




ANALYSIS OF SCIENCE LITERACY LEARNING MEDIA DEVELOPMENT AS A FORM OF DIFFERENTIATED LEARNING IN ELEMENTARY SCHOOL

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ABSTRACT

Implementing an independent curriculum through differentiated learning is a strategy that is recommended to be applied in learning in elementary schools, because learning with this strategy refers to the needs and abilities of diverse students. However, in its application teachers must be able and precise in determining appropriate teaching tools. Moreover, learning with scientific literacy content is something that is important to convey to students in the 21st century. So, this study aims to provide a literature review regarding the development of teaching media containing scientific literacy as a form of implementing differentiated learning in elementary schools. The literature review method is used to collect primary data originating from written sources such as journals, reports and other documents. The results of the study explain that the application of differentiated learning can be carried out after determining suitability which refers to the needs and abilities of students. Based on this, the development of scientific literacy teaching media is a form of differentiated learning. The development of teaching media is needed because differentiated learning requires appropriate and appropriate teaching media. So, it is important for teachers to continue to develop competence and be able to maturely implement differentiated learning. It is hoped that the results of this literature review can provide a better understanding of the application of differentiated learning and increasing students' scientific literacy competencies, especially for elementary school teachers in the context of implementing an independent curriculum and developing students' characters who can be competitive in the global world.

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ARTICLE INFO

Keywords:

*Scientific literacy,
Differentiated learning,
Media development,
Teacher competency*

Article History:

Received: 12 Nov 2024

Revised: 19 Nov 2024

Accepted: 30 Nov 2024

Published: 10 Dec 2024

How to Cite in APA Style:

Zahra, S. Z. N. S. (2024). ANALYSIS OF SCIENCE LITERACY LEARNING MEDIA DEVELOPMENT AS A FORM OF DIFFERENTIATED LEARNING IN PRIMARY SCHOOLS. Educational Researcher Journal, 1(2), 1-9.



Introduction

The development of the times, which of course has an influence on education, means that education has many challenges, demands and problems that need to be corrected, developed and addressed in line with the progress of the times for the sake of good quality education in this country. Education is an important aspect in developing a country. So, it is hoped that good quality education can create quality human resources, be able to compete in the global world, and be able to advance the nation (Marzoan, 2023).

Improving education is carried out through various efforts, especially by the government, including by developing an effective and flexible curriculum. The independent curriculum is now becoming a new paradigm for Indonesian education. The independent curriculum is a student-oriented curriculum, with various strategies that are continuously being developed. One of the strategies developed is differentiated learning. Learning that is tailored to the needs and abilities of individual students (Pramudianti et al., 2023). This strategy is expected to provide significant benefits for students, increase learning motivation and help students to be able to master various competencies in their fields and other competencies that must be possessed in accordance with the demands of the times.

In connection with the demands of the times, the hottest topic in education is 21st century skills. 21st century skills focus on science, technology and the social environment (Pratiwi et al., 2019). So, education must contain all of this and integrate it into learning, so that it can develop students who are literate in science, technology, social and other skills that will support survival in an era of increasingly advanced global challenges. This can be implemented from an early age, and the right place is elementary school.

Education units collaborate with the government in carrying out educational missions. Achieving educational goals and demands ultimately boils down to learning activities inside or outside the classroom between teachers and students. For this reason, differentiated learning provides benefits to achieve these goals. In its application, teachers need to analyze the various characters of students with different learning styles, interests and needs, then organize learning carefully including several models, methods, media and other things which must also be in accordance with the needs and abilities of students (Hasanah & Surakarta, 2024).

The implementation of differentiated learning must be supported by teachers' mastery of various implementations of learning tools which include models, techniques, methods, media and strategies. Teachers of course need to be creative, innovative and responsive. Students' interests or learning styles will definitely follow changing times, so learning tools must too *up to date* and continuously upgraded. The development of media, which is now increasingly being disseminated to the public, especially teaching staff, has made this topic even more interesting to research. Moreover, with the new paradigm of Indonesian education and the demands of education in the 21st century, it is necessary to continue education *upgrade*. The relationship between differentiated learning and the scientific literacy skills needed by students in the 21st century should produce lots of ideas that must continue to emerge in educators. Based on this, it is important to develop a thorough learning plan supported by good learning tools that suit the

needs, interests and learning styles of students and also in accordance with other demands in the 21st century, namely that students need to be technologically literate. The integration of learning tools that continue to be developed, especially scientific literacy teaching media with differentiated learning, is considered an excellent formula for implementing an independent curriculum towards high quality education. However, in its application, differentiation learning through the development of scientific literacy teaching media needs to be carried out with careful planning, including understanding the characteristics of students, the use of technology, and understanding good scientific literacy practices, so that the learning planning focuses on the expected results (Friantoro & Purwokerto, 2022). Therefore, it is important to carry out a literature review to gain a good understanding of the development of literacy teaching media as a form of implementing differentiated learning in elementary schools.

Method

This research uses the method *library research* or commonly known as literature study. Primary data in this research comes from articles, journals, books and other research relevant to the research objectives. The data analysis technique is by collecting data related to topics similar to the purpose of writing this article. The results of the data or results of the literature study will then be analyzed descriptively so that concepts will emerge in developing scientific literacy learning media in independent curriculum differentiated learning in elementary schools. Next, the data will be reduced to produce data that is in accordance with the problem formulation, then the data will be analyzed *display* to draw conclusions.

Results

The reference sources used in this paper refer to sources that are quite trustworthy, during the last three years (2020 – 2023) such as academic texts issued by the authorities, research results and other written sources.

From the results of identifying sources such as journals, books, reports and other documents, we found quite a lot of study results related to the topic of differentiated learning and scientific literacy. From this large number of sources, they were then selected and from the source selection, 3 were selected from journals and 1 from research reports so that the total literature sources studied in this paper were 4 literature sources. The following are the results of the study from these sources:

1. **Differentiated Learning as an Implementation of a New Educational Paradigm** (Fauzi et al., 2023). Authors: Muhammad Ali Rif'an Fauzi, Siti Alfiyana Azizah, and Isma Atikah. Publication: Journal of Educational Technology, volume 1, number 1. 2023. This study aims to explain the concept of differentiated learning as an implementation of the independent curriculum.

The development of education can be seen from implementation curriculum developed, from K13 to independent curriculum. The results of this development are a new paradigm for Indonesian education. This new paradigm in learning carries student-centered learning practices. One strategy is differentiated learning. In this case, the role of the teacher as a

learning agent is very important. Teachers must have basic competencies that must continue to be developed following the educational era. The role of the teacher as a learning agent means that the teacher must be a facilitator, motivator, booster, learning engineer, and provider of learning inspiration for students. This gives an indication that the teacher's role is to stimulating learning so that students can discover their interests and talents. Through competence pedagogical that a teacher has, cultivating students' interests and talents can be done with differentiated learning. Learning is designed through adjustments to students' learning needs and characteristics. This learning is a flexible strategy for teachers in making decisions regarding learning models, because it is adapted to the learning characteristics and needs of students. If viewed based on students' learning needs, this differentiated learning has 4 elements, namely content, process, product and environment. These elements are advantages that can be explored by teachers in implementing differentiated learning. The content element contains material content that can be delivered with various variations in learning. The process element is applied by looking at how the learning process takes place, which can be in the form of learning levels, interests and talents of students. The third element is the product element, differentiation learning can be implemented by providing a connecting bridge for students through the product designed according to the skills that students are interested in. The final element is the environment, which means a learning environment that is safe and comfortable and helps support learning.

In line with the principles of the new paradigm, the concepts in differentiation learning have a significant relationship. learning differentiate This views students as individuals who have their own uniqueness. Through learning facilities that adapt to students' learning needs, it allows teachers to provide different input to each student. The effectiveness of implementing differentiated learning can run well if there is confidence between teachers and students in the learning process.

2. Title : **Assistance in Making Differentiated E-Modules Containing Scientific Literacy in the Merdeka Curriculum at Sdn 1 Sengkerang** (Pengabdian et al., 2023). Authors: Syaipul Pahru, Made Ayu Pransisca, Ahmad Dedi Marzuki, Lia Rismawati, Sahabudin Sahabudin, Nopi Nurpitasari, Mastum Mastum. Publication: Journal of Global Community Service. Volume. 2, No. 2, 2023. This study aims to describe the implementation of developing teaching tools with a differentiated learning approach that contains scientific literacy.

Based on the results of observations made at SDN 1 Sengkerang, there are problems related to teachers' difficulties in creating differentiated teaching materials that contain scientific literacy. This is also based on the problem of students who are lazy about reading textbooks which only contain reading material and formulas without interesting pictures. Students also have difficulty understanding sentences and language in books, causing students

to be lazy about reading and being scientifically literate, making it difficult for students to understand the material. Based on these problems, assistance was provided in the development of teaching materials in the form of e-modules in PDF format. This mentoring activity was attended by SDN 1 Sengkerang teachers. It is hoped that this assistance can increase teacher competence in developing learning tools. This mentoring activity begins with preparation. Preparation for mentoring begins with initiating teamwork between implementers and school partners. Then the implementing team carried out a mapping of urgent and urgent problems survey needs analysis which aims to determine the basic needs that must be met quick solved. Furthermore, the results of the mapping are used as a reference for compiling instrument evaluation in the form of *pretest*, *posttest*, and participant reflection questionnaire. The next stage is the implementation of e-module assistance. This implementation was carried out for two consecutive weeks. Mentoring is divided into 2 sessions. The first session focused on presenting material about the concept of differentiated learning, e-module components according to the Independent Curriculum, and various differentiated teaching modules containing scientific literacy along with examples. The second session consisted of practical assistance in developing differentiated e-module teaching materials with load scientific literacy. The final stage in mentoring is the evaluation stage. Evaluation of mentoring is based on results *pretest* And *posttest*. To measure the effectiveness of mentoring, a gain analysis is also carried out. Data processing results *pretest*, *posttest* And *gain* stated that the results *pretest* still very low, namely an average of 27.11. This shows that the majority of teachers do not understand how to develop differentiated e-modules containing scientific literacy. Then data *posttest* shows an average of 90. Other primary data, namely reflection data, shows that > 80% of teachers agree and think that mentoring activities using a workshop pattern can facilitate them in increasing their knowledge, adaptability and flexibility. Based on the results of this data, mentoring activities are carried out the considered effective in the process of developing teacher competency.

This activity of assisting the development of e-modules as differentiated teaching materials containing scientific literacy is an effort to increase teacher competence in exploring problems that occur related to scientific literacy. The urgency of this activity can also be seen in the application of differentiated learning which is now recommended for implementation in elementary school learning. Therefore, this activity is considered to be the right solution in efforts to develop teacher competence in implementing differentiated learning and increasing scientific literacy.

3. **Increasing Literacy through Differentiated Learning** (Seminar et al., 2023). Writers: Nawal El Moutawaqil and Ana Fitrotun Nisa. Publication: Proceedings of the National Seminar on Basic Education, 2023. This study aims to determine the effect of differentiated learning on increasing literacy.

Student literacy abilities have become the focus of attention in efforts to improve the quality of education in Indonesia. Literacy is the main skill in analyzing, understanding and communicating in text form. Literacy has a crucial role in forming individuals who are competitive and able to make positive contributions in an increasingly complex society. Even though there are many challenges in improving literacy, in recent years there have been positive changes shown by students in Indonesia. Indonesian students are able to understand texts in depth, identify information and formulate understanding from reading texts. Not only that, they are also able to express ideas both orally and in writing in a structured manner. However, amidst these positive changes, challenges will remain. Students' ability levels vary, some students may be proficient in literacy, but there will still be those who still need support in developing literacy skills. Public facts show that Indonesia's literacy level is still low, especially in rural areas. Geographical factors, lack of facilities, and unequal internet access affect literacy skills. Based on this, awareness of the importance of literacy is very important to increase in every educational unit. Increasing literacy awareness must be supported by a learning approach that focuses on literacy development.

In this research, researchers conducted a cognitive diagnostic assessment to map the scientific literacy competencies of fifth grade students at SD Negeri 2 Karangluhur. Mapping scientific literacy competencies resulted in a very advanced category of 13%, an advanced category of 29%, a developing category of 29%, and an initial developing category of 29%. The indicator for the very advanced category is that students are able to analyze text, compose paragraphs, compose effective sentences, and apply PUEBI. The indicators for students in the advanced category are being able to analyze text, compose effective sentences, and apply PUEBI. The indicator for students in the developing category is that students are able to analyze text and compose effective sentences. Meanwhile, students in the early developing category are able to carry out literacy competencies with teacher intervention. The results of this mapping show that developing literacy competencies needs to be carried out periodically and consistently. Literacy is not an innate talent, but a potential that can be developed. Literacy understanding is not only limited to texts, such as the ability to read and write, but also involves critical skills in analyzing and understanding information. In addition, the concept of multiliteracy is now emerging and recognizes the importance of mastering various digital communication skills as well as the ability to adapt to culture and society.

The research carried out based on the mapping results is classroom action research carried out by applying the differentiation learning method with learning models *problem based learning*. The results of this research showed an increase marked by an increase in the average scientific literacy competency score, from 54.6 in cycle I to 70.3 in cycle II. The application of differentiated learning carried out in this research adopts student learning styles. Having learning according to this learning style makes learning more enjoyable efficient and effective. Students more easily absorb and understand learning. Based on the results of this research, it can be

concluded that differentiation learning is designed so that learning can be delivered on target. This learning produces an inclusive learning environment that focuses on diversity and optimizing the abilities of each student, as well as realizing the principles of fair, equitable and independent education according to the education curriculum in Indonesia.

Discussion

Scientific literacy skills are now not just to meet the demands of the 21st century, but because of the importance of scientific literacy, students must have these skills as preparation for facing challenges in the global era. Scientific literacy in elementary schools contains material, concepts, formulas, calculations and applications that students must understand. Therefore, students must read diligently with scientific literacy in order to increase knowledge and knowledge (Devotion et al., 2023).

Scientific literacy skills are very much needed in the current century, not without reason, but because they are closely related to how a person can understand the environment and other problems faced by modern society which is very dependent on the development of science, technology and social problems in society (Science, 2023). Scientific literacy is also important to master in the 21st century because scientific literacy is the main key to facing various challenges in the 21st century to maintain the continuity of life, such as meeting water and food needs, controlling disease, producing sufficient energy, and facing climate change (Review & Pujiati, n.d.).

Considering the importance of scientific literacy, educating the public to have scientific literacy is a must in reforming science education in our country. The government carries out these efforts periodically, including by developing educational curricula. The independent curriculum which is now being promoted in every educational unit with various other development strategies of course includes efforts to increase scientific literacy skills.

The implementation of the independent curriculum in elementary schools is carried out using various strategies, one of which is differentiated learning. Differentiated learning is closely related to the global education agenda, namely emphasizing scientific literacy which is associated with socioscientific issues (Devotion et al., 2023). This learning provides wider space for each student to develop according to their respective potential. Students are seen as unique entities who have the right to develop their full potential through learning that adapts to the personal characteristics of each student (Nawati et al., 2023). So that in this learning, students are no longer seen as homogeneous entities with uniform abilities, each student has different abilities and requires a learning approach that is appropriate to their abilities.

Differentiated learning has the characteristics of grouping learning according to students' needs (Nawati et al., 2023). Therefore, in its application it is necessary to understand the characteristics of students, so that they can determine how the learning process will be carried out. Implementing learning with a differentiation approach actually really encourages teachers to innovate. Innovation in learning is very necessary considering the development of students' mindsets and their diverse characteristics, so innovation in learning is very important.

Differentiated learning planning must be done carefully and refer to student needs and learning objectives. The initial analysis of student characteristics is usually carried out by teachers at the beginning of the learning year, such as exploring students' backgrounds, paying attention to learning styles and the talents of students, this is also done as learning progresses. The results of this analysis can be used as a reference for a learning approach, namely differentiation learning. One application is to develop media that contains scientific literacy and has a differentiation approach model. To achieve quality education, the learning process cannot be separated from the use of learning materials, strategies and learning media, this is related to the teacher's understanding of their duties and cannot be separated from how the teacher uses learning media (Cahya et al., 2023). Teachers can design media according to students' ability groups. In this case, teacher mastery in designing, developing and using learning media needs to be improved. Based on this, the development of this media is an innovative learning strategy, where in this learning, teachers can implement differentiated learning which contains scientific literacy using technologically literate learning media.

Conclusion

Based on the results of the research from various sources that have been carried out in this study, it can be concluded that the development of teaching media with scientific literacy content is an implementation of differentiated learning in the independent curriculum in elementary schools. Differentiated learning is considered a good strategy to help teachers determine the teaching tools that will be applied in learning, because it is tailored to the needs and abilities of students so as to produce targeted learning. The close relationship between scientific literacy and differentiated learning makes it easier for teachers to achieve learning goals. Based on this, the implementation of differentiated learning needs to be supported by teacher competence who is able to develop and apply teaching tools including teaching media that suit the needs and abilities of students. So, good training and cooperation between all parties, especially teachers, is needed as an effort to develop competence.

Thank-you note

The writing of this article cannot be separated from the parties who have supported and helped, so that this article can be completed well. For this reason, the researcher would like to thank the thesis supervisor, and all the lecturers of the elementary school teacher education study program, FAIPG, Djuanda University. Thank you also to the extended family of SD Negeri 2 Nagrak who supported the researchers in the research process

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