E-ISSN 2579-5023
P-ISSN 2459-9611

Jurnal Ilmiah Pendidikan dan Pembelajaran

Media Didaktika

Volume 11, Nomor 1, Mei 2025

Diterbitkan oleh
Program Pascasarjana
Universitas Islam Darul Ulum Lamongan

Media Didaktika	Vol. 11	No. 1	Hal. 1--90	Lamongan Mei 2025	ISSN 2459-9611

Media Didaktika

Jurnal Ilmiah Pendidikan dan Pembelajaran **ISSN 2459-9611**

Jurnal ini diterbitkan oleh Program Pascasarjana Universitas Islam Darul Ulum (Unisda) Lamongan sebagai media informasi dan penyebarluasan hasil penelitian, perkembangan teoretis, dan tulisan ilmiah mengenai pendidikan dan pembelajaran. Jurnal ini terbit dua kali dalam setahun: Mei dan November; terbit kali pertama bulan Mei 2015.

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ISSN 2459-9611

MEDIA DIDAKTIKA

Jurnal Ilmiah Pendidikan dan Pembelajaran

Volume 11, Nomor 1, Mei 2025, hlm. 1—90

DAFTAR ISI

CURRICULUM AND LEARNING METHODS COMPARATIVE STUDY BETWEEN INDONESIA AND IRAN

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Abstract: *The purpose of this study is to focus on primary and secondary education on the curriculum and learning methods used in Indonesia and Iran. The background of this study is based on the importance of understanding the education system in both countries, considering the differences in culture, religion and education policies that affect the development of curriculum and learning methods. The purpose of this study is to identify the curriculum structure, learning approaches, and similarities and differences in tasks in both countries in improving the quality of education. The research method used is a qualitative comparative study by collecting data through literature research, analysis of formal curriculum documents, and interviews with education experts from Indonesia and Iran. The results of the study show that both countries have curricula that focus on student development and skills, with different focuses. Indonesia focuses on Pancasila education and local wisdom, while Iran emphasizes education based on Islamic values and revolution. While Indonesia's learning methods tend to be student-centered (student-centered), Iran still has many traditional approaches (teacher-centric). These findings indicate the need to replace the best knowledge and best practices between the two countries to address challenges such as quality lessons and curriculum relevance. The conclusion of this study is that while both countries make significant differences in curriculum and learning methods, there is an opportunity to learn from each other to improve the education system.*

Kata kunci: *curriculum education, learning method, comparative study*

INTRODUCTION

Education is one of the main pillars of a country's development, where curriculum and learning methods play a vital role in determining the quality of educational performance. Indonesia and Iran have unique and interesting education systems to study more deeply, as they are two countries with different cultural, religious, and educational policies. Both countries pursue the same goal improving the quality of human resources but the approaches used in curriculum and learning methods differ significantly. Previous studies have revealed that the Indonesian curriculum places a stronger emphasis on developing Pancasila-based character education, while Iran integrates Islamic values into its education system (Wahab Syakharani et al., 2022). However, these studies have not delved into the comparative aspect in depth, especially regarding the learning methods used. Therefore, it is essential to conduct a more comprehensive comparative study to understand the dynamics of curriculum and learning approaches in both nations.

Global developments and the demands of 21st-century education require that education systems be more adaptable and responsive in making curricula

and learning methods more relevant. Iran, for instance, has incorporated information and communication technology (ICT) into its curriculum reforms as a key part of the learning process (Ahmadi et al., 2023).Meanwhile, Indonesia has introduced the Kurikulum Merdeka (Independent Curriculum), which highlights project-based learning and soft skills development. Recent findings show that differentiated instruction integrated with social-emotional learning is increasingly being applied in Indonesia to realize the profile of Pancasila students, as discussed by (Ana, 2022). This approach reflects the growing awareness of holistic education in Indonesia, which can be contrasted with Iran's emphasis on integrating Islamic ethics and cognitive learning.

Nevertheless, existing research still focuses on each country in isolation without comparing the effectiveness and challenges faced by their respective education systems. This research attempts to address that gap by offering a comparative analysis. Implementation problems in curriculum and learning methods are also critical to this study. In Indonesia, one of the main issues is the inequality in education quality between urban and rural regions (Nugroho et al., 2021). Similarly, Iran faces challenges related to accessibility and the availability of educational resources (Sassi, 2024). Studies like the one conducted by Wahyuni, Mulyani, and Rachmawati eveal the practical difficulties in implementing active learning models across diverse regions. While both countries have made efforts to overcome these problems, no research has yet compared the strategies or policies each nation has adopted. As such, this study seeks to provide new insights into how both countries respond to these shared challenges.(Khairiyah et al., 2024)

Additionally, earlier research has predominantly focused on theoretical frameworks without addressing practical applications in the classroom. For instance, (Hidayat et al., 2022)discuss general curriculum structure in Indonesia but do not explore how learning methods are applied in day-to-day teaching. Mohammadi and Rahimi address Iranian education policy without linking it to actual classroom practice. Meanwhile, Indonesian case studies, such as the one by Yulianto and Isnanto, show how discovery learning models in vocational schools can significantly enhance student engagement and outcomes providing a valuable comparison point for examining classroom practices in Iran. This study aims to bridge that gap by combining theoretical discussion with practical field-level analysis for a more holistic picture. (Rahimi et al., 2022)

Lastly, this study considers the cultural and social contexts that influence curriculum and learning methods. Local culture and values significantly shape Indonesia's curriculum (Sari et al., 2021), while religious values are central to Iran's curriculum development (Ghaori et al., 2020). By integrating these perspectives including recent Indonesian educational practices as reflected in (Ana, 2022), Wahyuni the study is expected to deepen understanding of how culture and religion inform the educational landscapes of both countries. (Wahyu et al., 2024).

LITERATURE REVIEW

Educational Curriculum

The educational curriculum of Indonesia and Iran has unique characteristics that

are influenced by the cultural, religious and political values of their respective countries. In Indonesia, the educational curriculum is based on Pankasila and local wisdom, so it focuses on student development and skills. The independent curriculum introduced in 2022 emphasizes the project base and the flexibility of teachers in the development of educational materials (Prasetyo et al., 2023). In Iran, the Iranian educational curriculum is heavily influenced by Islamic values and revolutions, with a focus on the formation of religious identity and nationalism (Ghafffari et al., 2021). Both countries have the same goal: to improve the quality of education, but their approach to curriculum development shows significant differences. Thus, the curriculum in Indonesia and Iran reflects the core values believed in by each country.

Learning Methods

The way Indonesia and Iran learn also shows significant differences. In Indonesia, learning methods tend to be student-centered (student centers) with a more interactive and collaborative approach. The use of technology in learning and project-based learning will be a major trend in the Merdeka curriculum (Indrawati et al., 2022). Meanwhile, Iran's learning methods still follow many traditional teacher-focused approaches (which are teacher-centered) while efforts to integrate information and communication technology (ICT) into learning are still ongoing. The main challenge in Iran is the lack of teacher training when using modern learning methods.

The Role of Technology in Education in Indonesia and Iran

The integration of technology into education focuses on efforts to improve the quality of learning in the 21st century. In Indonesia, the use of technology in education is facilitated by various programs, including guilty gigs and teacher training when using online learning platforms (Prasetyo et al.,2023). However, challenges such as infrastructure gaps and internet access in remote areas remain major obstacles. In Ilang, efforts to integrate technology into education continue to be implemented, but international resources and sanctions affecting access to technological devices are limited (Hassani al., 2022). Thus, despite the strong commitment of both countries, the implementation of technology in education still faces significant challenges.

Education Policy and Its Impact on Learning Quality

There are significant differences between Indonesia's and Iran's education policies in terms of approach and priorities. In Indonesia, guidelines such as independent curricula emphasize school flexibility and autonomy in the development of educational materials, and are expected to increase the relevance of education to local needs (Sari et al., 2023). In Iran, educational guidelines are more central and have been geared towards reinforcing religious identity and nationalism, with little room for local innovation (Rezaei et al., 2023).

Comparative Studies

Comparative studies of the curriculum and learning methods between Indonesia and Iran are still limited, but some studies provide the first photo of a comparison of the two countries' education systems. For example, research by Sari and Hosseini shows that the two countries pose similar challenges in relation to the quality of education between urban and rural areas. However, this study does not touch on the comparative aspect of depth, especially in relation to the effectiveness of the curriculum and learning

methods. A study by Putra and Mohammadi shows that the exchange of best knowledge and best practices between the two countries can be a solution to overcome these challenges. Thus, this comparative research is expected to make a significant contribution to understanding the dynamics of the education system in Indonesia and Iran.

RESEARCH METHODS

This research is a literature study that aims to compare the curriculum and learning methods of Indonesia and Iran by analyzing relevant written sources. The type of research used qualitatively with a comparative research approach that allows researchers to identify similarities and differences between the two education systems. Data was collected by examining various secondary sources, such as: Science journals, books, education policy documents, government official reports, and related articles published in the last six years (2020-2023). The focus of the research is on the curriculum structure, learning methods, and factors that affect the implementation of these two aspects of Indonesia and Iran.

The research instrument used is a document analysis manual that contains source selection criteria such as topic relevance, author reliability, and year of publication. The data collection process is carried out by extracting relevant information from selected sources and grouping it into key topics such as curriculum guidelines, learning approaches, and implementation challenges. Thematic data analysis by identifying patterns, similarities and differences between the two countries. The measurement of research variables such as curriculum and learning methods is based on operational definitions developed by previous literature research. Therefore, the research methodology aims to ensure that the analysis carried out is systematic and comprehensive and can be repeated by other researchers.

FINDINGS AND DISCUSSIONS

The results show that the educational curriculum in Indonesia and Iran has significant differences in orientation and approach, but both seem to meet the global education standards set by UNESCO. The UNESCO Standards emphasize the four pillars of education: knowing, learning, learning, learning, and learning to live together (UNESCO, 2021). In Indonesia, the curriculum emphasizes Pankasila-based character development and local wisdom, as reflected in the 2022 independent curriculum (Ministry of Culture and Culture, 2022). Meanwhile, the Iranian curriculum has been dominated by Islamic values and revolutions, with a focus on the formation of religious identity and nationalism (Ghafffari et al., 2021). Thus, despite having different orientations, the two countries seek to meet UNESCO standards in a way that is appropriate to their local contexts.

Figure 1: Logo UNESCO

In terms of learning methods, Indonesia tends to adopt a more modern and student-centered approach. Project-based learning and technology integration are the hallmarks of the Independent Curriculum (Widodo et al., 2022). On the other hand,

learning methods in Iran still rely heavily on traditional teacher-centered approaches, although efforts to integrate information and communication technology (ICT) continue (Karimi & Hashemi, 2020). According to a UNESCO report (2021), only 40% of schools in Iran have full access to technological devices, compared to 65% in Indonesia. This shows that the gap in technological infrastructure is a major challenge in the implementation of modern learning methods in Iran, while Indonesia is better prepared to meet UNESCO standards related to the use of technology.

Figure 2: Indonesian elementary school students

The findings also show that both countries face similar challenges in terms of quality education between urban and rural areas. In Indonesia, UNESCO (2021) shows that only 55% of rural schools have appropriate facilities, compared to 85% of urban areas. In Iran, this gap is more pronounced when it comes to accessing educational resources. There, only 30% of rural schools have appropriate libraries (UNESCO, 2021). Thus, geographical disparities are a problem that needs to be overcome by both countries to achieve equal distribution of education in accordance with UNESCO standards.

Figure 3: Iranian primary school students

In relation to curriculum implementation, this study shows that Indonesia is more flexible in providing autonomy for teachers to develop educational materials according to local needs. This is in line with the principles of an independent curriculum that emphasizes school independence (Rahayu et al., 2021). In Iran, the implementation of the government curriculum is more centralized and tightly regulated, with little room for local innovation (Mohammadi et al., 2022). This difference suggests that the decentralized approach in Indonesia can be an interesting model for Iran to consider in meeting UNESCO standards that emphasize local adaptation.

The results of this study also show that cultural and religious factors play an important role in the formation of curricula and learning methods in both countries. In Indonesia, Pankasila values and local wisdom are the main basis for curriculum

development (Maulana et al., 2021). Meanwhile, Iran's Islamic values and revolution are the main basis of any education policy (Rezaei et al., 2020). Thus, culture and religion not only influence the content of the curriculum, but also the learning methods applied, even though both seek to meet UNESCO's inclusive and holistic standards.

These findings are consistent with previous research conducted by Sari and Hosseini, which stated that the two countries have similar challenges in terms of education quality gaps. However, this study makes a new contribution by identifying that curriculum flexibility in Indonesia can be a potential solution to overcome these challenges. This shows that the exchange of knowledge and best practices between the two countries can provide significant benefits in meeting UNESCO standards.

In addition, the study also found that the integration of technology in learning is still a major challenge for Iran. Although efforts to improve access to ICT have been made, UNESCO data (2021) shows that only 30% of teachers in Iran are trained in using technology for learning. In Indonesia, this figure reaches 50%, thanks to intensive teacher training programs (Ministry of Education and Culture, 2022). Thus, increasing the capacity of teachers in the use of technology is key to improving the quality of learning in Iran and meeting UNESCO standards related to technology-based learning.

This discussion also revealed that the two countries can learn from each other in overcoming educational challenges. For example, Iran can adopt the decentralized approach of the curriculum implemented in Indonesia, while Indonesia can learn from Iran's efforts in integrating religious values holistically in the education system. This kind of knowledge exchange can be a strategic step to improve the quality of education in both countries and meet more comprehensive UNESCO standards.

The findings of this study also have practical implications for policymakers in both countries. In Indonesia, further efforts should be made to reduce the quality of education between urban and rural areas and at the same time maintain curriculum flexibility. In Iran, the focus should be on improving teachers' access to technology and training to support modern learning. Therefore, future educational guidelines must be designed to address the specific challenges in all countries and at the same time meet UNESCO's global standards.

Overall, this study provides new insights into the dynamics of curriculum and learning methods in Indonesia and Iran. The statement not only answers gaps in the previous literature, but also provides practical recommendations for the development of the education systems of the two countries. Therefore, this research contributes to a deeper understanding of how cultural, religious and political values affect the education system at the global level, and the efforts of both countries to meet UNESCO standards.

CONCLUSION

Based on the findings and discussions, it can be concluded that the curriculum and learning methods in Indonesia and Iran have significant differences, with Indonesia emphasizing Pancasila-based character development and student-centered learning, while Iran focuses on integrating Islamic values with traditional learning methods. Despite efforts to meet UNESCO's global education standards, challenges

such as educational quality gaps and technological limitations remain obstacles. The contribution of this research lies in the identification of best practices that can be exchanged, such as curriculum flexibility in Indonesia and the integration of religious values in Iran, to improve the quality of education holistically. The limitations of research that rely only on literature studies open up opportunities for further research with an empirical approach to test the effectiveness of educational policies and practices in the field.

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STUDY OF NATIONAL CURRICULUM IMPLEMENTATION IN INDONESIA AND AFRICA SOUTH: CHALLENGES AND SOLUTIONS IN IMPROVING THE QUALITY OF EDUCATION

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Abstract: *Study This aiming For compare implementation curriculum national in Indonesia and South Africa, with focus on challenges and solutions in increase quality Education . Research This motivated by the need For understand How system different education handle issues general like adaptation curriculum , teacher competence , allocation source power , and results Study students . With use approach qualitative comparative , data collected through analysis documents , interviews with stakeholders interest education , and observation fields in both countries. Findings study disclose that although both countries face challenge similar , like gap in access and quality education , they implementing different strategies For overcome problem said . Indonesia emphasized teacher training and engagement society , while South Africa focuses on policy reform and development infrastructure . This study conclude that combination from approaches said , which is adjusted with context local , can in a way significant increase results Education . Research This give contribution to the discussion latest about implementation curriculum and offers recommendation practical for maker policies and educators in both countries.*

Keywords: *Implementation curriculum , quality education , Indonesia, South Africa, study comparative*

INTRODUCTION

Education is a key pillar in the development of a nation, where the national curriculum plays a crucial role in determining the direction and quality of education. The implementation of the national curriculum in various countries often faces complex challenges, especially in the context of globalization and demands for improving the quality of education. Indonesia and South Africa, as two countries with different socio-economic and cultural backgrounds, face similar challenges in implementing their national curricula. Although both countries have made various efforts to improve the quality of education, the results are still not optimal, especially in terms of equality of access and quality of education (UNESCO, 2021).

In Indonesia, the implementation of the 2013 Curriculum (K-13) and the Independent Curriculum introduced in 2022 still faces various obstacles, such as lack of teacher training, inequality of educational resources between urban and rural areas, and low digital literacy among educators (Kemendikbud, 2023). (Sujianto, 2022) in Media Didaktika, highlights the importance of clinical supervision to improve non-educational teachers' classroom skills, particularly in delivering effective lesson openings. This finding emphasizes the role of structured professional development in addressing curriculum implementation issues.

Meanwhile, South Africa, which has implemented the National Curriculum and Assessment Policy Statement (CAPS) since 2012, also faces serious challenges, including inequality of educational infrastructure, high dropout rates, and gaps in the quality of education between schools in urban and rural areas (Department of Basic Education, South Africa, 2020). To cope with these issues, the integration of digital learning resources can be a promising solution. (Amiyah, 2024) points out that the development of digital teaching materials, such as e-modules using Heyzine Flipbook, can enhance student engagement and learning effectiveness suggesting a potential strategy for countries facing digital literacy gaps.

This study aims to examine the comparative implementation of national curricula in Indonesia and South Africa, focusing on the challenges and solutions faced by both countries in improving the quality of education. It also seeks to identify best practices that can be adopted by both countries to address these issues. (Ana, 2022) argues that differentiated instruction integrated with social and emotional learning (SEL) can foster the development of holistic student profiles. Her study illustrates how such integrative approaches contribute to shaping globally competent learners and may offer applicable insights for curriculum reforms in diverse educational settings.

Several previous studies have discussed curriculum implementation in Indonesia and South Africa separately. For example, a study by (Prastowo 2021) revealed that the lack of teacher training and minimal resources were the main obstacles in the implementation of the 2013 Curriculum in Indonesia. Meanwhile, a study by Mestry (2020) showed that uneven infrastructure and lack of government support were the main challenges in the implementation of CAPS in South Africa. However, there have not been many studies that directly compare curriculum implementation in the two countries, especially in the context of the challenges and solutions faced. Therefore, this study is expected to fill this literature gap and make a significant contribution to the development of future education policies.

LITERATURE REVIEW

Implementation of the National Curriculum in Indonesia

The implementation of the national curriculum in Indonesia has undergone several significant changes in recent years, especially with the introduction of the 2013 Curriculum (K-13) and the Independent Curriculum in 2022. The Independent Curriculum is designed to provide flexibility for teachers and schools in developing learning that is more relevant to students' needs (Kemdikbud , 2023). However, the implementation of this curriculum still faces various challenges, such as lack of teacher training, inequality of educational resources between urban and rural areas, and low digital literacy among educators (Prastowo, 2021). A study by (Suryani, 2022) shows that uneven teacher training is a major factor hampering the success of curriculum implementation, especially in remote areas.

In addition, research by (Wahyudi 2022) revealed that the lack of supporting infrastructure, such as internet access and technological devices, is a major obstacle in the implementation of the Merdeka Curriculum. This is especially evident in areas that are still underdeveloped, where students and teachers have difficulty accessing digital

learning materials. However, several schools in urban areas have shown success in implementing this curriculum, especially by utilizing technology and collaboration with the private sector (Kemdikbud, 2023).

Implementation of the National Curriculum in South Africa

In South Africa, the implementation of the National Curriculum Standards (CAPS) which began in 2012 also faces various challenges. Although CAPS is designed to improve the quality of education and reduce the gap between urban and rural schools, its implementation still faces serious obstacles, such as inequitable infrastructure, lack of government support, and high dropout rates (Department of Basic Education , South Africa , 2020). A study by (Mestry, 2020) shows that many schools in rural areas still lack basic facilities, such as adequate classrooms and textbooks, which hinders the learning process.

In addition, research by (Naidoo, 2021) revealed that lack of teacher training and low motivation of educators are the main factors affecting the success of CAPS implementation. Teachers in rural areas often do not have access to adequate training, making it difficult for them to teach according to the established curriculum standards. However, several initiatives have been undertaken by the South African government to address this issue, such as technology-based teacher training programmes and increased budget allocations for education (Department of Basic Education , South Africa , 2022).

Comparison of Curriculum Implementation in Indonesia and South Africa

Several studies have compared curriculum implementation in various countries, including Indonesia and South Africa. A study by UNESCO (2021) shows that both countries face similar challenges in curriculum implementation, such as inequality in educational resources and lack of teacher training. However, the strategies used by both countries to overcome these challenges are different. Indonesia places more emphasis on teacher training and community involvement, while South Africa focuses on policy reform and infrastructure development (Prastowo, 2021).

Research by Jansen also revealed that the success of curriculum implementation is greatly influenced by the local context. For example, in Indonesia, community participation and support from the private sector have helped several urban schools overcome obstacles in implementing the Independent Curriculum. Meanwhile, in South Africa, technology-based teacher training programs have shown positive results in improving the quality of learning in several rural areas (Naidoo, 2021)

RESEARCH METHODS

This study uses a comparative qualitative approach to analyze the implementation of national curricula in Indonesia and South Africa. This approach was chosen because it allows for an in-depth exploration of the policies, challenges, and solutions adopted by both countries in improving the quality of education. The type of research used is a comparative study, which compares the implementation of the curriculum in two countries with different social, economic, and cultural contexts. This study aims to identify factors that influence the success and obstacles in the implementation of the national curriculum in each country. This study uses secondary data obtained through document analysis. Document analysis includes official education policies from the Indonesian and South African governments, research reports, and scientific publications

related to curriculum implementation in both countries. In addition, data from international organizations such as UNESCO, OECD, and the World Bank are also used as references.

The data obtained were analyzed using thematic analysis techniques, which include data reduction, data presentation, and conclusion drawing. Data reduction was carried out by classifying information based on main themes, such as curriculum policies, implementation challenges, and problem-solving strategies. The results of the analysis are presented in the form of comparative tables and descriptive narratives to facilitate interpretation. Based on the results of the analysis, a synthesis of the main findings was made that can provide recommendations for improving curriculum implementation in both countries. To ensure the validity of the data, this study applied the source triangulation technique by comparing information from various official documents to ensure the consistency of the findings. With this method, the study is expected to provide a comprehensive picture of the implementation of the national curriculum in Indonesia and South Africa and offer insights for future education policies.

RESULTS AND DISCUSSIONS

Research Results

Based on the analysis of documents and secondary data obtained from various sources, this study reveals several key findings related to the implementation of the national curriculum in Indonesia and South Africa. The findings include challenges, strategies, and impacts of curriculum implementation in both countries.

a. **Challenges of Curriculum Implementation in Indonesia**
   1. **Resource Gap** : Data from UNESCO (2021) shows that the gap in educational resources between urban and rural areas is still a major problem in Indonesia. Schools in remote areas often lack basic facilities such as internet access, technological devices, and textbooks (Kemdikbud , 2023).
   2. **Teacher Quality** : A study by Prastowo (2021) revealed that the lack of teacher training, especially in the use of technology, is a major obstacle in the implementation of the Merdeka Curriculum. Teachers in rural areas often do not have access to adequate training, making it difficult for them to adapt to the new curriculum.
   3. **Digital Literacy** : The OECD (2022) report highlights the low digital literacy among educators and students in Indonesia, especially in rural areas. This hampers the implementation of technology-based learning which is the focus of the Merdeka Curriculum.

b. **Challenges of Curriculum Implementation in South Africa**
   1. **Infrastructure Inequality** : Data from the Department of Basic Education , South Africa (2020) shows that many schools in rural areas of South Africa still lack basic facilities such as classrooms, libraries and laboratories. This hampers the learning process and implementation of the National Curriculum (CAPS).
   2. **High Dropout Rates** : The World Bank (2021) report states that dropout rates in South Africa are still high, especially among students from low-income families. Economic factors and lack of government support are the main causes of this problem.
   3. **Teacher Quality** : A study by Naidoo (2021) revealed that lack of teacher training and low educator motivation are serious challenges in implementing

CAPS. Teachers in rural areas often do not have access to adequate training.

c. **Strategies and Solutions Implemented**
   1. **Indonesia** : The Indonesian government emphasizes teacher training and community engagement in addressing curriculum implementation challenges. Programs such as "Guru Penggerak" and "Sekolah Penggerak" have been launched to improve teacher competency and encourage community participation in education (Kemdikbud , 2023). In addition, collaboration with the private sector has also helped several urban schools overcome infrastructure and technology constraints.

   2. **South Africa** : The South African government is focused on policy reform and development of education infrastructure. Technology-based teacher training programs and increased budget allocations for education have been implemented to improve the quality of learning, especially in rural areas (Department of Basic Education , South Africa , 2022).

d. **Impact of Curriculum Implementation**
   1. **Indonesia** : Despite still facing various challenges, the implementation of the Merdeka Curriculum has shown positive impacts in several urban schools. The Ministry of Education and Culture's report (2023) shows that schools that have implemented this curriculum well have experienced an increase in student participation and learning outcomes.
   2. **South Africa** : The implementation of CAPS has succeeded in reducing the gap in the quality of education between urban and rural schools, although serious challenges remain in terms of infrastructure and teacher quality (Department of Basic Education , South Africa) . Africa , 2022).

Discussions

The findings of this study indicate that although Indonesia and South Africa face similar challenges in implementing national curricula, the strategies they use to address these issues differ. Indonesia places greater emphasis on teacher training and community engagement, while South Africa focuses on policy reform and infrastructure development. These differences reflect the different social, economic, and cultural contexts in the two countries.

1. **Local Context and Curriculum Implementation**

   This study confirms Jansen's (2023) findings that the success of curriculum implementation is greatly influenced by the local context. In Indonesia, community participation and support from the private sector have helped several urban schools overcome obstacles in implementing the Independent Curriculum. Meanwhile, in South Africa, a technology-based teacher training program has shown positive results in improving the quality of learning in several rural areas (Naido, 2021).

2. **Best Practices to Adopt**

   Based on the research findings, several best practices can be adopted by both countries. For example, Indonesia can learn from South Africa in terms of policy reform and education infrastructure development, while South Africa can adopt Indonesia's approach in involving communities and the private sector in education.

3. **Recommendations for the Future**

   To improve the quality of education, both countries need to strengthen

collaboration between the government, communities, and the private sector. In addition, improving teacher training and digital literacy should be a top priority, especially in rural areas. The government also needs to increase the allocation of the education budget to ensure equal access and quality of education across the region.

CONCLUSION

The study concludes that while Indonesia and South Africa face similar challenges in implementing national curricula such as resource gaps, teacher quality, and digital literacy the two countries have adopted different strategies based on their local contexts. Indonesia places greater emphasis on teacher training and community engagement through programs such as Guru Penggerak, while South Africa focuses on policy reform and developing education infrastructure. The study's findings suggest that both countries can learn from each other: Indonesia needs to strengthen education infrastructure and policies, while South Africa can adopt a collaborative approach with communities and the private sector. Key recommendations include increasing technology-based teacher training, equitable infrastructure, and strengthening multi-sector collaboration . The results of this study are expected to serve as a reference for developing more effective and adaptive education policies to global challenges, with a note on the need for continuous evaluation of programs that have been implemented to ensure sustainable improvements in the quality of education in both countries.

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CULTURAL AND DIDACTIC ANALYSIS OF PHYSICS LEARNING: A STUDY OF THE GOOD PRACTICES OF EDUCATION IN INDONESIA AND EGYPT

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Abstract: This study aims to examine and compare the practice of cultural-based and didactic physics learning between Indonesia and Egypt. This study is motivated by the importance of understanding local contexts in science education and the need to identify cross-border good practices to improve the quality of physics learning. This study uses a qualitative approach of literature study, by analyzing 50 selected literatures of 25 from Indonesia and Egypt each which include educational policies, teaching strategies, and the role of culture in physics learning. The data is categorized and compared in two main aspects: cultural and didactic. The results of the study show that Indonesia stands out in the application of contextual learning based on locality and method flexibility, while Egypt excels in curriculum consistency and strengthening of basic concepts of physics. Good practices from both countries can complement each other in creating more meaningful and relevant physics learning. This study suggests the development of physics learning that considers a balance between cultural approaches and didactic strategies. These findings are expected to be the basis for the development of curricula and learning practices that are adaptive to the diversity of global educational contexts.
Keywords: *cultural, didactic, good practice, indonesian physics, egyptian physics.*

INTRODUCTION

Physics is a branch of science that essentially consists of a collection of knowledge, methods of thinking, and research processes. The science in question is related to the study of the properties and phenomena that occur in various objects in nature that can be observed through the human senses. In the process of learning physics, abstract material is often found. This causes physics to still be considered a difficult subject to understand, since its concepts tend to be abstract and are not always easily associated with events in daily life (Malina et al., 2021).

Culture is a collective mindset that is socially formed and differentiates between community groups (Hotstede et al., 2011). Then didactics is defined as a framework of systematic analysis that includes fundamental questions about content, learners, and learning objectives (Gundem & Hopmann, 1998). In its application, physics, which is a difficult subject, turns out to be very common in daily life such as in culture. In this regard, physics learning can be obtained from local culture or wisdom, by accompanying it in its application. Thus, culture can provide a student's perspective in understanding physical phenomena.

Physics as a subject that is often considered abstract can be more easily understood by students if it is associated with the context of culture and daily life. A culture-based approach allows physics learning not only to focus on theoretical concepts, but also to connect them with local knowledge, traditional practices, and natural phenomena that students are already familiar with in their cultural environment (Aikenhead & Michell, 2011). For example, the concept of mechanics can be explained through traditional boatbuilding techniques, thermodynamics through the processing of regional foods, or astronomy through traditional dating. Thus, cultural integration in physics learning not

only enhances conceptual understanding, but also makes science more relevant and meaningful for students from different cultural backgrounds.

Each country has unique cultural characteristics, which in turn influence students' teaching approaches and understanding of physics concepts. An analysis of physics education best practices in different countries can reveal how cultural factors play a role in shaping effective pedagogical strategies. By comparing cross-cultural physics learning systems, we gain valuable insights into the linkages between cultural context and learning effectiveness. Findings like these not only enrich teaching methods, but also confirm that a deep understanding of students' cultural backgrounds is a key component in designing optimal physics learning.

Indonesia and Egypt have different cultural backgrounds and educational systems, which influence the way physics is taught in both countries. Indonesia, with its collectivist culture and a more flexible curriculum approach, provides space for teachers to adapt learning to students' abilities. This flexibility allows teachers to design more student-centered learning, choose essential materials, and apply varied learning methods according to the needs of students (Nasser et al., 2024). In contrast, Egypt, with its Middle Eastern cultural background and a more structured and rote learning education system, tends to adopt theory-oriented learning methods. The preparation of the curriculum in Egypt is carried out by a team of experts, education professors, supervisors, and experienced teachers. Each subject has a special committee in charge of designing the curriculum before it is endorsed by the pre-university education board. Although this curriculum can be adapted to the needs of the region, its implementation still relies heavily on teaching methods that are explicit and emphasize the understanding of concepts through the use of mathematics in physics. In addition, the textbooks used in learning are prepared based on the outline of the curriculum, but in practice there are obstacles such as limited teaching aids, variations in the quality of teachers, and the dominance of verbal learning methods. As a result, physics learning in Egypt emphasizes more on systematic mastery of theory than practical exploration in understanding physics concepts (Sulaiman et al., 2021). These differences reflect how education policies in each country are influenced by cultural values and the curriculum structure applied. While Indonesia provides more flexibility in learning, Egypt maintains a strict education structure with a focus on measurable academic standards.

The basic concept of didactic in physics learning is an important foundation for increasing the effectiveness of the teaching and learning process. Didactic deals with teaching theory and practice that includes the strategies, methods, and approaches used to deliver learning materials. In the context of physics, the proper application of didactic concepts can help students understand abstract and complex concepts in physics.

In Indonesia, learning physics faces various challenges, such as abstract concepts and the need for mathematical skills to understand them. In addition, less attractive teaching methods and limited laboratory facilities are also obstacles. To overcome this, an interactive conceptual learning approach has been applied. This approach emphasizes understanding of concepts through discussion and active interaction between students and teachers. A study shows that this approach can improve students' understanding of physics concepts (N. Sari et al., 2024).

In addition, other factors such as the language of instruction, the affordability of technology, and the role of teachers and communities in education also affect the approach to teaching physics in both countries. This comparison is important to see the

extent to which cultural and didactic elements in each education system can have an impact on students' understanding of physics.

The ethnophysical approach is one of the effective ways to relate physics concepts with local knowledge owned by the community. In the context of education, this approach provides a space for students to understand scientific concepts through cultural experiences and everyday practices that are relevant to their environment. In Indonesia, for example, ethnophysics is applied in the learning of energy and waves through traditional activities such as the game Seurune on u from Aceh, which represents the principle of resonance. The use of this cultural media not only bridges the understanding of abstract concepts, but also strengthens students' attachment to their local identity (Rahmadani & Nurmasyitah, 2022). In Egypt, the integration of cultural elements in the learning of physics can be found in the use of ancient architecture and the technology of past civilizations as a context to explain the principles of mechanics and optics. Thus, ethnophysics opens up opportunities for the development of more meaningful, grounded, and contextual learning, without having to sacrifice the accuracy of modern science. This approach shows that science does not always have to be taught in the abstract and apart from the real life of the student.

This research was conducted to fill the gap in the physics education literature by conducting an in-depth comparative analysis between Indonesia and Egypt. Most previous studies have tended to compare Western education systems with developing countries, or focus on policy aspects without in-depth cultural analysis. By focusing on two Muslim-majority countries with different cultural roots, this research is expected to make a new contribution to understanding the dynamics of science education. The findings of this study are expected to provide practical recommendations for the development of more effective and culturally sensitive physics curriculum and learning methods in both countries.

This study aims to identify and analyze good practices in physics learning in Indonesia as well as explore how culture-based approaches can improve the effectiveness of physics learning. In addition, this research also aims to provide recommendations for educators and policymakers in designing physics learning strategies that are more interactive and contextual. With this research, it is hoped that it can make a real contribution to improving the quality of physics education in Indonesia and provide recommendations for the development of more effective education policies.

According to D. Saputro and L. Hartono in the Journal of Media Didaktika (Vol. 13 No. 2, 2021), physics learning combined with local wisdom can increase students' interest and understanding of abstract physics concepts. Their research shows that by utilizing local culture as a learning medium, students become more enthusiastic and are able to combine physics material with everyday experiences. For example, the use of traditional musical instruments to explain the concept of waves or the use of traditional water wheels to understand the principles of kinetic and potential energy.

It is further explained that the didactic approach used must be able to accommodate the social and cultural context of students, so that the learning process is not only cognitive, but also affective and contextual. Didactics in this case plays a role as a basis for thinking in developing learning strategies that touch on local aspects. This is in line with the concept of ethnopedagogy, namely learning based on local culture as a source of learning to shape students' character and scientific knowledge holistically.

By using this approach, teachers are required not only to be transmitters of material, but also as facilitators who are able to connect physics theory with the reality of

students' lives. The culture-based contextual learning model has been proven to build deeper meaning in learning, as well as increase students' active participation in the learning process. Therefore, the application of local culture-based physics learning strategies is a form of didactic innovation that is relevant in the context of multicultural education such as in Indonesia.

LITERATURE REVIEW

Physics learning is an educational process that aims to develop students' understanding of natural concepts and physical phenomena through scientific approaches and logical thinking. In the context of 21st century education, physics learning focuses not only on mastery of the material, but also on the development of critical thinking skills, problem-solving, and the ability to apply concepts in daily life. According to (Bruner, 1960), the learning process should be active and allow students to build their own knowledge through direct experience with physical phenomena. Therefore, physics learning should be designed in such a way that it is relevant, contextual, and facilitates students' exploration of the natural world. This is the basis for the development of various adaptive learning models oriented towards the achievement of holistic competencies in physics education.

The integration of cultural values in physics learning is an important approach that aims to make the learning process more contextual and meaningful for students. This approach is known as culturally relevant pedagogy, as stated by Ladson-Billings (1995), which emphasizes the importance of associating students' cultural identity with the content of learning so that they feel represented and valued in the learning process. In the Indonesian context, many studies have shown that the use of local wisdom in physics learning, such as local natural phenomena, traditional tools, and folklore, can increase students' interest and understanding of science materials. Meanwhile, in the context of countries such as Egypt, the scientific heritage of ancient civilizations and figures such as Al-Haytham is often raised as part of the study of optics and astronomy. Cultural integration in physics learning not only strengthens national identity and appreciation of one's own culture, but also makes physics more relevant to students' experiences and environments.

Didactic in the context of education refers to the art and science of teaching, which includes strategies, approaches, as well as the selection of effective learning methods to achieve learning objectives. In physics learning, the didactic aspect is very important because physics is an abstract science that requires logical reasoning and a strong conceptual understanding. Learning models such as problem-based learning (PBL), guided inquiry, contextual teaching and learning (CTL), and discovery learning are widely used in physics teaching to encourage active student participation. An effective didactic approach should encourage exploration, experimentation, and reflection on the physical concepts being taught. Thus, the right didactic strategies can help students build a deeper understanding, while also developing the scientific skills and scientific attitudes necessary in the face of real-life challenges.

In Indonesia, the practice of learning physics has undergone significant development, especially in efforts to integrate local values into teaching materials. One of the widely used approaches is the application of learning based on local wisdom, where teachers associate physics concepts with natural phenomena, regional culture, and local community habits. For example, the concept of pressure and fluid can be attributed to traditional drink-making traditions or local irrigation systems. In addition,

the national curriculum encourages the use of active learning models such as guided inquiry, project-based learning, and collaborative learning tailored to the needs of students. Research by Nurpatri et al. (2023) shows that the integration of local culture in physics learning can significantly improve students' understanding of scientific concepts and attitudes. The practice of physics education in Indonesia reflects a combination of a scientific approach and a balanced and contextual cultural preservation effort.

Physics education in Egypt has a strong characteristic of integrating historical and scientific heritage into the learning process. Egypt is known as one of the early civilizations that made great contributions to the development of astronomy, mathematics, and natural sciences. In the practice of learning physics, several educational institutions in Egypt have raised Islamic scientists such as Ibn Al-Haytham who is widely known as the pioneer of modern light and optics theory. The use of this scientific history not only provides a contextual dimension in learning, but also strengthens students' cultural identity and national pride. According to Dadang Abdau (2024), an introduction to the contributions of Arab scientists in the science curriculum can increase students' sense of belonging to science and foster motivation to learn. In addition, the learning of physics in Egypt also shows the adoption of a constructivist approach, although its application still varies depending on the type of school and local policies.

Comparative studies in science education provide valuable perspectives in understanding the strengths and challenges of education systems in different countries. Through this approach, educational practices in one country can be used as a reference to improve or complement practices in other countries. In the context of physics learning, cross-border research such as that conducted by De Vries et al. (2015), shows that there are striking differences in pedagogical approaches, time allocation, and cultural integration between one system and another. The studies emphasize that there is no one-size-fits-all model, but good practices from different countries can be a source of inspiration. In this study, the approach to learning physics in Indonesia and Egypt was compared from cultural and didactic aspects to see the potential for value and strategy collaboration. Thus, comparative studies are not only descriptive, but also reflective and solutive to today's educational challenges.

RESEARCH METHODS

This study uses a literature study approach or literature study to analyze and compare the good practices of physics learning from a cultural and didactic perspective in Indonesia and Egypt, with the main data sources in the form of reliable secondary sources which include reputable scientific journals (indexed articles in databases such as Scopus and SINTA), reference books (texts and references relevant to physics education, cultural and didactic studies), education policy reports (official documents of the Ministry of Education and Culture of the Republic of Indonesia and the Ministry of Education of Egypt, as well as reports of related educational organizations), and other official publications (from research institutions, non-governmental organizations, and other relevant credible sources). The researchers intensively reviewed 25 documents from each country, which were systematically selected based on relevance, credibility, and up-to-dateness, to reflect valid and representative good practices. The literature selection process is carried out systematically based on the following criteria:

1. Publication timeframe: The selected literature is the publication published in the period 2015–2025 to ensure relevance to the current educational context.

2. Thematic relevance: The literature should significantly address cultural (social values, local wisdom) and/or didactic (methods, learning strategies) aspects in the context of physics learning.
3. Source credibility: Priority is given to literature written by authors with a good reputation in their field and/or published by a credible institution. The selection process involves searching for relevant keywords in scientific databases and reviewing abstracts and article content to ensure fit with the research focus.

The data analysis stage uses a descriptive-comparative approach with the following steps:

1. Data categorization: Information from the collected literature is categorized based on the main themes, namely cultural aspects (including social values, local wisdom relevant to physics learning) and didactic aspects (including learning methods, teaching strategies, assessment approaches, and the use of learning resources in physics learning).
2. Creation of a comparative matrix: The data that has been categorized is then mapped into a comparative matrix to identify similarities and differences in the practice of physics learning between Indonesia and Egypt in both aspects (cultural and didactic). This matrix helps in systematic visualization and comparative analysis.
3. Interpretation of findings: Findings from comparative analysis are interpreted through the lens of ethnophysical theory and critical pedagogy. Ethnophysical theory is used to understand how cultural context influences the understanding and learning of physics concepts, as well as how local wisdom can be integrated in learning. Critical pedagogy is used to analyze how the practice of physics learning empowers students, develops critical thinking, and considers relevant social issues.

The validity of the results of this study is maintained through triangulation of sources. Each conclusion drawn is supported by information from a minimum of three different literature to ensure the consistency and reliability of the findings. In addition, the researcher recognized and listed the limitations of the study, including the potential bias that may arise due to dependence on English, Indonesian, and Arabic literature (depending on the researcher's language ability) as well as the absence of field data that allows direct observation of learning practices.

FINDINGS AND DISCUSSIONS

Physics Learning in Indonesia

Physics learning in Indonesia takes place in a very rich social and cultural context. As an archipelagic country with hundreds of ethnic groups and diverse local wisdom, the approach to education in Indonesia cannot be separated from the cultural roots of its people. In the last two decades, the Indonesian government through the Ministry of Education and Culture (Kemendikbud) has encouraged the integration of local cultural values into the learning system, including physics subjects.

One of the characteristics of physics learning in Indonesia is the effort to relate physics concepts with the context of daily life that is typical of Indonesia. For example, natural phenomena such as earthquakes, volcanic eruptions, or monsoon wind patterns are used as contextual material to teach basic physics principles such as force, pressure, and fluid dynamics. As stated by Nurrohman (2016), the use of local wisdom as a contextual medium helps students build a deeper understanding of physics concepts, as they can relate them to their own life experiences.

From a cultural perspective, an ethnoscience-based approach has begun to be applied in various regions, especially in schools that develop a curriculum based on local culture. The concept of ethnophysics, which is a derivative of ethnoscience, allows the integration of cultural concepts such as traditional house structures, traditional agricultural techniques, and people's life patterns into part of physics learning. This is in line with the idea of Afnan et al., (2024) who state that local science can be a bridge to more contextual scientific understanding, without negating modern science.

In addition to the cultural aspect, the didactic practice of physics learning in Indonesia also shows diverse dynamics. Teachers have the flexibility to choose learning strategies, although the national curriculum remains the main reference. Inquiry-based learning models, problem-based learning (PBL), and discovery learning are widely used to encourage students to actively build concepts. According to A. R. Sari et al. (2020), inquiry-based learning strategies combined with local contexts have been proven to be able to improve students' science literacy while strengthening their cultural identity.

However, there are challenges in the implementation of contextual and progressive didactic physics learning in the field. One of them is the limited learning resources and in-depth teacher training on culture-based approaches. There are still many teachers who rely on conventional textbooks without adapting to the local character of students. This is in accordance with the findings of Pratiwi & Asyarotin (2019) which highlight the need to increase the pedagogic capacity of teachers in developing teaching materials based on the environment and surrounding culture.

Furthermore, at the policy level, the government has shown a commitment to strengthening contextual aspects through the Merdeka Learning curriculum. In this policy, teachers are encouraged to differentiate learning and utilize local potential in the preparation of teaching modules. This is in line with the principle of culture-based education stated by Ki Hadjar Dewantara, that education must be rooted in the nation's culture and aim to humanize humans.

Overall, physics learning in Indonesia shows a synergy between efforts to preserve local culture and strengthen students' scientific competence. Despite the challenges in implementation, many good practices can be developed and replicated, especially in terms of integrating cultural values into didactic learning strategies.

Physics Learning in Egypt

Physics learning in Egypt developed in an educational landscape characterized by a long scientific tradition and a centralized educational structure. Egypt is a country with a strong history of scientific civilization since ancient times, and this legacy still influences the way of looking at science education, including physics, to this day. The Egyptian Ministry of Education plays a major role in drafting the national physics curriculum, which is oriented towards strengthening students' scientific concepts and logical reasoning.

In terms of curriculum, Egypt adapted a competency-based curriculum with strong emphasis on mastery of basic concepts of physics and quantitative analysis skills. Based on the National Strategy for Education Reform document (Egyptian Ministry of Education, 2018), the physics learning system in Egypt covers key topics such as mechanics, waves, electricity, and thermodynamics, with an emphasis on practical applications and laboratory experiments (Developments, 2019). Physics lessons at the upper secondary level are geared towards equipping students for highly competitive

national exams, such as Thanaweya Amma, which determine graduation and access to higher education.

In classroom practice, physics teachers in Egypt still dominate the learning process through lectures and direct explanations, but there are efforts to adopt an inquiry and exploration-based approach. According to a study by El-Deghaidy & Mansour (2015), although active learning approaches such as inquiry-based science education (IBSE) have been introduced, challenges in teacher training and school resources are still major obstacles. However, there are excellent schools that have begun to develop STEM-based science learning programs that are more collaborative and applicative.

Culturally, the study of physics in Egypt was also shaped by strong social norms and religious values. In the context of the classroom, the teacher is often respected as an authoritative figure, and the classroom structure tends to be formal. Nevertheless, there is great potential to develop physics learning that takes into account Egypt's cultural heritage, such as the application of optical and architectural principles in the pyramids or the use of mechanical concepts in ancient irrigation systems. Research by Rima et al. (2019) shows that incorporating cultural elements in teaching can increase students' interest and understanding of complex physics concepts.

From a didactic perspective, the physics learning system in Egypt shows similarities to the European model in terms of structure and content of the material, mainly due to the historical influence of British colonialism and the adoption of the modern education system. Physics material is delivered systematically and follows a logical sequence from basic concepts to advanced concepts. Although the constructivist approach has not yet been fully implemented, physics teachers in Egypt are beginning to be trained to use problem-based methods and virtual labs, as learning technology develops.

The main challenge in teaching physics in Egypt is the disparity in resources between schools, especially between public schools in the countryside and private or international schools in large cities. Access to physics labs, simulation devices, and modern textbooks is uneven. As stated by UNESCO (2022), there is a gap in the quality of education between urban and rural areas that affects the effectiveness of science learning in general.

Nevertheless, the Egyptian government has shown its commitment to education reform by launching the Education 2.0 initiative, one of whose main focuses is on improving the quality of science learning and the use of information technology in education. In this context, physics learning is directed to be more applicable and relevant to modern life, such as by relating the material to renewable energy issues and digital technology. This initiative shows a positive policy direction towards the development of more meaningful physics learning and in line with the demands of the times.

Overall, physics learning in Egypt reflects a transition from traditional approaches to more constructivist and contextual learning models. Although there are still structural and pedagogical challenges, innovative efforts have been made, especially at the level of policy and teacher training. Physics education in Egypt has great potential to develop into a learning system that integrates the strengths of local culture and global technological advancements.

Comparative Analysis

1. Comparison of cultural aspects

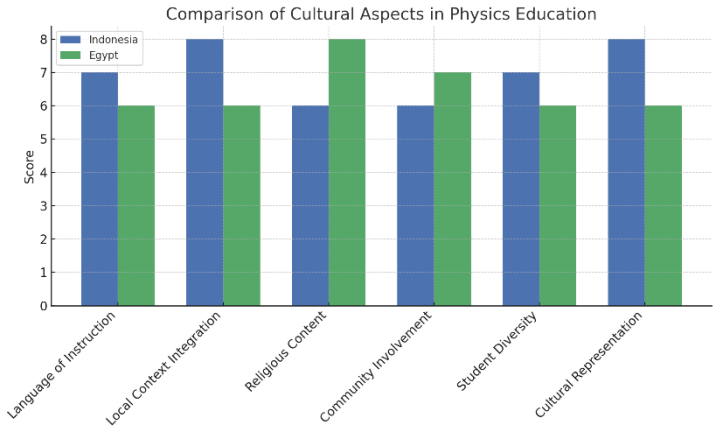
From a review of the education system in Indonesia and Egypt, we obtained a comparison of the cultural aspects of the two countries. By categorizing literature from both countries into the same topic, we obtained the following data.

Table 1. Comparison of Cultural Aspects of Physics Learning in Indonesia and Egypt

Aspek	Indonesia	Egypt
Integration of Social and Cultural Values in Learning	Physics learning in Indonesia began to adopt a local culture-based approach, such as associating physics concepts with traditional activities, local wisdom (e.g. traditional irrigation, earthquake-resistant traditional houses), and the daily practices of local communities.	Physics learning in Egypt also accommodates local socio-cultural values, incorporating themes appropriate to the context of students' lives, such as the desert environment, Nile irrigation agriculture, and the technological heritage of ancient civilizations such as pyramid architecture.
The Contribution of Cultural Context in the Understanding of Physical Concepts	Cultural context is often used to explain abstract concepts. For example, the use of traditional equipment or folklore to explain vibrations and waves.	Egyptian students were introduced to the concept of physics through phenomena close to their lives, such as the effects of heat in a desert environment or mechanics in ancient construction. This helps ground abstract material to their reality.
The Role of Local Wisdom in Learning Practice	Local wisdom such as traditional dating systems, seasonal calculations, and traditional house construction are used to link science to real life.	Local knowledge related to ancient Egyptian science is used as a bridge to understand the principles of modern physics, for example through discussions of Ancient Egyptian technology and its application in today's science.
Curriculum Responsiveness to Cultural Diversity	The Independent Curriculum provides space for teachers to associate learning with the local culture of their respective regions. It encourages	Egyptian curriculum has also begun to provide flexibility in the preparation of teaching materials based on local needs, as well as

	contextual learning and respects diversity.	encouraging the use of cultural contexts in a more humanistic approach to learning.
Student Empowerment through Local Culture	Students are empowered to explore local cultures through inquiry-based projects relevant to their culture. It also builds an identity and a sense of belonging to science.	Learning in Egypt encourages students to explore their nation's intellectual heritage, increase a sense of pride and make learning physics a means of strengthening national identity and civilization.
Use of Media or Local Context in Learning	Teachers often use videos, pictures, or local culture-based props to explain physics concepts. It also helps students in building meaning.	Teachers in Egypt use local sources and historical stories that are relevant to students to create a more real and meaningful learning experience.

Figure 1. Comparison of cultural aspects of physics learning in Indonesia and Egypt



The results of cultural analysis on physics learning in Indonesia and Egypt show that both have peculiarities in integrating cultural values into the educational process. In Indonesia, cultural-based physics learning tends to prioritize a contextual approach through the introduction of local wisdom such as subak in Bali to explain the principle of fluids or traditional houses as a representation of the concept of structural mechanics (Satriawan & Rosmiati, 2017). This is in line with the ethnopedagogical approach, which according to Annisha (2024), emphasizes the importance of making local culture a source of learning to increase the relevance and meaning of education.

Meanwhile, Egypt integrates cultural aspects through scientific and historical heritage, such as the use of ancient Egyptian astronomical knowledge and the introduction of figures such as Al-Haytham in optical learning (Alpaten et al., 2024). This reflects efforts to preserve the nation's historical identity as well as appreciation for

the contribution of past civilizations in the development of modern science. This is in line with Ladson-Billings (1995) view of culturally relevant pedagogy, where students are positioned as part of their history and culture, and empowered through a learning process that respects their identity.

Both approaches have similarities in terms of making learning more meaningful and contextual through cultural integration, but differing in the primary sources used. Indonesia emphasizes more on contemporary local wisdom, while Egypt focuses more on historical heritage and classical Muslim scholars. Both reflect each nation's unique way of maintaining cultural continuity through education.

The implications of these findings show that good practices from Indonesia can provide inspiration for Egypt in the exploration of contemporary local wisdom, while Egypt can be an example for Indonesia in the involvement of Muslim scholars and figures and historians in learning. This is important because, as Nieto, (2017) affirms, multicultural education is not only about tolerance for differences, but also about the recognition of the contribution of culture to science.

Thus, the culture-based physics learning approach in both countries reflects the form of adaptation of education to their respective national identities. Cultural integration in physics learning can be a path to education that not only intellectually educates, but also strengthens the cultural roots and character of learners.

1. Comparison of didactic aspects

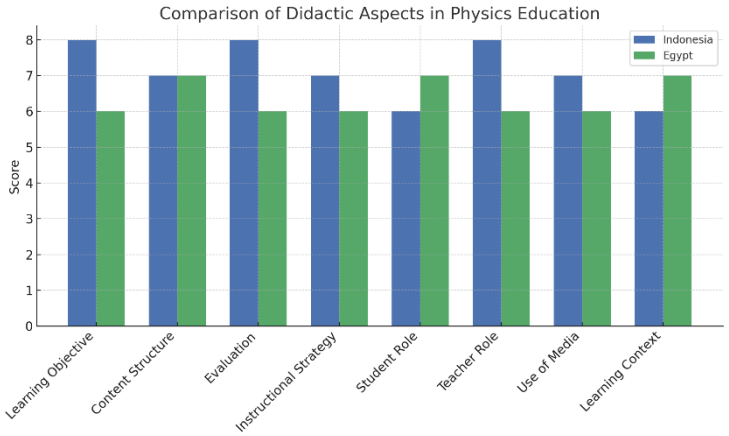
After a comparison of the cultural aspects of Indonesia and Egypt. So it is continued to compare the didactic aspects of the two countries. From the literature that we have obtained, the results are found, namely.

Table 2. Comparison of Didactic Aspects of Physics Learning in Indonesia and Egypt

Aspects	Indonesia	Egypt
Learning Approach	Using a scientific, inquiry-based approach, and starting to implement project- and phenomenon-based learning (PjBL and PBL) in the Independent Curriculum.	Apply a constructivist and problem-solving-oriented approach, with an emphasis on understanding concepts rather than memorization.
Learning Strategies	Strategies vary between group discussions, simple experiments, and the use of the surrounding environment as a learning resource.	The strategy includes case studies, demonstrations, and integration of digital technologies such as simulations and interactive videos.
Learning Model	Models such as Discovery Learning, Problem Based Learning, and Project Based Learning are applied at various levels of educational units.	Active learning models such as Inquiry-Based Learning and Guided Discovery are the focus in the development of physics learning in Egypt.

The Role of the Teacher	Teachers act as facilitators and guides, encouraging students to actively build their own knowledge.	Teachers also function as mediators in the active and critical learning process, with regular training from the government to improve competence
Learning Assessment	Asesmen mencakup formatif dan sumatif. Di Kurikulum Merdeka, asesmen diagnostik dan asesmen berbasis proyek mulai banyak digunakan.	Asesmen menitikberatkan pada keterampilan berpikir tingkat tinggi (HOTS) dan aplikasi konsep dalam kehidupan sehari-hari, serta penggunaan rubrik kinerja.
Use of Technology	Increasing the use of digital media and online learning platforms, especially after the COVID-19 pandemic.	The Egyptian government is actively encouraging the digitalization of schools and the integration of e-learning platforms in physics learning.
Professional Development	Program pelatihan dan komunitas belajar guru seperti Program Guru Penggerak (PGP), serta pelatihan implementasi Kurikulum Merdeka.	Teacher training is carried out centrally by the Egyptian Ministry of Education to improve pedagogic mastery and science content.

figure 2. Comparison of didactic aspects of physics learning in Indonesia and Egypt



Based on the results of the analysis of didactic aspects, it can be seen that both Indonesia and Egypt have shown significant developments in physics learning strategies, albeit with different approaches according to the context of each country's policies, cultures, and pedagogical habits.

In Indonesia, physics learning is driven by a competency-based curriculum and a scientific approach, with an emphasis on active, inquiry, and project-based learning

(Septyaningrum & Lestari, 2023). This is in line with the principles of constructivism, where students are considered as active agents in building their knowledge through experience and interaction (Liu & Matthews, 2005). Learning strategies such as the problem-based learning (PBL) and project-based learning (PjBL) models are widely used in an effort to grow 21st century skills and scientific literacy of students.

Meanwhile, Egypt also showed efforts to improve pedagogical quality by encouraging STEM-based curriculum reforms and digital technology-based approaches (Nasr, 2014). Physics learning in Egypt integrates a lot of digital visualization, simulation, and blended learning approaches, especially since the COVID-19 pandemic. This is in line with the principles of digital pedagogy, which allow for flexibility and student involvement through online and interactive media (Anselmo, 2024).

However, a striking difference can be seen in the focus of the approach: Indonesia emphasizes a more grounded contextual approach, while Egypt is more focused on digital transformation and modernization of learning infrastructure. Even so, both seek to strengthen teacher capacity through professional training and development, which is an important indicator of transformative didactics (Sulaiman et al., 2021), which is the ability of teachers to transform content knowledge into an effective form of teaching.

Another noteworthy similarity is the attention to interdisciplinary approaches and problem-based learning, although the context of implementation is different. In Indonesia, this is often associated with the integration of local values and cultural practices, while in Egypt it is more often coupled with the application of technology and contemporary scientific innovation. This shows that both countries are trying to strike a balance between preserving educational identity and adapting to global challenges.

These findings show that good practices from Indonesia in the use of cultural-context-based learning models can inspire Egypt's approach in bringing science closer to daily life. On the contrary, digital and STEM approaches in Egypt can be valuable lessons for Indonesia in strengthening the integration of technology and innovation in science education. As stated by Rahmayuni Jusar et al., (2023), a responsive education system is one that is able to innovate without losing its cultural roots.

A comparative analysis of physics learning in Indonesia and Egypt shows that cultural approaches greatly influence teaching strategies and orientations in both countries. Indonesia integrates local wisdom into learning to create contextual and meaningful learning experiences, while Egypt shows great concern for the continuity of traditional values by strengthening formal mastery of science. Although their approaches are different, both place culture as an important foundation in the development of physics learning.

From a didactic perspective, physics learning practices in Indonesia emphasize more on participatory approaches and collaborative projects, while Egypt tends to emphasize a systematic structure with a focus on scientific experiments and evidence-based approaches. Both have their own advantages that can complement each other. Good practices from Indonesia can strengthen aspects of local relevance and participation, while the Egyptian approach makes a major contribution in terms of pedagogical order and students' scientific skills.

Thus, these comparative results do not aim to compare quality hierarchically, but to explore good practices that can be an inspiration across cultures. The potential for mutual learning between these two countries is enormous, especially if cultural values and didactic approaches are developed in a more open and collaborative direction. The

ideal physics learning is one that is able to unite local and global forces, and shape students into critical, contextual, and characterful individuals.

CONCLUSIONS

The results of the study of 25 literature from Indonesia and 25 literature from Egypt show that physics learning in both countries has characteristics that are influenced by socio-cultural conditions, educational policies, and pedagogical approaches of each country. In Indonesia, physics learning integrates a lot of local values and the context of daily life, and is driven by a curriculum that makes room for scientific and project-based approaches. Meanwhile, physics learning in Egypt highlights the rich scientific history and heritage of civilization, with an emphasis on consistency in curriculum application and in-depth strengthening of physics concepts. Both countries display distinctive ways of adapting physics learning according to their cultural values and educational systems.

From the results of the comparative analysis, it was found that several good practices that can be adopted with each other to strengthen the quality of physics learning. Indonesia can take inspiration from Egypt in terms of consistency in curriculum implementation and depth of discussion of physics concepts, while Egypt can learn from Indonesia in the application of locality-based contextual learning, as well as the flexibility of methods that bring physics closer to students' lives. In addition, the integration of cultural values, the strengthening of scientific literacy, and the use of innovative media such as technology and local visualization, are relevant good practices to be applied cross-country in order to increase the effectiveness and meaning of physics learning.

As a recommendation, this study suggests that the development of physics curriculum and learning methods in both countries should be carried out by paying attention to cultural and didactic aspects in a balanced manner. Further research can be conducted with a field approach or case studies to evaluate the implementation of good practices that have been identified. In addition, international collaboration in the development of culture-based physics learning can be an important strategy to encourage physics education that is more inclusive, adaptive, and relevant to today's global challenges.

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FINDING THE COMMON THREAD OF THE INDONESIAN VS UNITED STATES EDUCATION SYSTEM

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Abstract: This study aims to analyze and compare the education systems in Indonesia and the United States, focusing on the Educational Goals and Philosophies of the Two Countries, Curriculum, Learning Methods, Role of Teachers and Teacher Training, Evaluation and Assessment, Equitable Access to Education and the Use of Technology in Education applied in both countries. In the context of globalization and the development of information technology, a deep understanding of the differences and similarities in this education system has become very important. The research methods used are literature studies and comparative analysis, which involves collecting data from various sources, including official documents, scientific articles, and educational reports. The results show that despite significant differences in the approach and implementation of the education system, the two countries have the same goal, which is to create a competent generation ready to face global challenges. This study also found that cultural, economic, and government policy factors play a major role in shaping the characteristics of each education system. Thus, this research is expected to provide broader insights for educators, policymakers, and researchers in an effort to improve the quality of education in Indonesia and the United States.

Keywords: *education system, comparison, goals and philosophy, curriculum, learning methods, role of teachers and teacher training*

INTRODUCTION

Education is one of the main pillars in the development of a nation, playing an important role in creating quality and competitive human resources. In the current era of globalization, the education system in various countries has undergone significant transformation, including in Indonesia and the United States. Although both countries share the same goal of creating a quality generation, the approach and implementation of their education systems are very different. Indonesia, as a developing country, faces challenges in improving the quality of education, while the United States, as a developed country, continues to innovate in teaching methods and curriculum to meet changing needs.

In this situation, it is crucial to understand how these two education systems function and influence each other. Previous research has discussed various aspects of comparative education systems between Indonesia and the United States.(Mustika et al., 2022) in his article "A Comparative Study of Basic Education Policies in Indonesia and the United States" highlights differences in basic education policies, especially in the curriculum structure implemented in the two countries. They found that despite significant differences in curriculum approaches, the two countries are trying to implement the best basic education systems according to their respective capacities.

The main focus of this study is the lack of literature. Very few studies compare the education system in Indonesia and the United States. This is important because each country's social, cultural, and economic context is very different, which can provide

new insights into the development of education policies. Meanwhile, (Julian et al., 2025) In "Analysis of the Comparative System of Education in the United States with the State of Indonesia" analyzes various important aspects of the education system in both countries, including the curriculum, educational structure, government policies, and the quality of human resources in the education sector. As in Indonesia, we basically know that Indonesia has utilized technology in the world of education, such as research conducted by (Hasriadi, 2022) saying that the use of media in learning activities must pay attention to the principles of media use. The results of the analysis show that the United States has a more flexible education system with a high level of innovation, while Indonesia still faces major challenges in terms of education equity and teaching quality. and based on research by (Indrawaningsih, 2023) stating that the development of education in schools at this time still needs to reform the education system. All this time it has been assumed that teachers are the ones who know the most and students are only listeners.

Research conducted by (Budiman Akli et al., 2023) In "Comparison of Education Systems in the United States and Indonesia" discusses the differences in educational structure, funding, and curriculum between the two countries. They found that the United States implements "No Child Left Behind" laws with education funding sources coming from states and districts, while Indonesia has seen changes in education patterns since the 1998 reforms toward decentralization.

However, these studies still have limitations, especially in the in-depth analysis of how the Indonesian education system differs from the United States. In addition, there have not been many studies that address the practical implications of the adoption of certain elements of the United States education system into the Indonesian context, taking into account existing social and cultural factors.

The purpose of this study is to find a common thread of similarities and differences of the education system in Indonesia and the United States which includes in terms of the Goals and Philosophy of Education of the Two Countries, Curriculum, Learning Methods, Role of Teachers and Teacher Training, Evaluation and Assessment, Equal Access to Education, Use of Technology in Education to build readers' knowledge about the differences between the Indonesian and United States education systems.

RESEARCH METHODS

This study uses a qualitative method with a comparative study approach. This approach was chosen because the main purpose of the study is to compare two education systems, namely the education system in Indonesia and in the United States, in order to find similarities (common threads), differences, and learning potentials that can be taken from each system.

The analysis technique used is the analysis of literature studies which is carried out by reading, understanding, grouping, and comparing the content of the literature that has been collected. The main focus of this analysis is on aspects such as:

- Goals and Philosophies of Education of the Two Countries
- Curriculum
- Learning Methods
- The Role of Teachers and Teacher Training
- Evaluation and Assessment

- Equitable Access to Education
- The Use of Technology in Education

Through this analysis, the researcher will identify the common thread or common ground of the education systems of the two countries, as well as propose policy recommendations or practices that can be adapted by Indonesia from the United States education system.

This method was chosen because it is suitable for studying social and educational phenomena in depth, without numerical or quantitative limitations, and allows for a broader interpretation of the available data.

FINDINGS AND DISCUSSIONS

Goals and Philosophies of Education of the Two Countries

In Education, it is necessary for a country to think about the purpose of Education and what basis will be the role model of Education with the modernity of the times and knowledge is increasing and technology is increasingly rampant and commonly used in the world of Education, but Education needs an important foundation that is the goal and the need for us to compare between the goals and philosophies of one negative one and another in order to become a benchmark and source of progress for Education in the country such as the developing countries of Indonesia and the developed countries of the United States.

Education in Indonesia is rooted in the philosophy of Pancasila, which emphasizes the values of divinity, humanity, unity, democracy, and social justice. This philosophy aims to form individuals who are faithful, pious, noble, healthy, knowledgeable, capable, creative, independent, and democratic and responsible citizens. Ki Hajar Dewantara, an Indonesian education figure, emphasized that education is a humanization process that aims to build individuals with a balance of intellectual, moral, and character(Asiva Noor Rachmayani, 2023). The implementation of this philosophy is reflected in the "Merdeka Belajar" initiative which was introduced in 2019. This program aims to improve learning outcomes by providing flexibility to educational units in managing the curriculum, so that learning is more relevant to the needs of students and the challenges of the times (OECD, 2023).

Whereas the goals and philosophies of education in the United States have evolved over time, influenced by various thoughts and needs of society. Historically, education in the U.S. has aimed to achieve four main aspects: academic, economic, democratic, and social. The academic aspect emphasizes the mastery of basic knowledge and skills; the economic aspect focuses on the preparation of a competent workforce; the democratic aspect aims to form participatory citizens; and the social aspect seeks to instill moral and cultural values.(Commission, 2021). In addition, the philosophy of education in the United States also emphasizes the importance of STEM (Science, Technology, Engineering, and Mathematics) education to prepare students to face global economic challenges and technological advancements. Chris Talgo in his article "Point & Counterpoint: STEM is Way to Compete in the Future" (2025) highlights the need for an emphasis on STEM education to ensure the competitiveness of American students in the future. In the development of the education system, it is important to strike a balance between character formation and mastery of technical skills. Indonesia can learn from the United States in terms of emphasis on STEM and

practical skills, while the United States can learn from Indonesia on the importance of moral values and character building in education.

In this case, of course, there are similarities and differences between Indonesia and the United States in terms of their educational goals and philosophies, so that the similarity between the two countries lies in their efforts to adapt the education system to the needs of the times and prepare students to face global challenges. The two countries also emphasized the importance of developing critical thinking skills and active participation in society. The difference is that Indonesia emphasizes the values of Pancasila and character formation as the core of education, while the United States focuses more on mastering technical skills and practical knowledge relevant to the needs of the job market. However, there are still things that need to be considered so that they can become a benchmark for the state to advance Education, namely the similarities and differences between the two countries in determining the goals and philosophies of their countries that are able to bring Education to a quality education for students The advantages of the Indonesian education system are the emphasis on the formation of character and moral values, but the lack of is to ensure effective implementation and relevance to global needs. On the other hand, the United States education system excels in its emphasis on practical and technical skills, but faces criticism regarding declining academic standards and a lack of emphasis on character building. So that many things need to be considered in the development of the education system, it is important to balance between character formation and mastery of technical skills. Indonesia can learn from the United States in terms of emphasis on STEM and practical skills, while the United States can learn from Indonesia on the importance of moral values and character building in education.

Curriculum

In education, the curriculum is very important and needs to be considered to achieve the expected educational goals, especially it is necessary to pay attention to the comparison of education from one country to another to increase the benchmark of one country in getting to know relevant education and can create education that is useful for the future and the comparison between developed countries and developing countries can be a good example and role for the development of education in the future such as Education in Indonesia and the United States.

Indonesia has implemented the Merdeka Curriculum in response to the challenges of modern education. This curriculum gives more autonomy to schools and teachers in designing learning that suits the needs of students.(Dian Fitra, 2023) emphasizing that the Independent Curriculum allows flexibility in learning, so that students can develop their potential optimally. However, the implementation of the Independent Curriculum faces challenges, including teacher readiness and uneven educational infrastructure. (Masri et al., 2023) highlighting that the active participation of all parties, including teachers, students, parents, and the government, is critical to the successful implementation of this curriculum. In addition, research by (Umar et al., 2025) discuss how the implementation and development of the Independent Curriculum contributes to realizing quality education in Indonesia. Then what are the differences and similarities with developed countries, namely the United States?

In the United States, curriculum development often involves collaboration between curriculum developers and educational institutions. Highlight the role of curriculum developers in supporting the development, revision, and renewal of

academic programs at the college level. In addition, the coverage of material in introductory courses in quantum information science at U.S. institutions, highlights the importance of consensus in curriculum development for emerging fields(Meyer et al., 2024). Further, a study by (Dickey & Bejarano, 2023) introduces the GAIDE framework that leverages generative AI to aid course content development, demonstrating the integration of technology in curriculum development.

It can be concluded that there are similarities and differences between the two countries in the application of the curriculum in Education. The similarities between Indonesia and the United States lie in their efforts to adapt the curriculum to the challenges of the times, such as the integration of technology and the response to industrial needs. The two countries also emphasized the importance of flexibility in the curriculum to meet the diverse needs of students.

The difference is that Indonesia tends to adopt a centralized approach to curriculum development, while the United States is more decentralized, with a significant role of curriculum developers and educational institutions in determining curriculum content and structure. And in this case, it is necessary to pay attention to the advantages and disadvantages of both countries in the implementation of the curriculum in their countries The advantage of the Indonesian curriculum system is the existence of clear national guidelines, but the disadvantage is to ensure effective implementation in all regions with diverse conditions. On the other hand, the United States curriculum system offers flexibility and innovation through decentralization, but it can face challenges in ensuring consistent quality standards across states.Therefore, it is necessary and important for a country to pay close attention by paying attention to the shortcomings, advantages and differences and similarities so that they get the information that needs to be considered to develop. In curriculum development, it is important to consider the readiness of human resources, supporting infrastructure, and evaluation mechanisms and continuous adjustments. Indonesia can learn from the U.S. decentralized approach in giving more autonomy to educational institutions, while the U.S. can learn from Indonesia's centralized approach in setting consistent national standards.

Learning Methods

Study by (Zuhdi, 2018) discusses two innovative approaches in pedagogical practice in Indonesia: PAIKEM (Active, Innovative, Creative, Effective, and Fun Learning) and GASING (Easy, Fun, and Fun). PAIKEM emphasizes the active participation of students in the learning process, while GASING focuses on fun learning to improve understanding of concepts. Both approaches aim to improve the quality of education by involving students more actively. Learning Methods in the Independent Curriculum are quoted from a researcher by (Darmawanti, 2021)Analyze video recordings of history lessons showing that although the curriculum demands an approach that actively engages students, practice in the classroom is still dominated by teacher-centered teaching methods. This shows that there is a gap between curriculum objectives and implementation in the field. Then the Indonesian curriculum underwent a transformation where the OECD Report (2023) highlighted that the new curriculum in Indonesia introduced pedagogical approaches such as project-based learning through the Pancasila Student Profile Strengthening Project. This approach aims to develop students' competencies holistically and relevant to the needs of the 21st century.

Meanwhile, in the United States, where it is interpreted from one of the Study by (Condliffe et al., 2017) shows that Project-Based Learning has been an effective approach in various schools in the United States. This approach allows students to develop critical and collaborative thinking skills through real-life projects that are relevant to their lives. Then the United States integrates technology in learning which is shown in one of the studies by (Zielezinski, 2016) emphasizes the importance of integrating technology in learning to improve student engagement and personalization of learning. The use of technology allows teachers to tailor learning materials according to individual needs of students. And the United States also takes a social and emotional learning approach which is interpreted by one The CASEL report (2020) discusses the implementation of Social and Emotional Learning in schools in the United States. This approach aims to develop students' social, emotional, and academic skills in a balanced manner.

In this case , differences and similarities can be found in education in Indonesia and the United States where both countries show efforts to adopt a more student-centered learning approach and relevant to the needs of the 21st century. However, Indonesia still faces challenges in implementing the approach consistently across the region, while the United States has been more advanced in technology integration and social-emotional learning. Therefore, here it can be seen that these two countries certainly have advantages and disadvantages in the world of education that are applied such as Indonesia's advantages lie in the initiative to develop innovative learning approaches such as PAIKEM and GASING. However, the drawback is the lack of teacher training and adequate resources for effective implementation. The United States excels in technology integration and a comprehensive approach to learning, but faces challenges in technology access gaps in some communities.

The Role of Teachers and Teacher Training

In the context of Indonesian education, teachers play the role of facilitators and innovators of active and creative learning. Research by (Dwiki et al., 2024) Highlighting the role of driving teachers as learning facilitators, sources of inspiration, and designers of adaptive learning strategies. Driving teachers are expected to be able to create an innovative learning environment and support student development holistically. Teacher training in Indonesia is increasingly leading to a competency-based approach. Study by (Sitopu et al., 2023) shows that online training through platforms such as Zoom has improved teachers' mastery of technology and pedagogical skills. This training is designed to improve the quality of teaching and adaptation to the current curriculum. Despite efforts to improve the quality of teachers through training, challenges still exist, especially in terms of equitable access and quality of training. Research by (Diki Maulansyah et al., 2023) emphasizing the importance of the role of teachers in improving the quality of education and the need for continuous training to support this role. While in the United States, the teaching profession faces serious challenges related to retention and job satisfaction. Report by (Kraft et al., 2022) shows a significant decrease in the number of prospective teachers and low job satisfaction levels, which has an impact on the quality of education. Teacher professional development in the U.S. emphasizes deep continuous learning. Report by (Hammond et al., 2017) highlighting the importance of training that focuses on developing complex skills such as problem-solving and collaboration. Education policy in the U.S. significantly affects teacher training. Study by (Mayer, 2021) discusses how federal and

state policies shape teacher training programs, with a focus on accreditation and competency standards. Both Indonesia and the United States recognize the importance of teachers' role as facilitators of learning and the need for continuous training. Both face challenges in terms of teacher retention and adaptation to changes in curriculum and technology.However, the training approach is different; Indonesia places more emphasis on competency-based training and the use of online technology, while the U.S. focuses on in-depth professional development and policies that support high competency standards.

Evaluation and Assessment System

The education evaluation system in Indonesia has undergone various changes to improve the quality of education. Evaluation is carried out through diagnostic, formative, and summative assessments. Research by (Cirocki et al., 2025) shows that teachers in Indonesia generally use these three types of evaluations to monitor student learning progress, although their implementation still faces challenges in terms of teacher understanding and skills. In addition, a study by (Cirocki et al., 2025) highlights the importance of assessment literacy among prospective English teachers in Indonesia. The results of the study show that the level of assessment literacy still needs to be improved through more intensive training and education.

Evaluation of national education standards is also a focus in efforts to improve the quality of education. Research by (Damanik, 2024) Recommend restructuring of national education standards by simplifying indicators and aspects of standards to improve the effectiveness of implementation in the field. While in the United States, educational evaluation systems are constantly evolving to improve effectiveness and fairness. Report by (Too many et al., 2023) evaluate the Innovative Assessment Demonstration Authority (IADA) program, which allows states to develop innovative assessment systems that are more appropriate to local needs and increase student engagement. Study by (Pinar, 2021) discussed the impact of the COVID-19 crisis on curriculum and educational evaluation, emphasizing the need to adapt the curriculum to face new challenges and support more flexible learning. In addition, the journal "Assessment & Evaluation in Higher Education" regularly publishes research related to evaluation and assessment practices in higher education, providing insights into approaches and challenges faced in the context of higher education in the U.S.

With this explanation, there will be similarities and differences between the two countries in the evaluation and assessment system such as, These two countries have similarities, among others, Both countries recognize the importance of formative and summative evaluation in the learning process, challenges in the implementation of effective evaluation, including the need for training for educators, efforts to adapt the evaluation system to local needs and global challenges. And some other differences such as Indonesia is more centralized in the development of evaluation policies, while the US gives more autonomy to states and educational institutions, the US is more active in developing and adopting innovative assessments through programs such as IADA, Assessment literacy among educators in Indonesia is still a challenge, while in the US there are more resources and training to support professional development.

Equitable Access to Education

In Indonesia, there is the implementation of zoning policies as in research by (Purnamasari & Ginanjar, 2025) explained that the zoning policy was introduced in

2017 as an effort to improve access and equitable education for all students. This policy aims to ensure that every child has equal access to quality education regardless of economic status or geographical location. However, the implementation of this policy is faced in research conducted by (Mulyani, 2021) challenges, such as quality inequality between schools and resistance from the community. The Government of Indonesia allocates an education budget of 20% of the state budget as an effort to equalize and expand access to education. However, the distribution of this budget still faces challenges in its implementation, especially in supporting private schools and remote areas. Despite various efforts have been made, the issue of equal distribution of education in Indonesia is still a big challenge. Various schools and educational institutions face obstacles such as inadequate facilities, limited human resources, high education costs, and uneven distribution of teachers. Meanwhile, in the United States, the report "Indicators of Higher Education Equity in the United States" shows that there are gaps in higher education achievement based on student characteristics, such as family income and race. The report highlights the importance of financial aid and support programs to reduce barriers in access to higher education(Report, 2020). Diversity, Equity, and Inclusion (DEI) policies have become a focus in efforts to improve educational equity in the U.S. However, recently, DEI policies have faced challenges, including the elimination of DEI programs at some educational institutions, which may affect access to and support for students from minority groups. In response to challenges to DEI policies, some universities in the U.S. have begun to adopt a pluralism approach, which emphasizes respectful engagement among ideological, religious, and cultural differences. This approach aims to create an inclusive educational environment for all students. So that Both Indonesia and the United States face challenges in equitable access to education. In Indonesia, the main challenge lies in the uneven distribution of resources and the quality of education between regions. Meanwhile, in the U.S., challenges arise from shifting policies and political tensions affecting programs that support educational equity.

The Use of Technology in Education

Technology plays an important role in life, and how does it play a role in the world of Education such as Research by (Natalia et al. 2024) highlighting the use of digital technology to create interactive learning in elementary schools. The use of digital media such as learning videos and educational applications increases student engagement by up to 35% compared to traditional methods. However, challenges such as technology gaps and lack of digital literacy are still obstacles in their implementation.(Siringoringo & Alfaridzi, 2024) Discuss how e-learning platforms and computer-based evaluation tools can improve teaching efficiency and effectiveness. Technology allows teachers to create engaging and interactive learning environments, although there are still challenges in terms of training and technology adaptation by educators. Research by (Mustakim, 2020) shows that the use of technology-based learning media can increase active participation and student learning outcomes. However, the implementation of technology in learning still faces challenges such as limited infrastructure and teacher readiness. Meanwhile, in the United States, research by (Kritandani et al., 2024) emphasizing the importance of integrating artificial intelligence (AI) in education to enhance learning and support innovation. This report discusses the need for policies that support the use of technology to improve the teaching and learning process. Study by (Ranzato et al., 2025) examine the use of

educational technology (EdTech) to support the learning of students with special educational needs in inclusive elementary schools. This research highlights how EdTech can support more inclusive and adaptive learning. A report by EDUCAUSE (2025) evaluates students' experiences in technology-related higher education, including preferences for hybrid learning and the use of AI in the classroom. This report provides insights into how institutions can adapt to meet the needs of students and enhance their learning experience.

Both Indonesia and the United States have shown significant efforts in integrating technology into their education systems. Both countries face challenges such as the digital divide and the readiness of educators to adopt new technologies. However, there are differences in the approach and focus of technology implementation:

1. Indonesia is more focused on improving access and digital literacy at the primary level, with an emphasis on the use of interactive learning media to increase student engagement
2. The United States emphasizes the integration of advanced technologies such as AI and EdTech to support more inclusive and adaptive learning, as well as prepare students for the needs of the future.

CONCLUSIONS

Based on the results of a comparative study between the Indonesian and United States education systems, I conclude that although the two countries have different social, cultural, and economic backgrounds, they share the same goal of creating a generation that is capable, competent, and ready to face global challenges. Indonesia emphasizes on character formation and moral values rooted in Pancasila, while the United States focuses more on developing technical skills and integrating technologies such as STEM and AI. In terms of curriculum, Indonesia tends to be centralistic through the Independent Curriculum, while the US gives autonomy to each state. Learning methods in Indonesia have begun to adopt active approaches such as PAIKEM and GASING, but their application is not evenly distributed. In contrast, the U.S. has been more advanced in implementing Project-Based Learning and Social Emotional Learning.

The role of teachers in both countries is equally vital, but training in Indonesia still faces the challenge of equitable quality. The evaluation and equitable access to education system also shows that Indonesia needs to strengthen infrastructure, training, and equity policies. On the other hand, the US, although more advanced in educational innovation, still faces the challenge of social and political disparities. The use of technology in education is an important point of this comparison. Indonesia shows great potential in the use of digital media but needs to pursue human resource and infrastructure readiness, while the US has extensively integrated advanced technology in its education system.

From this research, I realized that no system is perfect. It is precisely from that difference that we can learn from each other. Indonesia can draw inspiration from the flexibility and technological advancement of the US, while the US can learn from the approach to values and character that is firmly held in Indonesian education. I hope that

the results of this research can make a real contribution to the improvement of education policies and practices in Indonesia in the future.

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INNOVATION OF TECHNOLOGY-BASED INDONESIAN LANGUAGE LEARNING MEDIA AT STATE JUNIOR HIGH SCHOOL 5, BENGKULU CITY

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Abstract: This study aims to analyze the form of technology-based learning media innovation applied in Indonesian language learning at SMP Negeri 5 Bengkulu City, as well as its impact on the effectiveness of the teaching and learning process. The research method used is descriptive qualitative with observation, interview, and documentation techniques. The results of the study indicate that Indonesian language teachers have integrated various technology-based learning media such as Liveworksheet, Google Classroom, and interactive learning videos. The use of this media increases student participation, enriches learning resources, and supports independent learning. The obstacles faced include limited internet networks and lack of technology training for teachers. This study concludes that technology-based media innovation plays an important role in improving the quality of Indonesian language learning, but it requires infrastructure support and continuous development of teacher competencies.

Keywords: *Media Innovation, Learning Technology, Indonesian Language, SMP Negeri 5 Bengkulu*

INTRODUCTION

The development of information and communication technology (ICT) has brought significant changes to the world of education. In this digital era, education is no longer limited to physical classrooms, but can also be done through digital media that allows learning to occur anytime and anywhere. One of the major impacts of the development of ICT is the demand to integrate technology into the learning process, including in learning Indonesian. The use of technology-based learning media provides various advantages that are not only limited to easy access to information, but also to increasing interaction between teachers and students, as well as the presentation of more interesting and interactive materials.

In this context,(Arifin et al., 2020) stated that technology-based learning media can enrich students' learning experiences by providing various resources that can be accessed flexibly. This gives students the opportunity to better understand the material in a more interesting and innovative way, through various existing digital learning platforms.

(Arifin et al., 2020) also noted that the diversity of media used in learning can add variety to the learning process, which in turn can improve student understanding. With a variety of media options, students do not only rely on verbal explanations from teachers, but can engage directly with the subject matter through applications, videos, and various other forms of media that are more interactive and contextual. However, although technology has a lot of potential to support learning, the reality in the field shows that not all educational institutions are able to adopt technology optimally. Some of the challenges faced by schools in implementing learning technology include limited facilities, lack of training for teachers, and inadequate infrastructure. At SMP Negeri 5

Kota Bengkulu, although there have been efforts to integrate technology into learning, there are still several obstacles that need to be overcome to maximize the use of technology in the classroom.

At SMP Negeri 5 Bengkulu City, the use of technology in learning Indonesian is very important considering the demands of the times that require students to have good digital skills. However, in its implementation, not all students can access technology easily. Some students face obstacles such as a lack of adequate devices or unstable internet connection problems in some areas, which makes the use of technology-based media less than optimal (Hidayati et al., 2020).

For example, in learning Indonesian, teachers at SMP Negeri 5 are required to be able to present innovations that are relevant to the needs of today's digital generation. Therefore, the use of technology-based learning media in teaching Indonesian is not only an option, but a necessity that must be met. Indonesian language learning, which initially used conventional methods such as lectures and manual assignments, has now begun to shift to using technology-based media such as Google Classroom, Liveworksheet, and learning videos. This media innovation is expected to increase students' interest and understanding of Indonesian language learning materials which are sometimes considered difficult and boring.

Various learning applications such as Liveworksheet allow students to interact directly with learning questions that are tailored to certain topics, increasing the appeal of learning with more active methods. Google Classroom also functions as a platform that makes it easier for teachers to distribute materials, collect assignments, and provide feedback to students more efficiently. The use of learning videos as supporting media can also help students understand the concept of Indonesian through interesting visualizations (Hidayati et al., 2020).

This study aims to identify the forms of technology-based learning media innovation used by Indonesian teachers at SMP Negeri 5 Bengkulu City, and to analyze the impact of using these media on learning effectiveness. In addition, this study will also explore the obstacles faced by teachers and students in implementing technology in Indonesian language learning.

This study adopts a qualitative approach to obtain a deeper picture of the use of technology-based learning media. With this approach, it is hoped that more specific information can be found regarding the positive impacts and obstacles faced in implementing technology in classroom learning (Id et al., 2023).

More specifically, this study will answer three main objectives. First, to identify the forms of media innovation applied by Indonesian teachers at SMP Negeri 5 Bengkulu City. This includes media such as interactive learning applications, the use of online learning platforms, and the use of learning videos. Second, this study will analyze the impact of the use of these media on the effectiveness of Indonesian language learning, both in terms of increasing student understanding, student involvement, and achievement of learning outcomes. Third, this study will also identify the obstacles faced in the application of technology, such as technical problems related to devices or internet connections, as well as the lack of training for teachers in using technology-based learning applications. This study is expected to provide an important contribution in identifying solutions to overcome existing obstacles and providing recommendations to maximize the use of technology in Indonesian language learning at SMP Negeri 5 Kota Bengkulu.

LITERATURE REVIEW

Innovation in learning media, especially technology-based ones, has become one of the important elements in improving the quality of education in this digital era. The use of technology in the learning process has a significant impact on students' learning methods, especially in learning Indonesian at the junior high school level. This article discusses the importance of technology-based learning media innovation, as well as its implementation at SMP Negeri 5 Kota Bengkulu.

Definition of Learning Media

According to (Ikhsan et al., 2912), learning media is anything that can be used to convey messages in learning, which can stimulate students' attention, interest, and abilities in the learning process. Learning media functions to make it easier for students to understand the material being taught and develop their creativity. The use of appropriate media can increase learning efficiency and help achieve educational goals.

In the context of Indonesian, innovative learning media is very important to foster students' interest and skills in reading, writing, speaking, and listening. The media used can be books, audio, video, applications, and other digital platforms that support the active learning process.

Technology in Learning

The development of information and communication technology (ICT) has provided new opportunities in the world of education. Integration of technology in learning has the potential to enjoy students' learning experiences. According to (Prasojo et al., 2018), technology provides convenience in accessing information, increasing interaction between teachers and students, and accelerating the fulfillment of materials. Technology-based allows students to learn independently, access various learning resources, and collaborate on learning online.

The use of technology in Indonesian language learning media can include various forms, such as learning applications, e-learning platforms, video tutorials, and learning gamification. All of these technologies function to provide a more interesting and relevant learning experience to students' daily lives, especially at SMP Negeri 5 Kota Bengkulu.

Innovation of Technology-Based Learning Media at SMP Negeri 5 Kota Bengkulu

At SMP Negeri 5 Kota Bengkulu, the implementation of technology-based learning media innovation has shown significant development. One of the learning media implemented is a digital-based learning application, such as the use of the bold learning platform and website-based applications that support Indonesian language teaching. According to (Setyoko et al., 2023), the use of this application provides an opportunity for students to learn interactively and is not limited by time and space.

Indonesian language teachers at SMP Negeri 5 Kota Bengkulu utilize various applications such as Google Classroom, Kahoot, and Liveworksheet, which allow students to learn Indonesian more actively. The use of these platforms also makes it easier for students to access learning materials, hold discussions, and work on assignments related to Indonesian language skills. In addition, the application of technology-based media is also supported by the use of multimedia such as learning videos and podcasts that help students understand the material more deeply and interestingly. This is in accordance with the opinion of (Gilakjani, 2012) who stated that

the use of multimedia in learning can increase motivation and make it easier for students to understand difficult concepts.

Challenges in Implementing Technology-Based Learning Media

Although the use of technology-based learning media has many benefits, there are several challenges that must be faced by teachers and students. One of the biggest challenges is limited access to technology. Some students at SMP Negeri 5 Kota Bengkulu still have difficulty in accessing the technological devices needed for online learning. This can hinder them from participating in learning optimally, especially in areas with limited internet infrastructure.

In addition, not all teachers have adequate skills in using technology effectively. Therefore, training for teachers is very important to improve their competence in integrating technology in learning. According to (Zein, 2017), proper training for teachers can improve their understanding and skills in using technology in learning, which in turn can improve the quality of education.

The development and utilization of technology-based learning media at SMP Negeri 5 Kota Bengkulu is in line with the results of research published in Media Didaktika. One of them is a study by (Amiyah et al., 2024)) entitled "Development of Heyzine Flipbook-Based E-Modules in Learning to Write Biographical Texts for Class X". This study shows that interactive digital media, such as Flipbook-based e-modules, can increase students' interest and ability in writing, because they provide a more interesting and easily accessible learning experience for students. This is in line with the use of platforms such as Google Classroom and Liveworksheet at SMP Negeri 5 Kota Bengkulu which are designed to improve students' writing and reading skills through interactive digital media.

In addition, the use of digital media in developing scientific writing skills is also reinforced in the article "Utilization of Digital Media in Learning to Write Scientific Papers" by ,(Ulfah, n.d.) which shows that the use of AI-based technology and other digital platforms can help students access learning resources, process information critically, and produce more systematic written works. This is very relevant to Indonesian language learning at SMP Negeri 5 Kota Bengkulu, which integrates learning videos, podcasts, and interactive applications to encourage students to actively write and think critically in digital-based learning.

Innovation in technology-based learning media at SMP Negeri 5 Kota Bengkulu has made a major contribution to improving the quality of Indonesian language learning. Although challenges in terms of technology access and teacher skills still exist, the use of technology-based media provides opportunities to create more interactive, interesting, and relevant learning with the times. In the future, it is hoped that the implementation of technology in Indonesian language learning can continue to be improved to create a smarter and more skilled generation in facing global challenges.

RESEARCH METHODS

This study is included in the category of descriptive qualitative research that aims to systematically describe the form and impact of technology-based learning media innovation at SMP Negeri 5 Kota Bengkulu. This study focuses on how the use of technology-based learning media in the teaching and learning process in the classroom, as well as its impact on student understanding and teaching effectiveness.

a. Research Subjects

The research subjects consisted of Indonesian language teachers and students of grades VII and VIII of SMP Negeri 5 Kota Bengkulu. Indonesian language teachers were chosen because they have a central role in the implementation of technology based learning media, while students of grades VII and VIII were chosen as informants because they are the main users of the media in learning activities.

b. Data Collection Techniques

The data in this study were collected through several techniques as follows:

1. Direct observation of the learning process taking place in the classroom. This observation aims to see how technology-based learning media is applied and how interactions between teachers and students occur during teaching and learning activities.
2. Semi-structured interviews with teachers and students. This interview provides a deeper picture of the experiences, opinions, and responses of teachers and students regarding the use of technology-based learning media. Interviews were conducted by providing space for informants to express their views openly, but still directed to the focus of the research.
3. Documentation of learning devices and media used in the teaching and learning process. This documentation includes photos or notes related to technology-based learning media used, as well as materials delivered in class.

c. Data Analysis Techniques

The collected data were analyzed using the interactive data analysis model proposed by (Miles and Huberman, 2014.), which includes three main stages:

1. Data Reduction: The process of filtering and simplifying raw data obtained from observations, interviews, and documentation.
2. Data Presentation: Presentation of data in narrative form that describes the main findings from the results of observations and interviews.
3. Drawing Conclusions/Verification: At this stage, researchers draw conclusions based on the data that has been presented, and verify these conclusions to ensure their truth.

FINDINGS AND DISCUSSIONS

In the increasingly developing digital era, the use of technology in education is very important. Schools in Indonesia, including SMP Negeri 5 Kota Bengkulu, are increasingly adopting technology in learning to improve the quality of education and student engagement. The use of various technology-based media in Indonesian language learning is one of the strategies implemented to create a more interesting and effective learning experience. Therefore, this study aims to analyze the forms of learning media innovations applied by Indonesian language teachers, their impact on learning, and the obstacles faced in implementing the technology.

Based on the results of observations and interviews with students and Indonesian language teachers at SMP Negeri 5 Kota Bengkulu, various innovations in technology-based learning media were found to be used in the teaching and learning process. These media are designed to support the achievement of learning objectives and are adjusted to the characteristics of the material being taught. In addition, this study also covers the impacts felt by students and teachers from the application of this technology, as well as the obstacles that are still faced in its implementation.

a. Forms of Learning Media Innovation

The results of observations at SMP Negeri 5 Kota Bengkulu show that Indonesian language teachers have implemented various technology-based learning media to support more effective and interesting learning. Some of the media used include:

1. Liveworksheet: This media is used to provide interactive digital-based practice questions. Liveworksheet allows students to work on questions directly through the devices they have, with feedback features that can be received immediately. This makes the learning process more interactive and helps students monitor the development of their understanding.
2. Google Classroom: This platform is used as a medium for collecting assignments and distributing materials. Google Classroom makes it easier for teachers to provide materials and assignments to students, and allows students to access them anytime and anywhere. In addition, Google Classroom also facilitates the process of evaluating student assignments with integrated features.
3. YouTube and Learning Videos: This video media is used to support students' understanding of various types of texts, such as short stories, poems, and procedural texts. Interesting learning videos can present explanations visually and audibly, which makes the material easier to understand and interesting for students.
4. Kahoot and Quizizz: Both of these applications are used for learning evaluation with a game-based learning approach. Both of these platforms allow students to take quizzes interactively in a fun format. By using game-based learning, students can feel more challenged and involved in learning.

The use of various media is very much adjusted to the learning objectives and characteristics of the Indonesian language material being taught. By utilizing technology, learning becomes more interesting and can reach a wider range of aspects, both in terms of access and delivery methods.

b. Impact of Media Innovation on Learning

From the results of interviews with students and teachers, it is known that the implementation of technology-based learning media has a significant positive impact on the quality of learning. Some of the positive impacts that can be seen include:

1. Increasing Student Engagement: One of the biggest impacts is increasing student engagement in the learning process. Technology-based learning media, such as Liveworksheet, Quizizz, and Kahoot, provide a more interesting and interactive learning experience. Students not only receive material passively, but also actively participate in various learning activities.
2. Facilitating Access to Materials: The use of digital platforms, such as Google Classroom and learning videos on YouTube, allows students to access learning materials anytime and anywhere. This is very helpful for students who may have difficulty following face-to-face learning, either due to time constraints or distance.
3. Improving Digital Literacy Skills: In the digital era like today, digital literacy skills are very important. By utilizing various technology-based learning platforms, students become more skilled in using digital devices and online learning applications. This not only improves academic skills but also prepares students to be better prepared to face the challenges of the digital world in the future.
4. Encourage Independent Learning: One of the great advantages of implementing technology in learning is that it encourages students to learn independently. Students can repeat the material as needed, making it more flexible and in

accordance with their individual learning styles. This independent learning is very important in increasing student independence in the learning process.

One student stated:

"I am more enthusiastic about learning Indonesian because assignments and practice questions are sent via Google Classroom, I can do them while looking for references on the internet."

Meanwhile, an Indonesian teacher added:

"With media such as Liveworksheet and Quizizz, students become more active and learning does not feel monotonous."

This quote shows that technology not only makes learning more fun, but also increases students' active involvement, which in turn improves the quality of their learning outcomes.

c. Constraints in Implementing Technology

Although it has many positive impacts, the implementation of technology-based learning media also faces a number of constraints that need to be considered. Some of the constraints found in the field include:

1. Technical Constraints: One of the most common problems faced is an unstable internet connection in some areas where students live. Several students reported difficulty in accessing online learning materials due to an unstable internet network. This can hinder the learning process and make it difficult for students to follow lessons optimally.
2. Limited Facilities: Many students do not have adequate devices, such as laptops or smartphones with sufficient specifications to participate in technology-based learning. The limitations of these devices make it difficult for students to access various learning platforms smoothly. Especially for students who live in areas with limited facilities, this is a significant obstacle in implementing technology-based learning media optimally.
3. Lack of Training and Mastery of Technology by Teachers: Although teachers have tried to utilize various technology-based learning media, many of them are not yet accustomed to or are not yet proficient in using certain applications. One teacher said that they found it difficult to create interactive media due to the lack of training provided. This shows that although technology can provide great benefits, teacher mastery of technology is also very important to ensure effective implementation.

One teacher said:

"Sometimes I have difficulty making interactive media because I am not used to certain applications. We need training from the school."

This statement shows the importance of more intensive training and support for teachers to maximize the use of technology in learning. Without adequate skills, even though learning media is available, the effectiveness of its use can be hampered.

Based on the results of observations and interviews, it can be concluded that the implementation of technology-based learning media innovations at SMP Negeri 5 Kota Bengkulu has had a positive impact on increasing student engagement and motivation to learn. Media such as Liveworksheet, Google Classroom, YouTube, Kahoot, and Quizizz have made the learning process easier, expanded access to materials, and improved students' digital literacy. However, technical constraints, limited facilities, and lack of training for teachers are still challenges in implementing technology optimally. For this

reason, further support, both in the form of facilities and training, is needed to maximize the use of technology in **learning in schools.**

CONCLUSIONS

This study concludes that innovation of technology-based Indonesian language learning media at SMP Negeri 5 Bengkulu City has been implemented through the use of various digital platforms such as Liveworksheet, Google Classroom, and learning videos. This innovation has been proven to be able to increase student participation, enrich learning methods, and encourage learning independence. However, to optimize its implementation, support is needed in the form of adequate technological infrastructure, training for teachers, and school policies that are adaptive to changing times. The development of technology-based learning media should be a joint commitment between teachers, schools, and the government so that the quality of Indonesian language learning is increasingly good and relevant to the demands of the 21st century.

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SYMBOLISM IN "ELEMENTAL" MOVIE: A GUIDE FOR ENHANCING WRITING SKILLS THROUGH STORY RETELLING

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Abstract: *Developing writing skills remains a persistent challenge in education, particularly when conventional techniques fail to engage students meaningfully. This study investigates the effectiveness of using the animated film "Elemental" as a medium to enhance writing skills through symbolic analysis and story retelling. Grounded in sociocultural learning theory and interpretive anthropology, the study employed a mixed-methods pretest-posttest quasi-experimental design involving twenty tenth-grade students at NU 1 Vocational School Karanggeneng. Students participated in a guided intervention featuring the analysis of symbolic elements in the film, followed by structured story-retelling exercises. Data were collected through pretests and posttests, which were assessed by a symbolic interpretation rubric and analyzed using descriptive statistics, paired samples t-tests, and qualitative content analysis. Quantitative findings showed that students' mean scores improved significantly from 58.90 in the pretest to 80.13 in the posttest, with symbolic understanding achieving the highest improvement at 47.4% ($p < 0.001$). Qualitative analysis revealed enhanced abilities in interpreting symbolic meanings and embedding them creatively into narratives. This study concludes that incorporating symbolic analysis into multimedia-based instruction effectively fosters critical literacy and creative writing skills. Limitations include the small sample size and the relatively short duration of the intervention, suggesting that future research should explore longitudinal impacts and the application of symbolic storytelling strategies across broader educational contexts.*

Keywords: *writing skills, symbolism, elemental movie, story retelling*

INTRODUCTION

In the ever-evolving landscape of education, developing writing skills remains a fundamental challenge and concern for students at different levels of education (AlMarwani, 2020). Writing skills are essential because they are one of the methods through which people interact and exchange information with each other. Crafting good writing presents a significant mental challenge, as it requires the combined use of memory, language skills, and critical thinking (Al Hadad et al., 2024). Writing skills, especially in English, also contribute to other skills. That is why we need to have writing skills. Students need to come up with ideas in their heads to control their thoughts, and students need to experience writing and the experience of writing ideas (Salsabila et al., 2024). It still becomes a problem when the students are dulled to learn due to the boring learning techniques (Anwar et al., 2023). To improve writing skills, teachers need to attract students' interest by giving them an understanding and then being able to re-explain it interesting (Sahayu, 2024).

In today's era, students are developing in multimedia Irish situations, frequently considering different data sources and excitement. The swift advancement of technology has transformed education by introducing innovative tools that reshape

traditional teaching and learning practices (Pariyanto & Tungka, 2024). This steady movement contributes to a diminished resilience to boredom, requiring high levels of incitement to preserve the center (Roehling et al., 2010). The intersection of movie media and pedagogy has become a focal point, especially with narrative-oriented animation, which enhances students' motivation and provides a structured approach to story elements, fostering improved comprehension and writing skills. In practical applications, studies have shown that animations tailored to student-friendly content can provide a balanced blend of visual engagement and conceptual understanding, making it an ideal medium for writing exercises in educational settings (Ginting et al., 2019).

The movie 'Elemental' (2023) represents a fascinating case in researching symbolism and narrative techniques of modern storytelling. This movie narrates the story of several elemental groups with their symbol form as water, land, fire, and wind characters in an elemental city, which becomes a newcomer (Devyana & Nugroho, 2024). Symbolism is one of the most important literary devices that make viewing pleasurable. At the same time, storytelling plays an important role in the cognizance of any meaning to be conveyed by a movie (Doston Hamidulla O'g'li, 2024). Symbolism in movies easily helps the audience understand a movie's hidden or implied meanings (Hermanto Sihombing et al., 2022).

Previous studies have reported on the importance of animated movies for teaching. Animation movies have been proven to be effective in many studies for educational purposes, particularly in writing. This study also examined the ability of students to teach by using animated movies. For example, (Irwan & Putra, 2015), this research uses two kinds of treatment, which discuss the comparative writing ability of students who are taught a mixture of conventional therapy and modern media (animation movies). The results prove that there is only a slight change from the average pre-test to the average post-test results for conventional treatment (a difference of 0.25%). In comparison, the change in the average pre-test and post-test results for animation movie media looks more increased (difference of 18.65%). It was concluded that animation movie media was better than conventional treatment. Nonetheless, although these studies emphasize the generalistic use of animated movies in education and the facilitation of writing, knowledge of how some special symbolic features in the current frame of an animated movie, placed with systematic implementation within teaching writing, will remain a challenge. There is still a significant gap in understanding how certain symbolic elements in contemporary animation movies can be systematically used to develop writing skills.

This study seeks to see the use of modern media in education with the movie Elemental, which has a symbolic meaning to sharpen the students' ability to construct the story and support students' writing skills. Abbar, (2023) relates stronger student narratives to the ability to identify and critique symbolism in contemporary or modern media.

RESEARCH METHODS

This study utilized a mixed-methods pretest-posttest quasi-experimental design, as conceptualized by (Campbell & Stanley, 1966) The research aimed to enhance the writing skills of tenth-grade students at NU 1 Vocational School Karanggeneng through an innovative approach that combined story retelling with symbolic analysis of the film "Elemental." Twenty students, aged 15 to 16, participated in this educational intervention. The study was theoretically grounded in Vygotsky (1978)'s Sociocultural

learning theory and interpretive anthropology, both of which stress the importance of symbolic understanding as constructed through social interaction, cultural interpretation, and the reconstruction of lived experiences via narrative.

Research Instruments:

Comprehensive research instruments were developed and implemented throughout the study to evaluate the students' progress. The pretest writing assessment employed a Symbolic Interpretation Rubric with a scoring range of 0-100 points. This assessment evaluated three critical dimensions: Narrative Structure (30 points), which examined the students' ability to create coherent storylines; Symbolic Understanding (35 points), which measured their capacity to identify and interpret symbolic elements; and Creative Expression (35 points), which assessed their ability to articulate interpretations in original and insightful ways.

The intervention phase focused on the animated film "Elemental," chosen for its rich symbolic content and thematic complexity. Students engaged with the 101-minute film through guided viewing sessions and structured symbolic analysis activities designed to deepen their understanding of metaphorical representations. The intervention also included guided story retelling sessions, where students practiced reconstructing the narrative while incorporating their symbolic interpretations, thereby linking analytical thinking with creative expression.

After the intervention, students undertook a posttest writing assessment that mirrored the structure of the pretest. This methodological consistency allowed for direct comparative analysis of their progress in symbolic interpretation and narrative construction abilities. The posttest specifically instructed students to craft stories about "Elemental," integrating the symbolic elements they had analyzed during the intervention.

Data Collection:

Data collection was meticulously structured into three sequential phases: Pre-test phase, Intervention phase, and Post-test phase.

1. Phase 1 (Pre-test)

The pretest involved established baseline measurements of the students' symbolic interpretation skills without prior exposure to the film. This initial assessment provided essential comparative data for later analysis.

2. Phase 2 (Intervention)

The intervention encompassed, featuring a film screening and structured symbolic analysis activities facilitated by the researcher. These activities supported the students' understanding of symbolic elements and narrative structures.

3. Phase 3 (Post-test)

The posttest involved which comprehensive assessment of skills development following the educational intervention.

Data Analysis:

The study employed a triangulated approach, combining quantitative and qualitative techniques for data analysis. Descriptive statistics summarized patterns in student performance across both assessments. Paired samples t-tests validated any observable changes in student writing abilities from pretest to posttest. Additionally, qualitative content analysis was conducted on students' written work to identify emerging themes, patterns of symbolic understanding, and evidence of transformative learning that might not be captured through quantitative measures alone. This mixed-methods analytical approach provided a more nuanced understanding of how story

retelling and symbolic analysis influenced students' writing development and interpretive capabilities.

FINDINGS AND DISCUSSIONS

FINDINGS

Quantitative Findings

The paired samples t-test showed a significant increase in all assessment categories, with symbolic understanding being the largest increase. The average total score increased from 82.1 (Pre-Test) to 47.5 (Post-Test), indicating a significant positive impact (Sig.<.001).

Table 1. Pre-Test and Post-Test Mean Scores of all Assessment Categories

Participant	Pre-Test Mean Score	Post-Test Mean Score
1	57.67	79.00
2	60.00	81.67
3	59.00	80.33
4	57.33	77.67
5	61.00	82.67
6	56.00	76.67
7	62.00	83.67
8	57.67	79.00
9	60.00	81.67
10	59.00	80.33
11	55.00	75.67
12	63.00	84.67
13	57.33	77.67
14	61.00	82.67
15	56.00	76.67
16	62.00	83.67
17	57.67	79.00
18	60.00	81.67
19	59.00	80.33
20	57.33	77.67
	58.90	80.13

Table 2. Category, Mean, and Improvement

Assessment Category	Pre-Test Mean	Post-Test Mean	Improvement (%)	t-value	p-value
Narrative Structure	62.3	78.5	+26.0%	4.73	0.000
Symbolic Understanding	55.7	82.1	+47.4%	5.12	0.000
Creative Expression	59.6	85.3	+43.0%	4.89	0.000

Table 3: Paired Samples Test

		Paired Differences							
		Mean	**Std. Deviation**	**Std. Error Mean**	**95% Confidence Interval of the Difference Lower**	**Upper**	**t**	**dF**	**Sig. (2-tailed)**
Pair 1	Pretest - Posttest	-21.23	2.31	0.52	-22.32	-20.14	-40.83	19	0.000

Based on the data, the performance distribution of the students showed significant improvements after the intervention. For high performers, defined as those scoring above 80 points, the number increased dramatically from 2 students (10%) in the pretest to 12 students (60%) in the posttest. Meanwhile, the medium performers, those scoring between 60 and 79 points, slightly decreased from 9 students (45%) in the pretest to 7 students (35%) in the posttest. The most notable change was observed among the low performers, those scoring below 60 points, where the number dropped substantially from 9 students (45%) in the pretest to only 1 student (5%) in the posttest. These results highlight a significant upward shift in student performance.

Qualitative Insights

The qualitative findings demonstrate a notable enhancement in students' interpretive and creative writing skills following the intervention. Students showed an increased ability to recognize and interpret symbolic meanings within the narrative of the movie Elemental. Their understanding of abstract concepts improved significantly, allowing for more insightful story reconstructions. Participants could identify symbolic representations and embed these interpretations creatively into their own retellings, indicating a deeper engagement with the material.

Moreover, there was a marked growth in students' narrative comprehension and creative confidence. Many students who initially struggled with abstract or metaphorical ideas developed a more sophisticated approach to storytelling, effectively weaving symbolic elements into their narratives. Their figurative language became more deliberate and contextually appropriate, reflecting a maturation in their expressive abilities. The intervention thus highlighted the importance of multimedia exposure in fostering critical literacy and creative competencies.

DISCUSSION

The interpretation of these findings reveals how integrating symbolic analysis within narrative retelling can significantly enhance students' cognitive and creative development. The substantial improvement observed in symbolic understanding (+47.4%) clearly indicates that structured engagement with symbolic narratives stimulates deeper levels of thought and meaning-making. This outcome addresses a significant gap in previous research, where the focus often remained on basic language acquisition without emphasizing critical interpretive skills. By focusing on symbolism, this study moves beyond surface-level language proficiency and promotes higher-order thinking skills necessary for advanced writing development.

The findings also align with sociocultural learning theory (Vygotsky, 1978), affirming that social and cultural tools, such as movies rich in symbolic content, mediate cognitive growth. Students benefited not only from the guided analysis but

also from the social interaction during discussions, which supported the co-construction of meaning. This collaborative meaning-making process enabled students to internalize and express symbolic concepts through writing. Compared to previous studies that utilized animation merely for engagement, this research provides evidence that targeted symbolic analysis leads to measurable educational outcomes

Furthermore, improving creative expression suggests that symbolic analysis can bridge comprehension and production skills. While earlier studies emphasized using animation to increase student engagement (e.g., Irwan & Putra, 2015)This study advances the conversation by demonstrating that when symbolic content is systematically unpacked, it directly nurtures students' narrative creativity. This shift from passive viewing to active analytical engagement offers new pedagogical insights into designing multimedia-based writing instruction.

Finally, the findings offer important implications for curriculum design. Incorporating media analysis focused on symbolism can diversify instructional strategies and cater to diverse learner needs. The results also encourage educators to rethink the role of popular media in education, positioning it not just as an engagement tool but as a scaffold for building critical literacy. Compared to earlier educational practices that marginalized media use, this study supports a more integrated and purposeful adoption of multimedia resources to enhance students' interpretive and writing skills.

CONCLUSION

This study demonstrated that integrating symbolic analysis through story retelling, using the Elemental movie, significantly improved students' writing skills, particularly in narrative structure, symbolic understanding, and creative expression. The intervention allowed students to develop deeper cognitive engagement and a better ability to interpret and express abstract concepts within their writing. The findings affirm that symbolic elements embedded in popular media can effectively scaffold critical thinking and narrative creativity when systematically incorporated into the learning process.

The study contributes valuable insights for educators aiming to enrich writing instruction through multimedia resources, positioning symbolism as an artistic device and a powerful educational tool. However, limitations include the relatively small sample size and the short duration of intervention, which may not capture long-term impacts. Future research could explore longitudinal effects, the application of symbolic analysis across different media genres, or adaptations for diverse educational settings to further validate and extend these findings.

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IMPLEMENTASI MODEL PJBL PADA MATERI BIOTEKNOLOGI UNTUK MENINGKATKAN LITERASI SAINS SISWA KELAS IX DI SMP NEGERI 4 JEMBER

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Abstrak: *Penelitian ini bertujuan untuk mendeskripsikan peningkatan literasi sains siswa pada materi bioteknologi menggunakan model Project Based Learning (PjBL). Teknik pengumpulan data yang dilakukan yaitu menggunakan lembar tes tulis terkait soal literasi sains. Teknik analisis data menggunakan analisis N-Gain. Subjek dalam penelitian ini adalah siswa kelas IX-A SMP Negeri 4 Jember berjumlah 32 siswa. Hasil dari penelitian ini menunjukkan sebanyak 24 siswa mendapat kategori peningkatan kemampuan literasi sains yang tinggi dan 8 siswa mendapat kategori peningkatan yang sedang dengan total siswa di kelas sebanyak 32 siswa. Berdasarkan hasil tersebut, dapat disimpulkan bahwa penerapan model pembelajaran model Project Based Learning (PjBL) dapat meningkatkan kemampuan literasi sains siswa pada materi Bioteknologi*.

Kata Kunci: PJBL, literasi sains, bioteknologi, pembelajaran sains

Abstract: *This study aims to describe the improvement of students' science literacy in the topic of biotechnology using the Project Based Learning (PjBL) model. The data collection technique employed was a written test sheet related to science literacy questions. Data analysis was conducted using the N-Gain analysis method. The subjects of this study were 32 students of class IX-A at SMP Negeri 4 Jember. The results showed that 24 students achieved a high category of science literacy improvement, while 8 students were in the moderate improvement category, with a total of 32 students in the class. Based on these results, it can be concluded that the implementation of the Project Based Learning (PjBL) model can enhance students' science literacy skills in the topic of biotechnology*.

Keywords: *Project-Based Learning, science literacy, biotechnology, science learning*

PENDAHULUAN

Pendidikan berperan penting dalam mencetak generasi yang kompeten dan adaptif terhadap perkembangan zaman, terutama dalam menghadapi tantangan abad ke-21 yang menuntut kemampuan berpikir kritis, kreatif, dan literasi sains yang kuat (Maulinda, 2022; Saputri, 2022). Literasi sains sendiri mencakup kemampuan memahami konsep ilmiah, berpikir kritis, berkomunikasi, dan mengambil keputusan berdasarkan bukti ilmiah (Arlis et al., 2020; Banila et al., 2021). Dalam pembelajaran IPA, terutama materi bioteknologi yang aplikatif dalam berbagai aspek kehidupan, literasi sains menjadi keterampilan yang sangat penting untuk dimiliki peserta didik.

Namun, pembelajaran IPA di sekolah masih banyak dilakukan secara konvensional, seperti metode ceramah yang berpusat pada guru, sehingga siswa kurang aktif dalam proses pembelajaran dan mengalami kesulitan mengaitkan teori dengan praktik (Fuadi, 2020). Hal ini menyebabkan rendahnya kemampuan literasi sains siswa,

khususnya dalam memahami konsep ilmiah dan menerapkannya dalam kehidupan sehari-hari. Oleh karena itu, dibutuhkan pendekatan pembelajaran yang mampu mendorong partisipasi aktif dan pengalaman belajar yang bermakna.

Model *Project Based Learning* (PjBL) menjadi salah satu solusi yang sesuai dengan karakteristik pembelajaran abad ke-21. PjBL memungkinkan peserta didik terlibat langsung dalam proyek yang kontekstual dan relevan dengan materi, termasuk dalam pembelajaran bioteknologi (Fajariyanti et al., 2022).

Melalui model ini, siswa tidak hanya memahami konsep, tetapi juga mengembangkan keterampilan berpikir kritis, kolaborasi, kreativitas, dan komunikasi, sehingga diharapkan dapat meningkatkan literasi sains secara signifikan.

KAJIAN TEORI

Penerapan Model *Project Based Learning* (PjBL)

Model *Project Based Learning* (PjBL) merupakan pendekatan pembelajaran yang berpusat pada peserta didik, di mana mereka secara aktif terlibat dalam suatu proyek nyata untuk menyelesaikan permasalahan yang relevan dengan kehidupan sehari-hari dan materi pelajaran. Dalam model ini, siswa diberi kesempatan untuk mengeksplorasi, merancang, dan menghasilkan produk atau solusi dari proyek yang dikerjakan secara kolaboratif (Sani, 2014). Menurut Thomas (2000), model PjBL memiliki lima karakteristik utama, yaitu: adanya pertanyaan atau permasalahan sebagai pemicu kegiatan belajar, berfokus pada proses investigasi, bersifat konstruktif, menghasilkan produk atau karya nyata, serta melibatkan peserta didik dalam kegiatan yang bersifat kolaboratif dan reflektif. Model ini sesuai diterapkan dalam pembelajaran abad ke-21 yang menuntut siswa tidak hanya menguasai aspek kognitif, tetapi juga keterampilan sosial dan emosional yang mendukung kesiapan mereka menghadapi tantangan global (Kemendikbud, 2017).

Secara ringkas sintaks PjBL menurut Kemendikbud (2017) pada Tabel 1.

Tabel 1. Sintaks model PjBL

No	Fase Kegiatan
1	Penentuan pertanyaan mendasar *(start with the essential question)*
2	Perancangan proyek *(designing the project)*
3	Penyusunan jadwal *(creating a schedule)*
4	Pemantauan proyek *(monitoring the students and the progress of the project)*
5	Pengujian hasil *(assessing the outcome)*
6	Evaluasi pengalaman belajar *(evaluating the experience)*

Literasi Sains

Literasi sains adalah kemampuan dalam memahami konsep-konsep ilmiah dan proses yang digunakan untuk memecahkan permasalahan dan memberi kesimpulan berdasarkan bukti dalam memahami serta mengambil keputusan berkaitan dengan alam (Arlis et al., 2020). Literasi sains meliputi keterampilan kreatif, komunikasi, berpikir kritis dan kolaboratif (Banila et al., 2021). Selain itu, literasi sains juga meliputi kemampuan peserta didik dalam mengambil keputusan yang tepat berdasarkan bukti ilmiah serta mampu berkontribusi secara aktif dalam masyarakat.

METODOLOGI PENELITIAN

Subjek Penelitian

Subjek yang akan digunakan dalam penelitian ini, yaitu siswa kelas IX-A SMP Negeri 4 Jember yang berjumlah 32 siswa. Subjek penelitian rata-rata berusia 13-14 tahun.

Tempat dan Waktu Penelitian

Penelitian ini dilakukan di SMP Negeri 4 Jember yang beralamat Jl. Nusa Indah, Krajan, Jemberlor, Kec. Patrang, Kabupaten Jember. Adapun waktu pelaksanaan pada semester genap dengan tahun ajaran 2024/2025.

Instrumen Penelitian

Instrumen penelitian ini berupa lembar tes asesmen diagnostik kognitif dan lembar tes asesmen sumatif materi bioteknologi. Pada lembar tes asesmen terdapat beberapa pertanyaan yang terkait dengan literasi sains dan siswa dapat menjawab pertanyaan tersebut. Pemberian lembar tes ini bertujuan untuk mengetahui sejauh mana perubahan hasil belajar siswa sebelum diberi perlakuan (penerapan model *Project Based Learning*) dan setelah diberi perlakuan atau setelah menerapkan model *Project Based Learning*.

Teknik Analisis Data

Teknik analisis data untuk hasil belajar pengetahuan terkait literasi sains, yaitu menggunakan analisis N-Gain. N-gain ini bertujuan untuk mengetahui besar peningkatan hasil belajar peserta didik sebelum diberi perlakuan dan setelah mendapatkan perlakuan. Peningkatan hasil belajar peserta didik dapat dihitung menggunakan persamaan berikut.

$$\text{N Gain} = \frac{(Skor\ Posttest - Skor\ Pretest)}{(Skor\ Ideal - Skor\ Pretest\ )}$$

Besarnya faktor g dapat dikategorikan sesuai kriteria N-gain pada Tabel 2.

Tabel 2. Kriteria N-gain pada hasil belajar peserta didik

Nilai g	Kriteria
$g \geq 0{,}7$	Tinggi
$0{,}7 > g \geq 0{,}3$	Sedang
$g < 0{,}3$	Rendah

HASIL PENELITIAN DAN PEMBAHASAN

Hasil Penelitian

Peningkatan kemampuan literasi siswa diperoleh dari dua hasil tes yaitu tes diagnostik kognitif dan tes sumatif yang dilakukan sebelum dan sesudah diberi perlakuan. Soal tes terdiri dari delapan pertanyaan dengan tipe soal pilihan ganda majemuk, memasangkan, dan memilih pernyataan “sesuai dan tidak sesuai”. Peningkatan kemampuan literasi siswa dianalisis dengan rumus N-Gain lalu diinterpretasikan kedalam kriteria N-Gain yang menjelaskan peningkatan kemampuan literasi dikategorikan menjadi tiga kategori yaitu rendah, sedang, dan tinggi. Hasil belajar literasi siswa pada aspek pengetahuan yang meliputi nilai sebelum diberi perlakuan, sesudah diberi perlakuan, nilai N-Gain, serta kategorinya disajikan pada Tabel 3.

Tabel 3. Hasil peningkatan kemampuan literasi sains siswa

Nilai Siswa		N-Gain	Kriteria
Sebelum	Sesudah		
66	88	0,65	Sedang
51	88	0,76	Tinggi
77	96	0,83	Tinggi
66	88	0,65	Sedang
62	92	0,79	Tinggi
59	100	1,00	Tinggi
55	100	1,00	Tinggi
62	88	0,68	Sedang
44	88	0,79	Tinggi
55	88	0,73	Tinggi
77	100	1,00	Tinggi
44	88	0,79	Tinggi
77	100	1,00	Tinggi
59	100	1,00	Tinggi
70	88	0,60	Sedang
51	100	1,00	Tinggi
48	88	0,77	Tinggi
18	88	0,85	Tinggi
48	88	0,77	Tinggi
62	100	1,00	Tinggi
74	96	0,85	Tinggi
70	88	0,60	Sedang
70	88	0,60	Sedang
66	88	0,65	Sedang
81	96	0,79	Tinggi
51	100	1,00	Tinggi
51	88	0,76	Tinggi
77	96	0,83	Tinggi
66	92	0,76	Tinggi
55	88	0,73	Tinggi
51	96	0,92	Tinggi
74	88	0,54	Sedang

Pembahasan

Pada penelitian ini untuk mengukur kemampuan literasi siswa menggunakan tes yang dilakukan menggunakan masing-masing delapan butir soal. Sebelum pembelajaran menggunakan model *Project Based Learning* (PjBL) siswa diberikan soal tesuntuk mengetahui kemampuan literasi sains dan didapati hasil tes

sesuai dengan tabel, setelah itu siswa diberi perlakuan atau treatment berupa penerapan pembelajaran model *Project Based Learning* (PjBL) yang terintegrasi dengan literasi sains. Setelah diberi perlakuan siswa diberikan tes kembali berupa tes sumatif literasi sains dengan materi biteknologi untuk mengetahui sejauh mana model *Project Based Learning* (PjBL) dapat membantu meningkatkan kemampuan literasi sains siswa. Dari hasil tes sebelum dan sesudah diberi perlakuan dilihat peningkatan hasil belajar aspek literasi sains sebelum dan sesudah diberi treatment atau perlakuan dalam hal ini penerapan model *Project Based Learning* (PjBL). Peningkatan kemampuan literasi sains dapat diketahui dengan analisis N-Gain, dimana besar N-Gain dapat digunakan untuk mengetahui kriteria peningkatan hasil belajar siswa termasuk dalam kategori tinggi, sedang, atau rendah. Nilai N-Gain dikategorikan tinggi apabila indeksnya lebih dari 0,7 dan dikatakan rendah apabila indeks nilainya kurang dari 0,3 (Hake, 1998).

Pada penelitian yang telah dilaksanakan sebanyak 24 siswa mendapat kategori peningkatan hasil belajar yang tinggi dan 8 siswa mendapat kategori peningkatan yang sedang dengan total siswa di kelas sebanyak 32 siswa. Hal ini menandakan bahwa semua siswa di kelas mengalami peningkatan kemampuan literasi sains secara keseluruhan dengan masing-masing kategori tersebut. Hal ini sesuai dengan pernyataan bahwa Model *Project Based Learning* (PjBL) menjadi salah satu solusi yang sesuai dengan karakteristik pembelajaran abad ke-21. PjBL memungkinkan peserta didik terlibat langsung dalam proyek yang kontekstual dan relevan dengan materi, termasuk dalam pembelajaran bioteknologi (Fajariyanti et al., 2022).

SIMPULAN

Peningkatan kemampuan literasi sains siswa menunjukkan sebanyak 24 siswa mendapat kategori peningkatan hasil belajar yang tinggi dan 8 siswa mendapat kategori peningkatan yang sedang dengan total siswa di kelas sebanyak 32 siswa. Adanya inovasi penerapan model *Project Based Learning* (PjBL) yang dilakukan di kelas akan membuat siswa lebih tertarik dengan proses belajar mengajar di kelas. Hal ini dapat dilihat dari peningkatan yang cukup signifikan di dalam kelas dan termasuk kategori sangat bagus. Sehingga diharap para tenaga pendidik dalam hal ini guru mampu menerapkan dan mengembangkan model pembelajaran yang lebih bervariasi lagi.

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AN ANALYSIS OF THE VALIDITY AND RELIABILITY OF ENGLISH EXAMINATIONS: A STUDY AT A SENIOR HIGH SCHOOL IN KEFAMENANU

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Abstract: This study analyzed the validity and reliability of the English language school exam at a senior high school in Kefamenanu during the 2023/2024 academic year. A mixed-method approach was employed, with content validity assessed by matching test items to the blueprint and reliability measured using the Kuder-Richardson 20 (KR-20) formula. The results indicated that the test had a validity rate of 55%, which was classified as moderate due to some items not aligning with the specified indicators. Meanwhile, the reliability coefficient was 0.89, demonstrating a very high correlation and strong consistency of test results. It is recommended that the school improve the exam blueprint and ensure that all test items accurately reflect the taught material.

Keywords: English school examination, reliability, validity

INTRODUCTION

In education, evaluation plays a crucial role in measuring the teaching and learning process. According to Rahmah et al. (2020), evaluation is an assessment process conducted by teachers to measure student learning outcomes. It serves as a vital component for determining students' understanding of the material taught over a semester. One key purpose of evaluation is to measure students' learning progress and the extent to which they have achieved predetermined learning objectives.

Various methods can be used for evaluation, including the administration of tests. Among these, multiple-choice tests are one of the most common formats used to assess student achievement (Kusumawati & Hadi, 2018). Teachers typically administer multiple-choice tests during midterm exams, final semester exams, school examinations, and national assessments. For a multiple-choice test to be effective, it must meet the criteria of validity and reliability. Harahap and Novita (2020) state that validity involves expert judgment to determine whether the test instruments are appropriate for their intended purpose, while reliability refers to the consistency of test results over repeated administrations. Valid and reliable test items significantly influence the accuracy of measuring student learning outcomes. Specifically, analyzing content validity is crucial because it ensures that the test items fully represent the curriculum objectives and the material that has been taught. A test with low content validity may fail to measure the intended competencies, leading to unfair or inaccurate assessments of students' abilities. Similarly, analyzing the reliability of a test is essential to determine whether the test produces consistent results, providing trustworthiness to the evaluation process. Without high validity and reliability, the results of an examination cannot be considered a true reflection of a student's knowledge and skills.

Despite the importance of these aspects, at various educational levels (junior high school, senior high school, and college), multiple-choice tests often fail to meet the criteria of good item construction fully. Poorly designed multiple-choice questions can affect both validity and reliability, compromising the evaluation's effectiveness. Teachers must, therefore, possess the

skills and expertise necessary to develop appropriate multiple-choice items. Additionally, students' guessing strategies can undermine test validity, as they might select correct answers without a full understanding of the material (Foley, 2016). Hence, multiple-choice questions must be carefully designed to measure not only basic knowledge but also higher-order thinking skills (Marsevani, 2022). Based on these considerations, this study analyzes the quality, in terms sof validity and reliability, of a multiple-choice English examination at one of the senior high schools in Kefamenanu. The research was conducted in the school where the researcher completed her teaching practice for six months. The researcher chose the academic year 2023/2024 to ensure that the data analyzed is current and relevant to the present educational context.

Several previous studies are relevant to this research. First, Furwana (2019) investigated the validity and reliability of English summative tests at Vocational High School 2 Palopo, finding good content validity (80%) and relatively high reliability (0.6132). Second, Jayanti et al. (2019) analyzed the validity and reliability of the English National Final Examination for Junior High Schools in South Jakarta, reporting content and construct validity of 92% and a reliability coefficient of 0.784. Third, Winarti et al. (2021) evaluated the validity, reliability, and authenticity of English achievement tests for twelfth-grade students at SMAN 4 Tebo, Jambi, finding moderate validity and reliability. Last, Sugianto (2016) analyzed the English National Final Examination for Junior High Schools, reporting 100% content and construct validity and a high-reliability coefficient of 0.89. These previous studies provide a strong foundation for the present research and highlight the critical need to ensure that multiple-choice examinations meet the standards of validity and reliability to promote fair and accurate assessment of student learning.

The findings of this study are expected to provide valuable insights for English teachers in designing valid and reliable school examinations. By highlighting weaknesses and strengths in the existing tests, the study aims to encourage improvements in test construction practices. Furthermore, the results may serve as a useful reference for school administrators and curriculum developers in evaluating and enhancing the quality of assessment tools. Ultimately, this research contributes to ensuring that school examinations more accurately reflect students' abilities and support better educational outcomes.

METHOD

This research used qualitative and quantitative methods. Qualitative was used to analyze the content validity of the test school examination of English subjects. According to Sugiyono (2017). The documents collected in this study were the school examination test of English subject for the academic year 2023/2024, the blueprint of the test, and students' scores in the school examination of English subject for the academic year 2023/2024. English school examination test of English subject for the academic year 2023/2024 and blueprint of the test used to analyze the content validity of the test. Meanwhile, students' scores were used to analyze the reliability of the school examination test for English subjects. To determine the content validity of the school examinations of English subjects, the researcher matched the items in the school examinations of English subjects with the blueprint. It is to see whether each item of the test measures the same indicator. After that, the researcher asked the validator to see the analysis conducted by the researcher. For analyzing the content validity, the researcher followed the data analysis conducted by Semiun and Luruk (2020). Meanwhile, the researcher applied the KR 20

formula to analyze reliability. Then, the results calculation was categorized into scales of interpretation of reliability (Jayanti et al., 2019).

RESULTS AND DISCUSSION

In this study, an analysis of the validity and reliability of school exam questions was conducted to ensure the quality of the evaluation instrument used. Validity aims to measure the extent to which exam questions are able to measure the expected competencies. At the same time, reliability refers to the consistency of measurement results when tested on similar groups of respondents. The validity analysis process is carried out by matching test items with the blueprint. If one question item is declared valid, then the presentation is 2.5%, but if one question item is invalid, then the presentation is 0%. Meanwhile, reliability uses the Kuder-Richardson 20 (KR-20) formula. The results of this analysis are presented in the following section. In analyzing validity, researchers match each multiple-choice question item with the blueprint that has been provided. The following is a table of content validity analysis of multiple choice questions on the school examination.

Tabel 1 Analysis of content validity

Basic Competencies	Indicators	Students Ability	Percentage
Distinguish the social function, text structure, and linguistic elements of several and written news texts by giving and requesting information related to simple news from newspapers/radio/TV, according to the context of use.	Identifying the parts of the report text structure and observing how to use them. (1,2,3,4,5,8,9,10)	Reading	20%
	Identifying several information report texts related to subjects (6,7)	Reading	5%
Applying social functions, text structures, and linguistic elements of oral and written transactional interaction texts that involve the act of giving and asking for information relate to assumptions followed by commands/suggestions, according to the context of their use. (Pay attention to the linguistic elements if with imperative, can, should)	Identifying conditional expressions with suggestions from existing examples, seen from the content and how they are expressed. (11,13,15,17,19)	Reading	0%
	Identifying social functions/text structures/linguistic elements used in the interactions studied. (12,14,16,18,20)	Reading	0 %
Applying social functions, text structures, and linguistic elements of oral and written transactional interaction texts involving the act of giving and asking for information related to concessions, according to the context of their use. (Pay attention to the linguistic elements even though, although)	Identify the social function, text structure, and linguistic elements of the conversation. (21,22,23,24,25,26,27,29)	Reading	17,5%
	Determine the social function, text structure, and linguistic elements of the conversation. (28)	Reading	0%
Interpreting the social function and linguistic elements of song lyrics related to the lives of high school teenagers	Identifying social functions, text structures, and linguistic elements of song lyrics, contextually. (31,32,33)	Reading	7.5%
	Finding information in song lyrics.(34)	Reading	0%
	Identifying information in song lyrics.(35)	Reading	0%

	Analyzing the social function and linguistic elements of song lyrics, which are being studied contextually.(36)	Reading	0%
	Determining the topic of the text review.(37)	Reading	0%
	Finding implied detailed information from text review. (38,39)	Reading	0%
	Finding messages from song lyrics. (40)	Reading	0%

The English School Examination's validity analysis showed a validity coefficient of 55%. Based on standard validity categories, this score indicates a moderate to low level of validity, implying that several aspects of the test require revision to enhance its feasibility as a reliable measurement instrument.

One of the primary factors contributing to the low validity is the mismatch between the test items and the predetermined blueprint. Several questions did not specifically measure the indicators outlined in the test specifications, leading to a weak correlation between the items and the intended learning outcomes. This finding aligns with Astuti's (2020) analysis, which noted that invalid items often stem from discrepancies between the blueprint and the test items. For example, in this study, questions numbered 1–20 were intended to assess material on commands and suggestions but instead evaluated direct and indirect speech. Similarly, questions 21–30, which should have assessed the use of "although," instead asked about personal letters. As a result, the test instrument does not fully reflect the curriculum objectives, affecting the overall validity and potentially leading to unfair or inaccurate assessments of students' competencies.

Before analyzing reliability, researchers added up student scores ($\bar{X}$) divided by the number of students and produced 0.079. This 0.079 will later be used as a reduction in the standard deviation table (S2). The following table of PQ shows the results.

Table 2. Table of PQ

Question Number	Number of students who answered correctly	P	Q	PQ
1	27	0.96	0.04	0.038
2	28	1	0	0
3	28	1	0	0
4	27	0.96	0.04	0.038
5	27	0.96	0.04	0.038
6	28	1	0	0
7	27	0.96	0.04	0.038
8	28	1	0	0
9	28	1	0	0
10	27	0.96	0.04	0.038
11	28	1	0	0
12	28	1	0	0
13	27	0.96	0.04	0.038

14	26	0.92	0.08	0.078
15	28	1	0	0
16	27	0.96	0.04	0.038
17	28	1	0	0
18	28	1	0	0
19	28	1	0	0
20	28	1	0	0
21	28	1	0	0
22	28	1	0	0
23	28	1	0	0
24	27	0.96	0.04	0.038
25	27	0.96	0.04	0.038
26	28	1	0	0
27	28	1	0	0
28	28	1	0	0
29	28	1	0	0
30	28	1	0	0
31	26	0.92	0.08	0.073
32	22	0.78	0.22	0.171
33	27	0.96	0.04	0.038
34	28	1	0	0
35	28	1	0	0
36	28	1	0	0
37	20	0.71	0.28	0.198
38	27	0.96	0.04	0.038
39	27	0.96	0.04	0.038
40	28	1	0	0
Total				0.971

Based on the calculation results, the total pq value obtained is 0.97. This value indicates the level of variation in the proportion of correct and incorrect answers to the question items. After finding the pq value, here is the table of standard deviation(S^2).

Table 3. Table of S^2

Students	X	X-$\bar{x}$	$(X-X)^2$
1.	85,00	85,00 – 0.079	84.921 = 7.211,58
2.	87,50	87,50 – 0.079	87.421 = 7.642,43
3.	87,50	87,50 – 0.079	87.421 = 7.642,43
4.	87,50	87,50 – 0.079	87.421 = 7.642,43
5.	87,50	87,50 – 0.079	87.421 = 7.642,43
6.	85,00	85,00 – 0.079	84.921 = 7.211,58
7.	87,50	87,50 – 0.079	87.421 = 7.642,43

8.	90,00	90,00 – 0.079	89.921 = 8.085,78
9.	82,50	82,50 – 0.079	82.421 = 6.793,22
10.	80,00	80,00 – 0.079	79.921 = 6.387,36
11.	82,50	82,50 – 0.079	82.421 = 6.793,22
12.	87,50	87,50 – 0.079	87.421 = 7.642,43
13.	85,00	85,00 – 0.079	84.921 = 7.211,58
14.	87,50	87,50 – 0.079	87.421 = 7.642,43
15.	85,00	85,00 – 0.079	84.921 = 7.211,58
16.	87,50	87,50 – 0.079	87.421 = 7.642,43
17.	87,50	87,50 – 0.079	87.421 = 7.642,43
18.	85,00	85,00 – 0.079	84.921 = 7.211,58
19.	85,00	85,00 – 0.079	84.921 = 7.211,58
20.	85,00	85,00 – 0.079	84.921 = 7.211,58
21.	85,00	85,00 – 0.079	84.921 = 7.211,58
22.	87,50	87,50 – 0.079	87.421 = 7.642,43
23.	87,50	87,50 – 0.079	87.421 = 7.642,43
24.	77,50	77,50 – 0.079	77.421 = 5.994,01
25.	80,00	80,00 – 0.079	79.921 = 6.387,36
26.	85,00	85,00 – 0.079	84.921 = 7.211,58
27.	87,50	87,50 – 0.079	87.921 = 7.642,58
28.	87,50	87,50 – 0.079	87.921 = 7.642,58
			204.754,48

The researcher looked for the standard deviation (S^2) using the following formula:

$$S^2 = \frac{(X)^2}{n}$$

$$S^2 = \frac{204.754,48}{28}$$

$$S^2 = 7.312,66$$

The result of calculating the value of total variance (S2) is 7.312,66. The researcher employed the Kuder-Richardson 20 (KR-20) formula, calculating reliability based on students' total scores and the number of correct responses. The analysis yielded a reliability coefficient of 0.89, indicating a very high correlation and excellent internal consistency. This finding suggests that the English School Examination administered at one of the senior high schools in Kefamenanu during the 2023/2024 academic year is highly reliable and capable of consistently measuring students' knowledge in English.

When compared with previous studies, this reliability result is higher than the 0.79 reliability coefficient reported by Astuti (2020) and Azizah et al. (2024). The higher coefficient in the present study indicates better internal consistency of the test items. Although Astuti's study still provided valuable contributions to test development, the difference may stem from improvements in test construction and differences in data collection methods. Nevertheless, to ensure optimal reliability, it is recommended that further studies expand the sample size and apply additional methods such as test-retest

reliability analysis to confirm the stability of the measurement results under different conditions.

The findings of this study demonstrate a lower validity but higher reliability compared to several previous studies. For instance, Jayanti et al. (2019) found a content validity of 92% in their analysis of the English National Final Examination, significantly higher than the 55% validity found in this study. This discrepancy suggests that the present instrument does not yet fully align with the intended constructs, affecting its effectiveness in evaluating student competencies. However, in terms of reliability, the current study's result of 0.89 exceeds the reliability coefficient reported by Astuti (2020), which was 0.79. This indicates that although the validity of the instrument needs improvement, the internal consistency of the test items is commendable.

CONCLUSION

Based on the validity analysis, 22 out of 40 questions were found valid, resulting in an overall validity of 55%, which indicates a medium level of validity. This suggests that while the test has a solid foundation, 18 invalid questions should be revised to better measure the intended competencies. The reliability analysis yielded a high coefficient of 0.89, indicating very high reliability. However, to ensure the test accurately reflects students' abilities, it is recommended that English teachers align questions with the basic competencies and the material taught**,** ensure clarity in the questions, and use various types of questions for a more comprehensive assessment. Teachers should also involve colleagues in reviewing the exam. The school should revise the question blueprint to ensure it accurately reflects the curriculum and regularly evaluate test instruments to maintain high standards of validity and reliability. These improvements will enhance the test's overall quality and provide more accurate student assessments.

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STUDYING SCIENCE LEARNING AND TEACHING SYSTEMS IN INDONESIA AND RUSSIA

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Abstract: Science education plays a crucial role in advancing technology and innovation, especially in the era of the Industrial Revolution 4.0 which demands mastery of STEM (Science, Technology, Engineering, and Mathematics) competencies. However, the implementation of science education varies greatly between countries. This study aims to compare the teaching and learning systems of science, particularly physics, in Indonesia and Russia through a qualitative comparative approach. Data were collected from literature reviews including journal articles, books, educational reports, and policy documents. The analysis reveals that Russia employs a more structured science curriculum supported by intensive teacher training and a strong research-based teaching culture from an early age. In contrast, Indonesia still faces challenges such as limited laboratory facilities, uneven teacher training, and a lack of integration between theory and practice. These disparities result in lower science literacy performance among Indonesian students in international assessments like PISA, compared to their Russian counterparts. The study concludes by offering strategic recommendations for improving science education in Indonesia, including enhancing teacher training programs, strengthening policy support, and adopting experimental learning approaches inspired by the Russian model. This research contributes theoretically to the literature on international education comparisons and provides practical insights for policymakers and educators aiming to develop more effective science teaching strategies.

Keywords: Science Education, Comparative Education, Scientific Literacy, Teaching and Learning Systems Educational Policy

INTRODUCTION

Science education plays a crucial role in driving technological progress and innovation, especially in the era of globalization that demands mastery of science and practical skills. The ability to understand and apply scientific concepts is not only an individual need, but also the basis for the progress of society as a whole. Science education not only provides theoretical understanding, but also trains critical thinking skills, creativity, and problem-solving skills needed to face rapid technological developments. According to Kompas (2024), the development of science and technology education needs to be improved from elementary school to college to support economic growth and human welfare. An effective education system plays an important role in forming a generation of competent scientists and professionals, especially in facing the challenges of the Industrial Revolution 4.0 which emphasizes STEM (Science, Technology, Engineering, and Mathematics) skills (Grahito Wicaksono, 2020). However, the implementation of science education in various countries shows significant differences, both in terms of curriculum, teaching methods, and learning evaluation. Russia, for example, is known for its strong tradition of science education, which emphasizes mastery of the basics of science from an early age and experimental-based learning methods (Kuznetsov et al., 2020). This approach has produced many scientists and innovators who have made major contributions at the global level. On the other hand, Indonesia still faces various challenges in implementing

effective science learning methods, such as limited laboratory facilities, lack of teacher training, and a curriculum that does not fully accommodate the needs of practice-based learning. This causes a gap in the quality of science education between Indonesia and developed countries. Previous studies have identified several problems in science education in Indonesia, such as the lack of integration between theory and practice, and low student interest in science (Widodo et al., 2019)). However, there is still a gap in research comparing the science education system in Indonesia with countries that have a strong tradition of science education, such as Russia. This study aims to fill this gap by exploring the science learning and teaching systems in both countries, including curriculum analysis, teaching methods, learning evaluation, and supporting and inhibiting factors. By comparing the two systems, this study is expected to provide strategic recommendations to improve the quality of science education in Indonesia.

In the era of modern education, innovation in the learning process is key to increasing student effectiveness and engagement. One approach that has proven effective is the use of visual learning media, such as image media, which can help students understand abstract concepts, especially in Mathematics. (Amiyah et al., 2024) emphasized that the development of Heyzine Flipbook-based e-modules can increase students' interest and understanding of the material presented. In addition, (Shafna Shaumuristi, n.d.) showed that the application of a structured inquiry learning model can increase student activity and learning outcomes through an approach that encourages exploration and active participation. The implementation of project-based learning model (PBL) combined with contextual media is able to significantly improve learning outcomes. Based on these findings, this study aims to examine the effectiveness of using image media in improving the activity and learning outcomes of students of SDN 2 Babat Banyuasin in Mathematics subjects.

The purpose of this study is to examine the science learning methods in Indonesia and Russia, analyze the advantages and disadvantages of each system, and provide recommendations for improving the quality of science education in Indonesia. This study is expected to provide theoretical contributions by adding to the literature on the comparison of science education systems and identifying the advantages and disadvantages of each system. Practically, this study is useful for the government, educators, students, and further researchers in developing more effective learning methods. Socially, this study supports improving the quality of human resources in the fields of science and technology and preparing a generation that is able to compete in the era of the Industrial Revolution 4.0. Thus, this study is expected to be the first step in overcoming the challenges of science education in Indonesia and opening up opportunities for international collaboration in the development of science education.

LITERATURE REVIEW

This literature review is designed to provide a comprehensive overview of the concept of science education, the education system in Indonesia and Russia, and previous research findings relevant to this research topic. This section also explains the theoretical basis used, the development of concepts or theories, and the contribution of this research to the discussion on science education.

Science education is a branch of education that aims to equip students with scientific knowledge, skills, and attitudes. The goal is to enable students to understand natural phenomena, solve everyday life problems, and develop critical, analytical, and creative thinking skills (Nasution et al., 2024). According to the OECD (2023),

scientific literacy includes three main components: content knowledge (scientific facts and concepts), procedural knowledge (the ability to conduct scientific investigations), and epistemic knowledge (understanding of how science is constructed and validated). Science education also aims to shape individuals who are able to adapt to technological developments and global change.

Science plays a strategic role in national and global development. At the national level, science education supports the development of competent human resources in technology and innovation, which is important for increasing the nation's competitiveness (Yusmar & Fadilah, 2023). Globally, science literacy helps people understand important issues such as climate change, the energy crisis, and public health, and contributes to decision-making that impacts the sustainability of life (OECD, 2023).

The education system in Indonesia consists of elementary school (SD/MI), junior high school (SMP/MTs), senior high school (SMA/MA), and higher education. The Merdeka Curriculum currently implemented provides teachers with flexibility to develop learning according to student needs (Winarso et al., 2021). In Russia, basic education lasts for nine years with a focus on mastering the basics of science such as mathematics, physics, biology, and chemistry (Kuznetsov et al., 2020). After completing basic education, students can choose an academic or vocational path according to their interests.

The science curriculum in Indonesia covers science subjects at elementary school level to physics, biology, and chemistry at high school level. This curriculum is designed to provide a foundation of science before students choose a specialization at the higher education level (Eviota & Liangco, 2020). In Russia, the science curriculum is more structured with more study hours, designed to encourage in-depth understanding through analytical and experimental approaches (Nasution et al., 2024).

Teaching methods in Indonesia are still dominated by traditional approaches such as lectures and memorization. However, some schools have begun to implement project-based learning or inquiry-based learning methods to increase student engagement (Hidayah et al., 2021). In Russia, teaching methods emphasize practical experiments and research from an early age, with teachers trained to use research-based approaches to encourage students to think critically and solve problems independently (Nasution et al., 2024).

Previous studies have shown that Indonesian students' scientific literacy is still low compared to other countries, with an average score of 383 in PISA 2022 (OECD, 2023). In contrast, Russia has managed to achieve high scores in international evaluations such as TIMSS, thanks to the experiment-based learning approach implemented early on (Kuznetsov et al., 2020).

Developed countries such as Russia have a more structured science education system supported by adequate laboratory facilities. In developing countries such as Indonesia, limited resources are a major challenge in implementing an effective science curriculum (Yusmar & Fadilah, 2023).

Education policy plays an important role in determining the quality of science learning. In Indonesia, the Independent Curriculum policy aims to increase learning flexibility, but faces challenges in its implementation (Kemendikbudristek, 2022). In Russia, government policies support the development of scientific research in schools, thereby improving the overall quality of science learning (Nasution et al., 2024).

The theoretical basis used in this study includes the concept of scientific literacy (OECD, 2023), inquiry-based and experimental learning approaches (Nasution et al.,

2024), and a comparison of education systems between developed and developing countries (Yusmar & Fadilah, 2023). This study contributes to the discussion on science education by analyzing the differences in science education systems in Indonesia and Russia, and identifying factors that influence the quality of science learning in both countries. In addition, this study provides recommendations

METHOD

This study is a comparative study with a qualitative approach that aims to compare the science learning and teaching systems, especially physics, in Indonesia and Russia. Data were collected through literature reviews (scientific journals, books, education reports, and policy documents). The analysis technique used is qualitative descriptive analysis, which includes three main steps: (1) describing the science learning systems in both countries, (2) comparing traditional and modern didactic methods, and (3) exploring the influence of culture on learning practices. The validity of the study was maintained through triangulation of data sources (literature review), while reliability was guaranteed by the use of standardized instruments and systematic data analysis.

RESULTS AND DISCUSSION

Based on the results of the literature review, there are several fundamental differences between the science learning and teaching systems in Indonesia and Russia. In Indonesia, the approach to science learning is still dominated by lecture and memorization methods, while in Russia there is more emphasis on experiments and research from an early age. This has an impact on the level of science literacy of students in both countries, where Russian students perform better in international assessments such as TIMSS and PISA (OECD, 2023).

The science curriculum in Russia is designed systematically and integrated from the elementary level, with more study hours and more in-depth material. Teachers in Russia also receive intensive training to apply research-based approaches and encourage students to think critically. In Indonesia, although the Independent Curriculum gives teachers the freedom to innovate, its implementation is still limited due to limited facilities, uneven teacher training, and low student interest in science.

In addition, the academic culture in Russia supports collaboration between schools and research institutions, which enriches students' learning experiences. Meanwhile, in Indonesia there is still a gap between theory and practice, where science learning is not fully based on solving real problems or experiments.

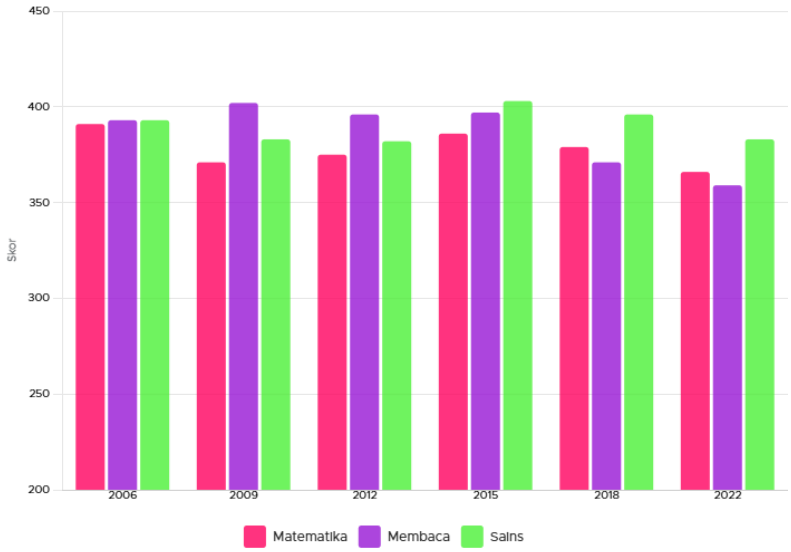
In general, the findings of this study indicate that the success of the science education system in Russia depends not only on the curriculum, but also on the supporting education ecosystem, from teacher training, laboratory facilities, to government policy support. Indonesia can learn important lessons from Russia's approach to improving the quality of science education, especially in fostering a scientific culture from an early age and improving the quality of teacher training.

Tabel 1. Comparison of Indonesian and Russian Science Education Systems

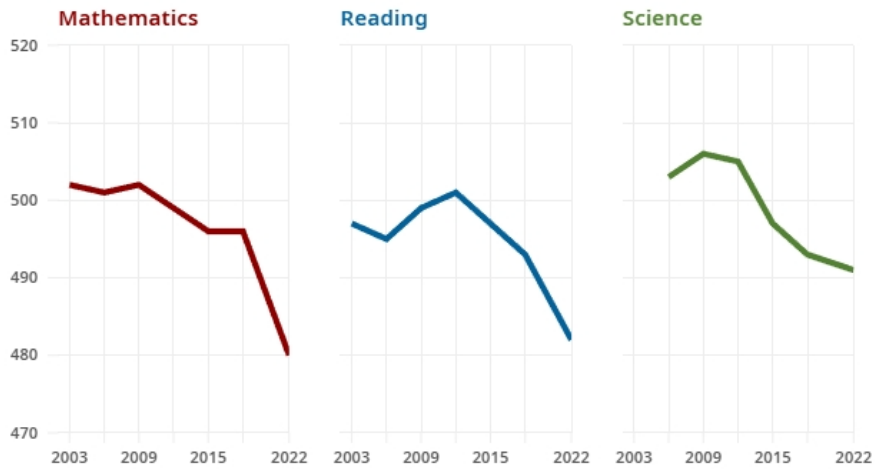
Aspect	Indonesian	Russian
Learning Approach	Lectures, memorization	Experimentation, early research
Curriculum	Flexible (Independent Curriculum)	Structured and integrated
Teacher Training	Not evenly distributed	Intensive and sustainable

Laboratory Facilities	Limited	Complete and supportive of experiments
Academic Culture	Focused on theory	Collaborative with research institutions
Assessment Results (PISA	Low	High

Picture 1: Diagram of Science Education Ecosystem in Russia



Picture 2: PISA 2022 Score Comparison Chart Between Indonesia and Russia



CONCLUSION

This study concludes that there are significant differences between the science learning and teaching systems in Indonesia and Russia. The Russian system tends to be more structured, supported by strong education policies, intensive teacher training, and integration between theory and practice through experiments. On the other hand, the Indonesian system still faces challenges in terms of facilities, teacher training, and learning approaches that are not yet optimal.

The contribution of this study lies in the comparative analysis that provides a clear picture of the advantages and disadvantages of each science education system. This study provides recommendations for Indonesia to adopt good practices from the Russian science education system, such as improving research-based teacher training, integrating the curriculum with experimental practices, and strengthening support for education policies.

This study has limitations because it only uses literature reviews as the main data source. Therefore, further research is recommended to use field study methods or interviews with education practitioners from both countries to obtain a more in-depth and empirical perspective.

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A COMPARISON OF INDONESIA AND MALAYSIA'S NATIONAL EDUCATION SYSTEM IN TERMS OF SCIENCE LEARNING IMPLEMENTATION

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Abstract: Focusing on curriculum, teaching methods and learning outcomes, this study compares the policies and implementation of science learning in Indonesia and Malaysia. This research stems from the fact that science education is crucial to building quality human resources in the era of globalization. One of the main problems faced is the difference in policy and the effectiveness of the implementation of science education in the two countries. The purpose of this study is to look at the differences in the science education system in the two countries, find the problems faced, and make suggestions to improve the quality of science learning in Indonesia. A literature study was conducted using a descriptive-comparative approach. The results showed that Malaysia has a more stable science education system after STEM integration. On the other hand, Indonesia is transitioning to the Merdeka Curriculum, and there are problems in implementing it. Indonesia still uses the lecture method, but Malaysia uses project and technology-based approaches. The science literacy of Indonesian students is lower compared to Malaysia, according to the results of PISA and TIMSS evaluations. So, to improve science literacy and global competitiveness, policy stability, improved teacher training, and implementation of project- and technology-based learning are needed to improve science education in Indonesia.

Keywords: Science Education, Education System, Implementation, Learning, Science Curriculum

INTRODUCTION

Science education has a very significant role in building quality human resources (HR). In this context, the importance of science education is not only seen in the development of scientific knowledge, but also in producing individuals who are able to adapt to global challenges and changes in the digital era. Science education serves as a foundation to prepare future generations who are innovative and competitive in an increasingly complex work environment (Verawati & Sarjan, 2023). One of the key aspects in science education is the ability to develop critical thinking skills and problem-solving abilities among students. Active learning approaches, such as problem-based learning models, have been shown to be effective in improving these skills, especially in the secondary education domain (Astiana Al Azizah & An Nuril Maulida Fauziah, 2023). By improving these skills, individuals are able to find effective and efficient solutions to the problems they face, thereby making a positive contribution to society and the local economy (Aisyah et al., 2024).

The differences in science learning policies and implementation between Indonesia and Malaysia are important issues that impact on the quality of education in both countries. Research shows that there are significant differences in the educational policy framework and pedagogical approaches applied in science teaching in each country. In Malaysia, the science education policy prioritizes the STEM (Science, Technology, Engineering, Mathematics) approach integrated in the curriculum. This is

aimed at preparing students with the 21st century skills required in the ever-evolving job market (Rochim, 2024). The curriculum in Malaysia favors project-based learning and experimentation, which allows students to gain a deeper understanding of science concepts through hands-on practice. The use of learning models such as Problem Based Learning (PBL) and collaborative approaches are strengthened in an effort to improve students' science literacy (Ermawati et al., 2023). On the other hand, Indonesia faces challenges in implementing science education policies. The education curriculum undergoes frequent changes, which can result in instability in science teaching (Ali Akbar et al., 2023). Despite efforts to integrate science literacy into learning, traditional teaching techniques and the use of less varied learning methods are often an obstacle. Research shows that Indonesian students' science literacy still needs to be developed, especially in improving their critical thinking skills and mastery of basic science concepts (Suparya et al., 2022).

The comparison of science learning implementation in Indonesia and Malaysia covers three main aspects, namely curriculum, teaching methods and learning outcomes. Each country has a different approach, which affects the quality of science education received by students. 1. Curriculum, Malaysia has developed an integrated STEM-based education system since the last few years. On the other hand, Indonesia is currently implementing the Merdeka Curriculum which provides excitement in the teaching and learning process. However, challenges still exist regarding the effective implementation of the curriculum in the field (Fuadi et al., 2020). 2. Teaching methods in Malaysia are generally more varied and implement active learning that involves students directly in the learning process (Fatimah, 2023). In Indonesia, although there have been some developments in more active learning, the lecture method still dominates, and many classes have not fully utilized interactive and creative approaches (Irsan, 2021). 3. Science learning outcomes in Malaysia tend to be more satisfactory when compared to Indonesia, as seen from the results of international standardized tests such as TIMSS and PISA, where Malaysian students perform better in science literacy (Fatimah, 2023). This is due to a more comprehensive and planned support system in Malaysia in planning and implementing the science curriculum. In contrast, in Indonesia, the low level of science literacy among students is an indicator that the implementation of the existing curriculum and teaching methods is not optimal. Studies show that many students do not have a good understanding of basic science concepts, which is caused by inappropriate teaching methods and teaching materials that are not contextualized (Fuadi et al., 2020).

Comparative research between the national education systems of Indonesia and Malaysia in the implementation of science learning shows significant differences even though both countries have similar social and cultural backgrounds. According to research published by Suharyanto and Hidayat (2020) and Abdullah and Ibrahim (2021) in Media Didaktika, the fundamental differences between the two education systems lie in the use of technology in learning, management of the science curriculum, and the pedagogical approaches applied by each country.

This study aims to analyze the differences in science learning policies and practices in Indonesia and Malaysia and identify the factors that influence the quality of science education in both countries. This study seeks to provide a comprehensive overview of how science curriculum, teaching methods and learning outcomes are interrelated in the context of preparing competitive human resources in the era of globalization and digitalization. In addition, this study also aims to formulate

recommendations for policies and learning practices that can improve students' science literacy and critical thinking skills in Indonesia, taking into account the success of approaches that have been implemented in Malaysia.

The method used in this research is a literature study with a descriptive-comparative approach. This approach was chosen as it allows for in-depth analysis of various academic sources, education policies, as well as relevant international data. Through this method, the research seeks to identify gaps and challenges in the implementation of science education in Indonesia and compare them with best practices implemented in Malaysia. Thus, the results of this study are expected to contribute to the development of more effective and sustainable science education policies in Indonesia.

LITERATURE REVIEW

Science education is a crucial component in the global education system, especially in shaping a generation that is adaptive to technological developments and 21st century challenges. A number of studies emphasize the importance of learning approaches that prioritize critical thinking skills, problem solving, and technology integration in the learning process (Damayanti & Nuzuli, 2023). In the context of Southeast Asia, Indonesia and Malaysia show different approaches in developing science education systems, especially in the aspects of curriculum, teaching methods, and learning outcomes.

Indonesia is currently undergoing a transition to the Merdeka Curriculum that emphasizes flexibility, project-based learning, and integration of local cultural values (Angga et al., 2022). However, repeated curriculum changes and lack of teacher training are the main challenges in its implementation (Ali Akbar et al., 2023). On the other hand, Malaysia has implemented a stable curriculum through the integration of STEM in the Secondary School Standard Curriculum (KSSM), which aims to equip students with technological skills and problem-solving abilities in real contexts (Abd Malek & Halim, 2023). In terms of teaching methods, Malaysia has shown success by incorporating project-based approaches and technology, and encouraging the development of computational thinking early on (Mohd Kusnan et al., 2020). In Indonesia, active learning approaches are being implemented but many schools still rely on traditional lecture methodsl (Irsan, 2021). This has an impact on students' science literacy which is still relatively low, as seen in the results of the PISA and TIMSS studies (Juniansyah et al., 2023).

International evaluations also show that Malaysia's education system is superior in preparing students for global challenges. Malaysia shows an increase in scores from year to year in the TIMSS evaluation, while Indonesia lags at the bottom (Kusharyadi et al., 2024). This difference reflects the effectiveness of education policies, teacher readiness, and the integration of technology in the learning process that is more mature in Malaysia. By comparing the two countries, it can be concluded that a systemic approach, policy consistency and continuous teacher training are key to improving the quality of science education. Project-based, collaborative learning and technology are ideal models that Indonesia can adopt by adjusting to the local context and national challenges.

RESEARCH METHODS

This research uses a descriptive-comparative literature study method. This method was chosen as the main method as it allows for systematic analysis of various academic sources, educational policies and previous research findings relating to the implementation of science learning in Indonesia and Malaysia. The purpose of this method is to find gaps and challenges in the implementation of science education in Indonesia and Malaysia.

FINDINGS AND DISCUSSION

Science Education Curriculum Comparison

Curriculum development in Indonesia has undergone significant changes. The Merdeka Curriculum Initiative changed the 2013 primary and secondary school curriculum. This method prioritizes project-based learning and interdisciplinary learning to solve learning problems after the pandemic. For example, research by Angga et al. found that there are differences between the implementation of Curriculum 2013 and Curriculum Merdeka, both of which focus on increasing students' independence and creativity at the primary level (Angga et al., 2022). In addition, Iskandar et al. emphasized that Merdeka Curriculum is a strategic step taken by the government to overcome the crisis of the education system that occurred during the pandemic and involve teachers and innovation in learning empowerment (Y. Iskandar, 2024). In Indonesia, the paradigm of science education not only pays attention to cognitive aspects, but also seeks to integrate cultural and religious values in education. This is reflected in the trend of research that examines the integration of science and religious education (Mujahidin & Martanegara, 2020).

On the other hand, the science education system in Malaysia implements a more stable policy within the framework of the Secondary School Standard Curriculum (KSSM). Environmental education is incorporated into science subjects. For example, Malek and Halim's research illustrates how environmental education-specifically on water conservation-is integrated into the curriculum through interdisciplinary strategies. It aims to increase conservation awareness and practical skills to deal with environmental issues, so that science is not only limited to theory but also practical application relevant to the local social and economic context (Abd Malek & Halim, 2023). This method reflects the nature of Malaysian science education which is heavily centered on skill building through hands-on experience and real problem solving.

When viewed synergistically, a comparison of the two countries' curricula shows that Indonesia is undergoing pedagogical transition and innovation by undertaking curriculum reforms that are responsive to the challenges of the times. On the other hand, Malaysia maintains a stable proven science education framework with an emphasis on character education and environmental awareness. The dynamics of curriculum change in Indonesia are characterized by efforts to integrate cultural and religious values with the development of science knowledge in an effort to create graduates who are both academically and morally sound (S. Iskandar et al., 2024). However, science teaching policies in Malaysia emphasize the use of contextual and practical approaches through integration across subjects to produce well-rounded learning relevant to contemporary issues, particularly in environmental education.

Table 1 Comparison of learning systems between Indonesia and Malaysia

Aspects	Indonesia	Malaysia
Curriculum	• Transitioning to Merdeka Curriculum. • Focus on project-based learning and cultural/religious values. • Not yet stable and still in the process of adaptation.	• Using the Secondary School Standard Curriculum (KSSM). • Integration of STEM and environmental issues. • More stable and systematic.
Teaching Methods	• Lectures are still dominant. • The application of PBL (Problem Based Learning) is still limited. • Technology adoption is starting to develop, but it is not yet evenly distributed. • Teachers have difficulty adapting.	• Active and varied, project and technology based. • Integration of computational and contextual thinking. • Teachers receive structured professional training.
Learning Outcomes (PISA & TIMSS)	• PISA and TIMSS rankings are low. • Students' science literacy is still weak. • Lack of development of critical thinking skills.	• Higher ranking than Indonesia. • Achievement increases every year. • Learning is more relevant and contextualized.

Overall, a comparison between the two curricula shows that there are different strategies used to achieve the goals of science education. With Curriculum Merdeka, Indonesia pursues innovation and flexibility in learning methods, whereas in Malaysia, science content is combined with environmental education to emphasize practical relevance and empower students to face challenges around the world. The two approaches show that although the implementation and focus are different, both countries seek to improve science education through policy adjustments and interdisciplinary approaches that suit their national contexts.

Teaching Methods and Their Effectiveness

A comparison between teaching methods in Indonesia and Malaysia suggests an in-depth consideration of the effectiveness and relevance of the approaches implemented in each country. In this context, it is important to look at how different teaching methods are applied and how they affect student learning outcomes.

Research conducted by Azizah et al. shows that problem-based learning (PBL) can improve the science literacy of students in Indonesia, especially in the context of socio-scientific problems (Dinda Nur Azizah et al., 2021). PBL makes learning more interesting as it encourages students to think critically and relate it to real-life situations. In addition, research shows that combining traditional teaching methods with technology, such as instructional videos and educational game tools, can improve learning outcomes (Damayanti & Nuzuli, 2023). In such a situation, there needs to be a continuous effort to incorporate technology into the learning process to keep students more engaged and achieve better results.

In addition, teaching in Malaysia shows progress in computational thinking and the use of technology in education. According to research conducted by (Mohd Kusnan et al., 2020), various types of computational thinking activities are used in education in Malaysia. This is crucial to prepare students to face global challenges in today's technological era. The use of technology in learning not only makes students more engaged, but also makes learning more effective. In addition, research shows that the approach used in Malaysia often focuses on integrating the subject matter with the

needs of society. This helps students understand the application of science in the real world (Murtadlo et al., 2023).

In addition, research shows that the use of technology combined with traditional methods is also effective in teaching in Indonesia, which improves learning in primary schools(Damayanti & Nuzuli, 2023). This shows that although traditional methods are still used, the incorporation of technology can make learning more interactive, efficient and fun.

A study on the challenges teachers face when implementing Merdeka Curriculum found that teachers face difficulties adjusting to curriculum changes and new teaching techniques (Safitri & Fajar, 2023). This research emphasizes that adequate support for teachers is needed to face these challenges and ensure that educational goals are achieved. Teaching effectiveness is strongly influenced by conditions, teachers' readiness to apply new methods, and support from educational institutions (Hasanah, 2023).

In addition, research shows that education in Malaysia is more organized, with professional development and teacher training taking precedence to improve the quality of learning (Amelia et al., 2024). While in Indonesia, the independent curriculum has been updated, but training is still being adjusted and refined.

Overall, Indonesia and Malaysia have great potential to improve educational outcomes by utilizing technology and active learning methods. By incorporating approaches that are relevant to the needs of the times and increasing teacher and student engagement, it is expected that teaching methods in both countries will be more effective.

Evaluation of Learning Outcomes Based on PISA and TIMSS

Student learning results from the Program for International Student Assessment (PISA) and TIMSS (Trends in International Mathematics and Science Study) provide an excellent picture of the quality of education in Malaysia and Indonesia. The focus of these two international assessments is on students' abilities in learning, science and math. The results show a huge difference in student achievement in the two countries.

The 2018 PISA data showed that Indonesia's math skills ranked 72nd out of 77 countries, with a score of 379; this indicates that math education in Indonesia is less than satisfactory (Juniarti Iryani et al., 2023). This situation is in line with research conducted by Yusmar and Fadilah, who found that contextualized education and lack of teaching techniques contribute to low PISA results (Yusmar & Fadilah, 2023). In contrast, Malaysia ranked better than Indonesia. This suggests that the curriculum and educational methods in Malaysia are better at preparing students to face the challenges of the world (Rohaeti et al., 2020).

TIMSS 2015 results also showed the same difference; Indonesia ranked 44th out of 49 countries, indicating that Indonesian students are still below average in mathematics (Juniarti Iryani et al., 2023). In contrast, Malaysia is not only ranked above Indonesia, but also shows an increasing trend every year, which indicates the success of the education system in implementing a more effective curriculum and learning methodology (Kusharyadi et al., 2024). The research conducted by Kusharyadi et al. noted that the different methodologies and curricula implemented in the two countries contributed significantly to the improvement of the quality of education in the two countries.

In this regard, there are a number of variables that can be considered for the results of such evaluations. For example, research by Yusmar and Fadilah suggests that the education system in Indonesia does not fully concentrate on improving students' critical thinking skills and that teachers are poorly trained to use interactive and contextual learning methods as the main causes of the decline in science literacy in the country (Yusmar & Fadilah, 2023). This is contrary to the situation in Malaysia. There, educational methods that incorporate local context and technology are proven to be more effective in attracting students' interest and improving their learning outcomes (Ismiraj et al., 2024).

In addition, it is expected that Indonesian students' learning outcomes will be improved through the use of more inventive learning methods, such as the use of video-based media and project-based learning. To make Indonesia competitive with other Southeast Asian countries such as Malaysia, Khoeriah et al. recommended reforming learning strategies (Rosadi et al., 2023). This shows the courage to change education to handle world challenges.

Overall, the results of educational evaluations such as PISA and TIMSS show that there is a marked difference between Indonesian and Malaysian students in terms of their learning outcomes, especially in math and science subjects. While Malaysia has a better approach to education, Indonesia should invest more in competency-based curriculum and proper teacher training to improve science literacy.

CONCLUSION

This study compared science learning policies and implementation in Indonesia and Malaysia by focusing on curriculum, teaching techniques and learning outcomes. Malaysia has a more stable science education system due to STEM integration, while Indonesia is still in the transition stage with the Merdeka Curriculum, and there are problems implementing it. While teaching methods in Indonesia are still dominated by lectures, Malaysia uses project-based and technology approaches. Malaysian and Indonesian students have lower science literacy, according to PISA and TIMSS evaluation results. Policy stability, improved teacher training, and the use of project-based learning and technology are needed to improve science literacy and global competitiveness.

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