPN 4 Tarogong Kidul obtained a minimum score of 15, a maximum score of 31, then an average/mean of 6.93, a middle/median score of 21, a mode score of 19, and a standard deviation of 4.68.

Tabel 1. Pretest Description Results

Statistics	Pretest Results
N	15
Mean	6,93
Median	21
Mode	19
std dev	4,6883848
Min	15

Max	31

Data on posttest passing results for futsal extracurricular students at SMPN 4 Tarogong Kidul obtained a minimum score of 27, a maximum score of 35, then an average/mean of 13, a middle/median score of 29, a mode score of 27, and a standard deviation of 2.41.

Tabel 2. Posttest Description Results

Statistics	Posttest Results
N	15
Mean	13
Median	29
Mode	27
std dev	2,4162151
Min	27
Max	35

In this study, researchers used a normality test with parametric statistics to find out whether the data used in parametric statistical analysis was normally distributed or not. The norm guideline used in this normality test is the formula that has been used previously, namely if the probability is > 0.05 the population is normally distributed, and if the probability is < 0.05 then the population is distributed abnormally. This time data processing was assisted by a computer application, namely the SPSS version 27 program, where the data processing results were as follows:

Tabel 3. Description of Normality Test Result Data

Data Results	Probabilitas	Sig	Ket
Pretest	0,200	0,05	Normal
Posttest	0,172	0,05	Normal

From the data in the table above, it can be found that the data on the passing skills of futsal extracurricular students at SMPN 4 Tarogong Kaler has a P value (0.200 & 0.172) > 0.05, so the variable results can be said to be normally distributed and data analysis can be continued..

This t-test was used to determine the initial suspicion or hypothesis which states "there is an influence of drill training on passing skills in futsal extracurricular students at SMPN 4 Tarogong Kidul", from the results of the pretest and posttest research carried out. If the results of the hypothesis test analysis show quite significant differences, then this variation of Drill training can be applied to improve the passing skills of futsal extracurricular students at SMPN 4 Tarogong Kidul. The analysis results are said to be significant if the t-count value is > than the t-table and the sig value is <0.05 (5%). The processing of this hypothesis test analysis is also assisted by the SPSS version 27 computer program, as follows:

Tabel 4. Description of Hypothesis Test Results Data

Data Resu lts	t-test						
	d f	t-cou nt	t-tab le	Sig.	aver age	Selli sis	%
Prete st	2 8	5,8 74	1,7 01	0,0 00	21.53	8,00	28 %
Postt est					29.53		

Based on the results of the t test above, the t-count value is (5.874) > t-table (1.701), and the sig value. (0.000) < 0.05, these results indicate that there is a significant influence. Thus Hypothesis Alternatif (Ha) Which stated that "There is an influence of drill training on passing skills in extracurricular futsal at SMPN 4 Tarogong Kidul.", can be accepted. It can be concluded that drill training has a significant influence on the passing skills of futsal extracurricular students at SMPN 4 Tarogong Kidul. It can be seen from the posttest results which have an average value of 29.53 points, while the pretest has an average value of 21.53 points.

Based on the results of data analysis from research that has been carried out, a significant influence indicator of 28% was obtained. The results of the t test analysis in this study obtained a calculated t value (5.874) > t table (1.701), and a sig value (0.000) < 0. .05. These results can be concluded that there is an influence in variations of drill training on basic passing technical skills in futsal extracurricular students at SMPN 4 Tarogong Kidul. Which means that training in basic passing skills with a variety of drill exercises for futsal extracurricular students at SMPN 4 Tarogong Kidul can be carried out continuously in order to improve basic passing skills in futsal sports games.

By knowing that there is a significant influence on basic passing skills with a variety of drill exercises, coaches must develop and develop all types of training variations in order to improve students' basic skills, especially basic passing technical skills in the sport of futsal. The drill method is an approach to teaching by

providing practice on what has been learned so as to obtain certain skills, the application of drill is an activity that is carried out repeatedly so that the stimulus and response become very strong so they are not easily forgotten. [12]. By applying a variety of drill exercises to passing, students have more awareness of each individual's abilities, especially in calculating the extent to which they have basic technical ability scores in futsal. Apart from that, adding variations in training carried out by coaches can develop interest and talent. students, especially in futsal extracurricular activities at SMPN 4 Tarogong Kidul.

The results of this data show that the basic skills of each student certainly have differences in each individual, which can be caused by several factors, which are that it is a person's achievement in terms of improvement Skills are influenced by many factors. These factors are divided into 3, namely:

a) Teaching and Learning Process Factors: Each step that must be taken in the learning process is based on each stage which is accepted for certainty and chosen according to the value of the benefits obtained.

b) Personal Factors: Every individual has differences in each person, be it physical, mental, ability or belief differences.

c) Situational Factors: These factors are conditions that influence the situation in the field, such as the equipment used including learning media, the type of task given, and the surrounding conditions in which the teaching and learning process takes place.

In this form of training, the role of a coach is very important. A coach has quite a big influence on athletes, especially in the process of training activities which enable athletes to achieve achievements in the future. This is also the basis that coaches must provide a variety of exercises that can improve basic passing skills, because athletes are still relatively unfamiliar with finding training resources independently. [13].

Apart from the lack of variety of training provided by coaches, personal factors play an important role in the development of individual abilities in basic techniques in futsal sports skills. This is a big problem in improving the abilities of each individual, because most students and athletes still depend on improving basic technical skills on the training schedule set by the coach. Referring to the factors above, to achieve certain goals you need to sacrifice several aspects to achieve the desired achievement through personal desires and inner motivation. regarding personal factors that each individual has different levels of movement abilities, both mental, physical and emotional, namely that each individual has a different level of skills, intelligence, perception, physical size, emotions, motivation,

abilities, gender, and age are some of the things that influence levels a person's achievements in terms of skills [14].

IV. CONCLUSION

Based on the results of all research results and discussions that have been explained and presented, conclusions can be drawn on This research showed that the results obtained for futsal extracurricular students at SMPN 4 Tarogong Kidul were t-count (5.874) > t-table (1.701). And the sig value (0.000) < 0.05 (5%). And there was an increase in the influence of training in the percentage of passing skills among futsal extracurricular students at SMPN 4 Tarogong Kidul by 8.00 (28%).

The drill training method used has a quite significant influence on drill training on the passing skills of futsal extracurricular participants at SMPN 4 Tarogong Kidul Garut. If you look at the average obtained in the pretest of 21.53 and the average in the posttest of 29.53, you get a mean figure of 8.00, this shows a better change, namely 28% compared to before being given drill training.

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