

Development of Numeracy of Grade V Elementary School Students in KPK and FPB Learning Using Dakota Media

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Abstract. This research was conducted with the aim of developing and examining the effectiveness of Media Dakota (Dakon Mathematics) in improving the numeracy skills of fifth grade elementary school students to better understand material about KPK (Least Common Multiple) and FPB (Greatest Common Factor) in the independent curriculum. This research uses a development research methodology related to the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The research subjects were 28 fifth grade students at SDN Slawu 01 Jember. Data was collected through tests, observations, interviews and analyzed descriptively. The results of this research show that the use of Dakota Media (Dakon Mathematics) significantly increases students' understanding of KPK and FPB material. In the development stage, the media is refined to meet students' needs to be more interactive and effective. After implementation, 85% of students were able to achieve results above the Minimum Integrity Standards (KKM). In addition, the use of Media Dakota (Dakon Mathematics) increases student motivation and involvement in mathematics lessons. Media Dakota supports the implementation of an independent curriculum through experiential learning and developing students' critical and creative thinking skills.

Keywords: ADDIE Model, Development Method, Independent Curriculum, KPK and FPB, Media Dakota, Numeracy

1 Introduction

Education is a human activity to gain knowledge and understanding about something. It is hoped that this knowledge and understanding can be a means of improving and developing human natural talents to become better, more cultured, more independent and whole. The core problem of education is the difficulty of elementary school students in understanding abstract mathematical concepts such as FPB (Greatest Common Factor) and KPK (Least Common Multiple). The authors point out that conventional approaches, such as the use of factor trees, have not been effective because students have not understood prime numbers and factorization in depth. This problem

is placed in an empirical context—the lack of learning media in schools and the low motivation of students for mathematics—thus providing a solid basis for the urgency of research. However, the explanation of why DAKOTA media is an innovative intervention should be expanded with explicit arguments about its superiority over other existing concrete media. However, the idea of adapting traditional games into educational means shows creativity that is relevant to the needs of 21st-century learning that emphasizes fun and meaningful learning experiences. According to [1] He concluded that "education is a process in human life as a means of obtaining knowledge that will be useful to support life in the future. Mathematics in elementary school has become a feared scourge for most students. Students feel scared and very burdened when they encounter this lesson, because mathematics is considered a very complicated subject and requires a deep understanding to learn it [2].

The link between the development of DAKOTA media and Piaget's theory is well demonstrated. The authors assert that elementary school students, especially 7–11 years old, are at a concrete operational stage where they are only capable of thinking logically towards real and manipulable objects. Therefore, the use of manipulative media such as DAKOTA (Dakon Mathematics) is based on the cognitive need to convert abstract mathematical concepts into concrete experiences. This argument is effective because it connects the theory of cognitive development with real pedagogical needs, reinforcing the rationale that mathematics learning requires concrete media for conceptual understanding to be more easily formed. However, theoretical reinforcement can be enhanced by linking the principles of learning by doing and constructivism, which are the practical basis of Piaget's theory in the context of game-based learning.

The achievement of learning goals is influenced by good educators. One of the focuses in improving the quality of education in Indonesia today is to improve the quality of education [3]. If it is more pointed out, this refers to improving the quality of learning in the classroom. One of the efforts to overcome this is to use the results of educational research as a reference and additional knowledge To support the implementation of learning in the classroom, learning media is needed to make it easier for students to understand the learning material and make learning more varied and not boring [4]. According to the National Education Association (NEA), media is defined as any form of tool that can be manipulated, seen, heard, read or talked about along with the instruments used in an activity [5]. In addition, Hamalik divided the definition of media into two, namely media in a narrow sense and in a broad sense, where the narrow meaning of learning media is a medium that teachers use in the teaching and learning process effectively and planned (Hamalik, 2003). Meanwhile, broadly speaking, media is media that is included in electronic communication media, both complex and simple, such as slides, photos, diagrams, charts made by teachers, real objects around the school, and other real objects that can be encountered when students visit outside school [6].

In reality, in the schools where this research was carried out, there are very few learning media. Based on the results of interviews with teachers in the learning process, they rarely use mathematics learning media due to the lack of facilities and the existence of media. Even though elementary school children really need learning

media, because elementary school students are between 7-11 years old. According to Piaget, this age is in the realm of concrete operational cognition. The stage of concrete operational thinking is that the children are able to think rationally, but are still limited to concrete problems [7]. Meanwhile, the concepts in mathematics are very abstract, so elementary school students still find it difficult to understand directly. Effective learning media needs to be developed to help make it easier for students to better understand mathematics material [8].

This article succeeds in showing the educational relevance of the modification of the traditional game of congklak into the DAKOTA media, but the originality aspect can still be asserted more strongly. The author mentions several previous studies that also used the game of dakon as a means of learning mathematics, but it has not been fully explained how the development of DAKOTA in this study expands, modifies, or improves on previous innovations. From the point of view of novelty, the integration of local cultural values with pedagogical goals can be categorized as an ethnomathematic approach, which has high relevance to the independent curriculum. By reinforcing the argument that DAKOTA is not only an adaptation of old games, but a pedagogical transformation based on cultural contexts and concrete learning theories, this manuscript will be more convincing as a new contribution to the innovation of mathematics learning media in elementary schools.

Most of the material at the elementary level is about numbers. Elementary school students in grade V in learning about FPB and KPK often experience difficulties. The presentation of the concept of FPB and KPK is often presented in the form of a factor tree. In fact, in reality in the field, there are still many students who do not fully understand prime numbers and how to determine the prime factors of a number. For this reason, the purpose of this research can be formulated, which is to develop DAKOTA (Dakon Mathematics) learning media. The math dakon game is a learning medium that is the result of a modification of one of Indonesia's traditional games, namely congklak, according to [9] dan [10]. Meanwhile, according to [11] The dakon game can help and make it easier for students to understand the concept of mathematical calculation as well as be fun for students because it contains game elements. The relevant research is [12] conducted research and obtained results that the application of Dakota media (Dakon Mathematics) can improve the mathematics learning outcomes of grade IV elementary school students in Riau.

2 Methods

This research method section has not shown that there is a comprehensive and up-to-date literature review regarding mathematics learning media at the elementary education level. Although the introduction mentions the limitations of the media used by teachers and the difficulty of students understanding the concepts of FPB and KPK, the methods section does not link them with the results of relevant previous research or learning technologies that have been developed before. As a result, the research gap that is, DAKOTA's position compared to other manipulative media such as smart boards, numeric cards, or interactive digital media—has not been clearly defined. In

fact, the current literature can serve as a rational basis for showing that traditional games based on local culture are an innovative alternative to the dominance of modern digital media. Therefore, this method should be complemented by a brief description of the results of previous research to strengthen the justification for the development of DAKOTA as a new solution to the concrete needs of elementary school students.

This research is a type of development research that is included in the Research and Development (R&D) category, with the main goal of producing an innovative product that is able to improve the quality of the learning process in elementary schools. The product developed through this research is an interactive learning media called Dakota (Dakon Mathematics). This media is specifically designed to help grade V elementary school students improve their numeracy skills, especially in understanding the concepts of the Smallest Common Multiple (KPK) and the Largest Common Factor (FPB) in mathematics. In the development process, this research uses the ADDIE model, which consists of five systematic stages, namely analysis, design, development, implementation, and evaluation [13]. The ADDIE model was chosen because of its advantages in providing a structured and comprehensive approach, so that the resulting products can be adjusted to the needs of students and support the teaching and learning process optimally.

The research design has been explicitly stated as research and development with the ADDIE model, and this is the right approach to produce and test new learning media. The five stages in the ADDIE model (analysis, design, development, implementation, evaluation) are conceptually mentioned, but the implementation procedure is still presented in general without technical details. For example, it is not explained in detail how the trials are carried out, the number of development cycles taken, and the revision criteria at each stage. In addition, although there is mention of validation by media experts and subject matter experts, the assessment methods such as the form of the validation instrument, the scale used (e.g. Likert 1–5), and the method of processing validation results have not been described. This additional explanation is important so that methodological transparency increases and the results of the research can be replicated or compared with similar studies in the field of mathematics learning media development.

The main target of this study is grade V students at SDN Slawu 01, with product validation carried out by learning media experts and mathematics material experts. This validation aims to ensure that the learning media developed is not only technically feasible but also relevant and effective in improving students' abilities in the material that is the focus of learning. To support data collection, this study uses three main techniques, namely observation, documentation, and testing. Observation techniques are used to directly observe the learning process in the classroom, focusing on students' interaction with the learning media used. The results of this research are expected to make a significant contribution in supporting the improvement of the quality of mathematics learning in elementary schools, especially in the aspect of student numeracy [14]. In addition, the resulting learning media is also expected to be a practical solution for teachers in presenting learning methods that are innovative, fun, and

in accordance with the characteristics and needs of students at the elementary school level.

The research method mentions three data collection techniques (observation, documentation, and tests), but does not provide a description of the validity and reliability of the instruments used to assess students' mathematical understanding and learning outcomes. It is also not explained what indicators of numeracy ability are measured and how they relate to the achievement of mathematics learning in class V in the Independent Curriculum. To strengthen the credibility of the results, information should be included about the test type (e.g., multiple-choice, description, or problem-solving task), the assessment rubric, and the test procedures for validity (e.g., expert judgment or item correlation analysis) and reliability (e.g., Cronbach's alpha). The elaboration of indicators that are in line with the elements of "factors and multiples" in curriculum outcomes will also show that the evaluation of learning outcomes really reflects the increase in numeracy that is the focus of the research.

3 Results and Discussion

3.1 Research Result

This study shows positive results when using Dakota Media (Dakon Mathematics) to learn GCD and LCM in fifth grade elementary school. After using this media, students' understanding of the material increased significantly. Tests conducted after using the learning media showed that students were able to achieve the Minimum Passing Standard (KKM), which was higher than before using the media. Students also demonstrated better ability in solving GCD and LCM problems independently and in groups. Observations showed not only an increase in learning outcomes, but also an increase in student motivation to learn. Students were more active in participating in group discussions, more enthusiastic in solving problems related to GCD and LCM and showed a high level of engagement in the learning process. Interviews with teachers also revealed that the Dakota Media (Mathematics Dakon) facilitated the learning process, as students were able to better understand concepts that were previously difficult to comprehend.

The use of Dakota Media to study KPK and FPB has proven to be very beneficial for students' understanding of mathematical concepts. These medium transforms what was originally abstract learning into more concrete and visual learning. As part of the Merdeka curriculum that prioritizes a fun and context-based learning experience. Dakota Media supports an active, creative, and fun learning process. Dakota Media develops students' Numeracy by providing a clear visual representation of the patterns of various factors. This is in accordance with the principles of mathematics learning in the independent curriculum which emphasizes practical application in daily life. For example, students can easily see the relationship between the numbers in the Dakota table making it easier to find the KPK and FPB.

Increasing student motivation is also an important outcome of this study. More interactive learning using fun media increases student engagement. This is in accordance with research [15] which shows that the use of visual media increases students'

interest in mathematics and learning outcomes. But even though the results are very good, there are still some things that need to be considered in the next development.

Some students have difficulty understanding how to use media at the beginning of implementation and require more intensive support in the first stage of use. This is in line with the findings of previous research that although visual learning media can be very helpful, it takes time for students to adapt to new media, especially when understanding more complex concepts. Overall, this study proves that Media Dakota (Dakon Mathematics) can be an effective tool to improve students' computing skills in KPK and FPB learning and support the implementation of the Independent Curriculum in a fun way.

3.2 Discussion

This research uses the ADDIE model approach with each stage making a significant contribution to the development of Dakota Media (Dakon Mathematics). Here is a breakdown of the process at each stage:

Analysis.

At this stage, it was found that students often had difficulty in understanding the concepts of KPK and FPB because of their abstract nature. The teacher stated that the previous learning method using a factor tree was not fully effective. This underlines the need for learning media that is concrete, interesting, and in accordance with the characteristics of grade V students who are at the concrete operational stage according to Piaget's theory. The analysis also shows that the limited learning media in schools is one of the causes of students' low interest in learning mathematics.

Design.

Based on the results of the analysis, the researcher designed Media Dakota (Dakon Mathematics) by combining traditional game elements of dakon and visual elements to make it easier for students to understand the material. This media is designed to provide a concrete and interactive learning experience. With an experiential learning approach, Media Dakota not only helps students understand concepts but also encourages cooperation through group activities.

Development.

Dakota media was developed using simple materials such as boards containing tables of numbers. The media prototype is tested on a small group of students to identify its strengths and weaknesses. The feedback received is used to improve the media, including simplifying the user guide and adding clearer illustrations. This stage ensures that the media can be used effectively in a classroom setting.

Implementation.

Dakota media is applied in several learning sessions in grade V of elementary school. Teachers use this media to explain the concepts of KPK and FPB gradually. Students are seen to be more engaged, enthusiastic, and active in the learning process. By using Dakota Media, students are able to understand the material faster than conventional teaching methods.

Evaluation.

The evaluation stage shows that Dakota Media is effective in improving student learning outcomes. Most students managed to achieve grades above KKM, with improved comprehension compared to before using Dakota media. However, students' initial adaptation to new media requires additional time. These difficulties can be overcome with intensive mentoring from teachers during the early stages of implementation.



Fig. 1. KPK & FPB learning using factor trees



Fig. 2. Learning of KPK & FPB materials using DAKOTA teaching materials

4 Conclusion

Based on the findings of the study, the use of Dakota Media (Dakon Mathematics) in class V learning about KPK and FPB materials, has a positive impact on improving students' mathematical understanding. Learning becomes more engaging and interactive, allowing students to understand initially difficult mathematical concepts through clear and applicative visualization. Student learning outcomes have improved, most students have achieved the Minimum Completeness Standards (KKM) and increased involvement in learning. Media Dakota (Dakon Mathematics) supports the Merdeka curriculum approach that emphasizes experiential learning by providing students with the opportunity to interact directly with the material and improve their numeracy skills in daily life. However, at first, familiarizing students with the new media requires more attention, especially in supporting it in the early stages of use. Overall, this study concludes that Dakota Media is an effective tool to improve the quality of mathematics learning, especially KPK and FPB learning, and contributes positively to the implementation of the Independent Curriculum in elementary schools.

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