DEVELOPING OF DIFFERENTIATED NATURAL AND SOCIAL SCIENCE LEARNING TOOLS IN *MERDEKA* CURRICULUM IN ELEMENTARY SCHOOLS

Ahmad Ipmawan Kharisma¹, A.F. Suryaning Ati MZ^{2*}, Rossa Selfi Yuliana Putri³

^{1,2,3}Universitas Muhammadiyah Lamongan ²af_suryaning_ati_mz@umla.ac.id

Abstract

One way to design and carry out a learning process based on student characteristics is with a differentiatio learning strategy. The differentiation learning strategy is a very important to implement in the 21st century. This research and development study aimed to develop a differentiated learning tool. The research subjects were fourth grade elementary school students. The 4D model with four stages (define, design, development, and dissemination) was used in this study. However, the implementation of this research was only limited to the development stage. The development of differentiated natural and social sciences learning tools aimed to produce ATP, teaching modules, teaching materials, student worksheets, and learning assessments which were valid, practical, and effective for use in elementary school students. The results indicated that ATP had a percentage of 91.5%, teaching modules with a percentage of 91%, teaching materials with a percentage of 93%, student worksheets with a percentage of 91.62%, and an assessment with a percentage of 91.12% so that the average was 91.64% with a valid category. Differentiated science and science learning tools developed are valid for use as learning tools in the student learning process in elementary schools.

Keywords: Learning Tools; Natural and Social Sciences; Differentiation, Merdeka Curriculum

Abstrak

Salah satu cara merancang dan melaksanakan proses pembelajaran berdasarkan karakteristik siswa adalah dengan strategi pembelajaran diferensiasi. Strategi pembelajaran diferensiasi merupakan hal yang sangat penting untuk diterapkan pada abad ke-21. Tujuan penelitian ini adalah untuk mengembangkan perangkat pembelajaran IPAS Berdiferensiasi. Desain penelitian ini adalah penelitian Pengembangan. Subjek penelitian dalam penelitian ini adalah siswa kelas IV Sekolah Dasar. Model penelitian yang digunakan adalah 4D dengan empat tahapan penelitian pengembangan yaitu define, design, development, dan dissemination. Namun dalam pelaksanaan penelitian ini hanya dibatasi sampai pada tahap development. pengembangan perangkat pembelajaran IPAS berdiferensiasi menghasilkan ATP, modul ajar, Bahan Ajar, Lembar kerja peserta didik (LKPD), dan Penilaian pembelajaran yang valid, praktis dan efektif untuk digunakan pada siswa di Sekolah Dasar. Presentase yang didapat dari masing-masing perangkat yaitu ATP dengan presentase 91,5%, modul ajar dengan presentase 91%, Bahan Ajar dengan presentase 93%, LKPD dengan presentase 91,62%, dan penilaian 91,12% sehingga didapatkan rata-rata 91,64% dengan kategori valid. Perangkat pembelajaran IPAS berdiferensiasi dapat digunakan sebagai perangkat pembelajaran di sekolah dasar dengan hasil respon siswa uji coba terbatas sebesar 91% dan hasil respon siswa uji coba lapangan sebesar 97%. Sehingga dapat disimpulkan bahwa Perangkat pembelajaran IPAS berdiferensiasi yang dikembangkan sudah valid untuk digunakan sebagai perangkat pembelajaran pada proses pembelajaran siswa di Sekolah Dasar.

Kata Kunci: Perangkat Pembelajaran; IPAS; Diferensiasi; Kurikulum Merdeka

| Received | : 2024-02-29 | Approved | : 2024-04-27 |
|----------|--------------|-----------|--------------|
| Reviesed | : 2024-04-22 | Published | : 2024-04-30 |



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Introduction

Education is a conscious and planned effort to develop students' religious spiritual strength, self-control, personality, intelligence, noble morals, and skills needed by themselves and society. In Indonesia, the education system has undergone curriculum changes for eleven times, starting in 1947, with a very simple curriculum, then the latest was the 2013 curriculum. These changes aimed to improve the previous curriculum. Curriculum changes in Indonesia are related to the policy of the parties responsible for handling education. Currently, the curriculum in Indonesia is known as Merdeka curriculum with the concept of independent learning. Merdeka curriculum is in accordance with the ideals of the national education figure, Ki Hajar Dewantara, focusing on students' freedom to learn independently and creatively. This will have an impact on creating students' independent characters. There are also several policies in this curriculum including changing the national school exam to a competency assessment, changing the national exam to a minimum competency assessment and a character survey (Insani 2019). In addition, the previous learning plans which contained 20 pages have been removed to only one page containing three components i.e., learning objectives, learning activities, and assessment (Indarta et al., 2022).

Through changes in learning carried out during the pandemic in 2020, the educational situation worsened, resulting in a learning crisis and nonoptimal learning process. As it is confirmed by UNICEF, which stated that the pandemic caused widespread disruption to education so that more than 60 million students and 4 million teachers experienced difficulties in the learning process (UNICEF, 2022). The pandemic occurred for two years has resulted in unachieved overall learning objectives (Putri, & Suyadi, 2021).

Learning innovation, increased use of technology, and the need to ensure teacher readiness in conducting online learning (Duwika, & Janardana, 2021). However, this cannot be separated from planning the curriculum in accordance with the online learning model. In dealing with those problems, the central government issued a policy regarding Merdeka curriculum or formerly known as the prototype curriculum as an effort to revive the development of education (Rahayu, & Prihantini, 2022). In education, the curriculum is an important and mandatory element in educational institutions. Curriculum has an important role in the form of learning tools which contain planning of learning activities in the form of a process of acquiring knowledge and experience gained through a series of learning activities (Rachman et al., 2021). Curriculum can also be interpreted as a process which includes determining learning objectives based on several aspects such as needs, selection of learning materials and methods, development of learning materials and activities, evaluation of learning outcomes designed by considering the development of student characteristics (Suratno et al., 2022). The design of this curriculum contains rules in planning the objectives, content, materials, as well as how to apply them.

The concept of independence in Merdeka curriculum is in line with the ideals of Ki Hajar Dewantara which focuses on independent and creative learning. With this freedom, students can explore their knowledge to create an independent character (Vhalery et al., 2022). The freedom to learn was born because many problems occur in education but it focuses more on human resources (Baro'ah 2020). This learning policy aims to return the management of education to schools and local governments through flexibility in designing, implementing and evaluating education programs (Kemendikbudristek 2020). However, Merdeka curriculum has not been fully implemented in all schools in Indonesia. There are only a few schools which implement this curriculum for grades 1 and 4. Even though two criteria needed in implementing this curriculum is quite easy. These two criteria are the readiness of the school principal to study

the material provided by the Ministry of Education and Culture as well as filling out the registration form and a short survey conducted by the school.

One of the serious problems regarding learning process management is the lack of teacher creativity. Creating a conducive atmosphere, a strategy, model and feedback between the teacher and students is needed so that learning objectives can be achieved effectively, efficiently, and pleasantly (Kharisma, & Huda, 2022). Therefore, methods and strategies in learning tools must be appropriate and in accordance with the conditions of elementary school students. Methods and strategies are ways and steps which help teachers in delivering specific material so that it is easier for students to understand and master the subject matter. The character of Merdeka curriculum is flexibility, expecially in terms of giving freedom to schools, teachers, and students to determine the learning process. The teacher can create and develop learning tools, especially teaching modules which will later be applied in learning according to the situation and conditions of the class.

Natural and social sciences learning is a new subject in Merdeka curriculum. The combination of natural and social sciences is considered very appropriate because it combines natural conditions and the environment around students. Natural and Social Sciences (IPAS) is a science that studies living things and inanimate objects in the universe and their interactions, examines human life as individuals as well as social creatures who interact with their environment. Social sciences education has a role in realizing the Pancasila Student Profile as an ideal picture of Indonesian student profiles. Natural science helps students grow their curiosity about the phenomena that occur around them.

One way to design and carry out a learning process based on student characteristics is with a differentiatio learning strategy. The differentiation learning strategy is a very important to implement in the 21st century. In education, the concept of differentiation learning is not a new concept. Differentiation learning is also known as differential learning. According to Schöllhorn in Herwina, (2021), "Differential learning is a motor aspect learning model that is embedded in the importance of movement variability and is rooted in the dynamic systems theory of human movement." Differentiation learning strategies in elementary schools are carried out based on students' learning needs which consist of three aspects, namely learning readiness, learning interest and students' learning profiles. Student readiness to learn means the capacity or initial ability of students to learn new material concepts. Students' learning interests are defined as learning what students like and are interested in so that it can produce meaningful learning. While the learning profile of students is a learning process approach liked by students. Learning profiles include culture, language, learning styles, and family circumstances.

According to Santos et. al in (Herwina 2021), the differentiation learning strategy appears to be used as an approach to the learning process with the aim of increasing creative student behavior. Developed from a dynamic system view, differentiation learning strategies have been widely implemented in motor learning concepts (Herwina 2021). The benefits of the differentiation learning strategy approach include 1) being able to facilitate the development of students' creativity components; 2) can provide a substantial drop in failure; 3) able to provide learning that can encourage the adaptation of different students based on their expertise and potential; and 4) differentiation learning strategies are able to support regularity in the behavior of individual students in the classroom. According to Kharisma et al, (2023), a well-designed differentiation learning strategy can encourage self-organization in the learning process (self-organizing).

The application of differentiation learning strategies is able to demonstrate learning process activities that suit students' needs both in terms of learning readiness, learning interests and students' learning styles. Thus, the fulfillment of the learning needs of students can be fulfilled properly. In the end, students will be able to learn according to their abilities and potential (MZ et al., 2022). Differentiated natural and social science learning tools were developed on fourth grade natural and social science material using the Merdeka curriculum.

Based on the problem description and existing development research, the researcher intends to develop differentiated natual and social sciences learning tools for Merdeka Curriculum in elementary schools. This research and development aimed to produce effective science learning tools as a means of assisting the learning process for elementary school students.

Research Methods

The development of differentiated natural and social sciences learning tools to improve students' critical reasoning skills in Merdeka Curriculum in Elementary Schools in this research using the 4-D Model proposed by Thiagarajan (Thiagarajan, Sivasailam 1974). The 4-D development model has four main stages, namely define, design, development, and disseminate.



Figure 1. 4-D Model Development Stages

In the first stage (define), it aims to establish and define the requirements needed in learning. This stage consists of five activity steps including initial and final analysis, analysis of student conditions, concept analysis, task analysis and formulation of learning objectives. In the analysis of student's condition, the researcher conducted an analysis related to the character of the fourth grade students in the first semester who were planned as research target students. The character of the students was the cognitive development and psychomotor development of students. At the concept analysis stage, it was carried out to identify the main concepts to teach and arrange systematically and link one concept with other relevant concepts. The task analysis stage is a way to identify the main skills to be taught and break them down into sub-skills. Task analysis is a collection of procedures for finding content in learning that is carried out to detail the contents of teaching materials in an outline according to Merdeka Curriculum. The series of task analysis is the basis for preparing learning objectives that are adapted to learning tools.

In the second stage (design), it is carried out to design learning tools. The results of the design stage include the preparation of tests, the design of learning media, and the initial design of learning devices. The test preparation stage is the activity of compiling items based on the results of the formulation of specific learning objectives to measure students' critical reasoning. The learning design stage is used to choose the right learning tools in presenting learning material. The learning design stage is the initial design of the learning device which consists of

the learning objective flow, teaching modules, teaching materials, student worksheets, and assessments adapted to natural and social sciences material.

In the third stage (develop), the differentiated natural and social sciences learning tools were developed. In this research, there were two tests conducted namely, 1) validity test and then tested for feasibility by experts to obtain suggestions and improvements so that the learning tools were suitable for use, 2) implementation of learning tools in the classroom. After the learning tools was complete, the researchers conducted trials in the fourth grade of SDN Made 4 Lamongan in the 2023/2024 academic year. The teacher in this study was the school teacher who was observed by two observers as co-authors.

In the last stage (disseminate), the researchers distributed the learning tools to limited quantities of teachers. The distribution was intended to obtain responses and feedback on the learning tools developed. If the response from the target users of the learning tools is good, distribution will be carried out in large quantities so that the learning tools can be widely used.

Result and Discussion

The Development of Differentiated Natural and Social Sciences Learning Tools

This research aimed to develop differentiated natural and social sciences learning tools which used the 4-D model including define, design, develop, and disseminate.



Figure 2. Cover of Differentiated Natural and Social Sciences Learning Tools

By developing differentiated natural and social sciences learning tools, it is hoped that teachers can more easily manage differentiated learning activities so that they are able to demonstrate learning process activities that suit students' needs, both in terms of learning readiness, learning interests and students' learning styles. Thus, the learning needs of students can be fulfilled properly. In the end, students will be able to learn according to their abilities and potential (MZ, et al., 2022).

Learning Tools Validation Results

Before conducting the trial, the media were validated first by experts. Media validation is carried out to determine its validity based on teaching materials experts. The validation was carried out by two experts who were competent with natural and social sciences learning materials for elementary school students. The validation results can be perceived in Table 1 below.

| Tabl | Table 1. Recapitulation of Differentiated Science Learning Tools Validation Results | | | |
|------|---|-----------------|-------------|--------|
| No | Assessment Aspects | Mean Percentage | | |
| | | Validator 1 | Validator 2 | |
| 1 | Learning objective flow | 3.62 | 3.70 | 91.5% |
| 2 | Teaching module | 3.64 | 3.64 | 91% |
| 3 | Student worksheet | 3.72 | 3.72 | 93% |
| 4 | Teaching materials | 3.3 | 3.70 | 91.62% |
| 5 | Assessment | 3.69 | 3.60 | 91.12% |

 Table 1. Recapitulation of Differentiated Science Learning Tools Validation Results

The results of the two validators in Table 1 show that the learning tools as a whole have met the elements of validity and the instruments prepared are reliable, so that the learning device is declared feasible to be tested.

Effectiveness of Differentiated Natural and Social Sciences Learning Tools

The effectiveness of differentiated natural and social sciences learning tools in elementary schools can be perceived from the results of limited and field trials. Limited trials were carried out on 10 students, while field trials were carried out with 25 students in one class. The results of limited trials and field trials can be perceived in Table 2 and Table 3.

| Table 2. The Results of Limited Trials |
|--|
|--|

| No | Products | Mean |
|-----------------------------|--|------|
| 1 | Learning is more interesting and not boring | 4 |
| 2 | Learning is easier to understand | 3 |
| 3 | Learning is more fun and enjoyable | 4 |
| 4 | Encourages me to do teamwork | 4 |
| 5 | Pushing me to do things I've never tried | 4 |
| 6 | Encourages me to be enthusiastic in carrying out the learning process | 3 |
| 7 | Gain experience from the results of project work | 4 |
| 8 | Suitable for me who prefers direct practice rather than lots of theory | 3 |
| Total limited trial | | 29 |
| Percentage of limited trial | | 91% |

The results of the limited trial using the differentiated learning tools showed that the percentage of student response questionnaire results was 91% with a very good category seen from eight criteria. After a limited trial, a field trial was carried out with a larger number of 25 students. The results of the analysis of student responses in the field trial can be seen in table 4 below.

| Table 3. | The | Results | of Field | Trial |
|----------|-----|---------|----------|-------|
| | - | | | |

| No | Products | Mean |
|---------------------------|--|------------|
| 1 | Learning is more interesting and not boring | 4 |
| 2 | Learning is easier to understand | 4 |
| 3 | Learning is more fun and enjoyable | 4 |
| 4 | Encourages me to do teamwork | 4 |
| 5 | Pushing me to do things I've never tried | 4 |
| 6 | Encourages me to be enthusiastic in carrying out the learning process | 4 |
| 7 | Gain experience from the results of project work | 4 |
| 8 | Suitable for me who prefers direct practice rather than lots of theory | 3 |
| Total field trial | | 31 |
| Percentage of field trial | | 97% |

The results of field trials showed that the percentage of results of the questionnaire analysis with student responses was 97% in the very good category. It can be concluded that the learning process will be more effective and easier for students to learn abstract material by using differentiated natural and social sciences learning tools in elementary schools (MZ, et al., 2021).

One of the learning tools that must be completed by educational institutions is the curriculum (Fatmawati, F., & Yusrizal 2020). Curriculum is a lesson plan, teaching materials, and learning experiences which have been programmed in advance. The curriculum is a reference for every educator in implementing the teaching and learning process. Indonesia is a country which has made several changes/revisions to the curriculum (Fatmawati, F., & Yusrizal 2021). In the preparation process for the implementation of Merdeka curriculum at SDN Made 4 Lamongan, both teachers and principals have attended various trainings carried out both online and in person held by the local cluster. There are several important aspects or indicators related to Merdeka curriculum including readiness to carry out assessments as a substitute for national school exam, changes in lesson plan, teaching modules, preparation of operational curricula, as well as preparation of project modules to strengthen the profile of Pancasila students (Fitriyah, C. Z., & Wardani 2022).

Differentiated natural and social sciences learning tools are developed using the implementation of Merdeka curriculum in elementary schools. Merdeka curriculum, which was born to overcome educational problems during this endemic era, formulated several new policies that conceptually provide freedom for both institutions and students in implementing the learning process. Through this curriculum change, it is hoped that there will be changes in the world of education that focus more on developing character and soft skills based on competency (Indarta, Y., Jalinus, N., Waskito, W., Samala, A. D., Riyanda, A. R., & Adi 2022). The application of differentiation learning strategies is able to demonstrate learning process activities that suit students' needs both in terms of learning readiness, learning interests, and students' learning styles. So that the fulfillment of the learning needs of students can be fulfilled properly. In the end, students will be able to learn according to their abilities and potential (Kharisma 2021).

Based on the data described in the research results, it can be said that the validators agreed that the differentiated natural and social sciences learning tools are valid and relevant to the needs or expectations of fourth grade students. This is shown by the data from the assessment results by the validators on the relevance of learning tools to the needs and expectations of students. The validators' assessments turned out to be in line with students' responses to learning. Based on students' questionnaire responses, it was found that 94% of students were interested in learning process which applied process skills. The learning tools developed are relevant to the needs of students in the 21st century. In addition to fulfilling content validity, the validity of learning tools is also more important, that they have to fulfill construct validity. This means that the preparation of learning tools must be consistently interrelated and logically have a clear format and theoretical basis. The validity of learning tools has an impact on learning outcomes. Thus, it can be concluded that the learning process will be more effective and easier for students to learn abstract material by using differentiated natural and social sciences learning tools in the learning process in elementary schools. In other words, the differentiated learning tools can be used as a reference for learning in elementary schools.

Conclusion

Based on the results of the research and discussion, it is revealed that the development of science learning tools produced syllabus, learning implementation plans, student worksheets, teaching materials and assessments that are valid, practical, and effective for use in elementary school students. The learning objective flow obtains a percentage of 91.5%, teaching modules with a percentage of 91%, teaching materials with a percentage of 93%, student worksheets with a percentage of 91.62%, and an assessment with a percentage of 91.12%, so that the mean score of 91.64% in the valid category. Differentiated natural and social sciences learning tools are very effective for elementary school students as evidenced by limited and field trials conducted to measure students' responses. Therefore, it can be concluded that the differentiated natural and social sciences are valid to be used as learning tools in Merdeka curriculum in elementary schools. The learning process will be more effective and easier for students to learn abstract material by using differentiated natural and social sciences learning tools in the learning process in elementary schools.

Acknowledment

The researcher would like to thank Directorate of Research and Community Service, Ministry of Education, Culture, Research and Technology for providing financial support to this research through a research grant for the "Penelitian Dosen Pemula" scheme in accordance with decision Number: 0557/E5.5/AL.04/2023 dated June 1, 2023. The researchers also would like to thank to SDN Made 4 Lamongan for the contribution as the research site.

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