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Analysis of Differentiated Learning Needs in Mathematics Subjects in Class 5 of SDN 182 North Bengkulu

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Abstract

This research activity aims to analyze the need for differentiated learning in mathematics at SD Kurikulum Merdeka in the fifth grade of SDN 182 North Bengkulu. The utilized research methodology involved a descriptive qualitative approach, employing a case study framework. Data collection encompassed observation, interviews, and document analysis. The findings of the investigation suggest that there is a requirement for implementing distinct approaches to learning mathematics in the fifth grade of Merdeka Curriculum Elementary School, located at SDN 182 North Bengkulu. Several factors underlie this need including the various levels of student understanding, different learning styles, and the diversity of students' abilities and talents in mathematics. Based on data analysis, several differentiated learning strategies that can be applied include (1) the use of learning materials that are varied and vary according to the level of understanding of students, (2) giving assignments or activities based on student's interests and talents, (3) the use of various learning media, (4) heterogeneous study group settings, and (5) providing additional support to students in need. This research is expected to contribute to the development of mathematics learning in Merdeka Curriculum Elementary School in the fifth grade of SDN 182 North Bengkulu, as well as to provide guidance for teachers and education stakeholders in designing effective differentiated learning to improve students' mathematics achievement.

A. Introduction

The Indonesian curriculum has undergone several changes over the years, including the 1947, 1952, 1964, 1975, 1984, 1994, 2004, 2006, 2013 curriculum, the emergency curriculum (2019), the prototype curriculum (2020), and the independence curriculum (2022). These changes are made based on the needs of students and are directed systematically. The Merdeka Curriculum was introduced in 2020 during the Covid-19 pandemic when face-to-face learning was limited. This period witnessed the development of technology in education, with online learning and the creation of learning videos becoming common. However, challenges related to internet availability and device ownership emerged during the implementation of the emergency curriculum. The pandemic resulted in learning loss and varying levels of student competency (Siregar et al., 2022). To address this, a learning recovery policy is necessary, focusing on implementing a curriculum that meets the learning needs of students and ensuring competency achievement. The current curriculum in use is the Merdeka Curriculum (Yaelasari & Astuti, 2022).

Implementation of the Merdeka Curriculum has not been fully implemented by all schools. This causes different levels of school readiness. So, the Ministry of Education and Culture took a policy to choose a curriculum according to the needs of the school. Implementation. There are three alternative choices in the

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implementation of the Merdeka Curriculum implemented by schools, namely: first, the Independent Learning option, the second, the Independent Change option, and the third, the Independent Sharing option (Andari, 2022).

The Merdeka Curriculum is currently being implemented in schools, focusing on learner-centered education. Teachers have the flexibility to choose teaching tools that cater to the specific learning needs and interests of students. Projects aimed at enhancing students' understanding of Pancasila are developed based on government-set themes. These projects are not aimed at achieving specific learning targets tied to subject content. The curriculum also emphasizes differentiated learning approaches (Ariga, 2022).

Teachers play a crucial role as learning leaders, expected to recognize and guide the abilities, interests, and talents of diverse students. However, teachers often face challenges in facilitating students with different abilities using a single teaching method, which may not cater to their individual interests and talents. A descriptive data analysis using a questionnaire was conducted to assess the diversity of interests and talents among Class V students at SDN 182 North Bengkulu. The analysis revealed that 7 students had a visual learning profile, 6 had an audiovisual profile, and 7 had a kinesthetic profile. In terms of interests, 8 students were interested in sports, 6 in art, and 6 in science. In mathematics, particularly when learning about cube nets and blocks, there was a significant gap in scores between students. Formative tests showed that 6 students scored between 10-30, while 12 students scored between 70-100 on a scale of 10-100. In class students have various characteristics and backgrounds such as: 1) Our students come from underprivileged families who cannot access technology from home so they cannot participate in online learning; 2) Students who have difficulty understanding the language used in class, because they are students who have just moved from another area; 3) Students who are bored because they have actually mastered the skills being taught so that learning is no longer challenging for them; 4) The student is currently struggling to understand what is being taught, but because there is too much gap between what he is capable of and what is being learned, he is unable to make the connection; 5) Our students whose work results look good, but on the other hand have social-emotional problems; 6) Our students who have a great interest in certain fields; and 7) Our students who have learning difficulties.

The teacher takes into consideration the students' readiness, interests, and talents when designing their learning needs. Differentiated learning is employed, utilizing a diagnostic assessment to analyze the students' initial abilities. This approach aims to address gaps in learning outcomes through the use of scaffolding. Scaffolding involves providing adequate assistance to students based on their specific difficulties. The concept of scaffolding was originally introduced by Vygotsky, a Russian psychologist, and further popularized by Bruner, an expert in mathematics education. Vygotsky proposed the idea of the Zone of Proximal Development (ZPD) and Scaffolding, emphasizing the importance of providing appropriate support to help students advance their learning (Chairani, 2015). Each child possesses a unique Zone of Proximal Development (ZPD), which represents the gap between their current level of development and their potential for further growth. Scaffolding, a key concept in education, places significant emphasis on teacher guidance and support.

In overcoming the gap in student learning outcomes there are various alternative solutions, namely: 1) Cooperative learning has the meaning of a learning activity that was developed to present nurturing interactions between students to increase collaboration and intimacy. The cooperative learning model fosters independence, creativity, and student involvement during the learning process. In learning activities, teachers can use various types of cooperative learning, such as (1) STAD (Student Team Achievement Division), (2) Jigsaw Strategy, (2) Group Investigation, (4) Numbered Heads Together, (5) Think-Pair-Share Learning Strengths and Weaknesses Cooperative Cooperative learning has several advantages. The advantages of cooperative learning, according to Hill & Hill (1993: 1-6), are (1) improving student learning outcomes, (2) increasing student understanding, (3) creating fun learning for students, (4) developing leadership attitudes, (5) developing a positive attitude (6) developing self-respect, (7) developing a sense of belonging, and (9) cultivating life skill. According to Karli and Margaretha (2002), the characteristics of cooperative learning include (1) Individual responsibility, meaning that each individual in the group is responsible for solving problems faced by the group, so that the success of the group is highly dependent on the responsibilities of each individual member. (2) Social skills covering all aspects of social life and social sensitivity, train students to develop self-control and self-direction for the benefit of the group. These skills teach students to give and take, accept and accept responsibility, respect the rights of others, and develop social awareness. (3) Positive interdependence is a trait that shows positive interdependence. The success of the group is largely determined by the participation of each individual member of the group

because each member of the group is considered a contributor. So students are not cooperative.(4) Group work, for example: finding answers to problems that occur in general groups (Priatna, 2016).

There are three core aspects of students' learning needs in differentiated learning (Tomlinson, 2001), including 1) learning readiness, namely the initial ability of students to take part in learning; 2) interest in learning, namely the difference in interest in learning that is owned by students; and 3) learning profile, namely the learning styles possessed by students in the form of Visual, audiovisual and kinesthetic. There are 3 approaches to content, process, and product differentiation learning. Content differentiation, namely different materials used in learning according to readiness, process differentiation in relation to ways of obtaining information for students learning in a variety of ways, and product differentiation in relation to student learning outcomes that vary according to their interests and learning styles. Several research results on differentiated learning show that differentiated learning can improve student learning outcomes (Syarifuddin & Nurmi, 2022).

Content refers to the material and subjects that students learn, which are closely tied to the curriculum. Differentiation in content can be achieved by using reading materials at various levels of readability and providing teaching materials in different formats, such as on cassette.

The process component of differentiation focuses on how students engage with ideas and information, as well as how their interactions contribute to their learning choices. Due to the diverse learning styles and preferences among students, classrooms should be modified to accommodate different needs. One example of differentiation in the process component is using tiered activities, where all students work on the same foundational skills but receive varying levels of support, challenge, and complexity.

The product component involves how students demonstrate their learning. By providing choices for students to express their understanding through various mediums, such as creating puppet shows, writing letters, or composing poetry, teachers can accommodate different learning styles and preferences.

The learning environment component considers the atmosphere in which students work and feel comfortable while learning. Differentiation in the learning environment can be achieved by ensuring there are quiet work areas free from distractions, as well as collaborative spaces that promote student interaction and cooperation.

Learning models are learning styles applied by teachers so that learning objectives can be achieved optimally. The definition of a learning model is based on Permendikbud 103 of 2014 with the topic "Learning is a conceptual and functional learning framework with names, characteristics, logical order, organization and culture".The learning model is defined as a conceptual outline or a model with a name that is used systematically in creating curriculum, managing materials, managing student activities, directing teachers, managing the learning environment, creating a supportive learning environment and setting goals. and evaluation (measuring, evaluating and providing feedback) (Asyafah, 2019).

It can be concluded that the learning model is a description that describes the design of learning from the start of planning, the learning process, and post-learning that is chosen by the lecturer/teacher and all related attributes that are used either directly or indirectly in the learning design.

In practice, teachers must remember that there is no learning model that is most appropriate for all situations and conditions. Based on the alternatives presented, according to the authors the appropriate learning model to overcome the gap in mathematics learning outcomes in grade 5 (five) is to use differentiated learning, namely point 2. The advantage of the differentiated learning model is that it can facilitate the diversity of students in class V SDN 182 Bengkulu North. Besides that, the advantages of differentiated learning are 1) Flexible, students learn with peers of the same or different abilities according to their strengths and interests; 2) Providing learning assignments in accordance with students' learning interests and readiness, but still referring to the learning objectives; 3) Learning based on assessment and learning needs; 4) Students learn based on the same curriculum objectives but use varying success criteria; 5) The teacher is fully responsible for the way students learn; and 6) Structured learning activities.

Implementation of Differentiated Learning can be considered feasible and capable of improving learning outcomes so as to reduce student learning outcomes gaps. The implementation of differentiated learning that was carried out by the author in a good practice entitled Effects of Differentiated Learning Implementation to Overcome Gaps and Improve Student Learning Achievement in Mathematics Learning in Class 5 (Five) SD Negeri 182 North Bengkulu. The population used is students of grade 5 (five) SDN 182 North Bengkulu. The method used is observation and using documentation data. The results of this study are: 1) By accurately mapping student needs, it can make it easier for teachers to design and

implement learning; 2) The material is presented in a variety of ways and through different learning processes according to the student's learning profile; 3) Implementation of Differentiated Learning can be considered feasible and capable of increasing learning outcomes so as to reduce gaps in student learning outcomes; 4) Response and participation increase because their learning needs match the student's learning profile

The material that the writer chose in this study was grade 5 (five) mathematics. In this study there is a gap in learning outcomes, low student learning outcomes and low learning motivation. In the development of the curriculum in Indonesia, elementary mathematics lessons in grades 4-6 are separated from thematic learning because the character of the content of mathematics lessons is different from other content. Students are expected to master the 4C thinking stages, namely Critical, Creative, Collaborative, and Communicative to master mathematical concepts (Setiawan, 2020). According to Bruner's theory, there are cognitive levels called the three stages of the learning process, namely (Eci & Sinaga, 2021) : 1. Inactive Stage. At this stage, students manipulate objects, using real objects or situations 2. Iconic Stage. At this stage, students construct images of manipulated objects by applying/visualizing them to concrete objects.3. The symbolic stage. At this stage, students manipulate symbols or symbols to analyze knowledge in the form of objects of abstract symbols to be used for the development of the next material. The learning process that applies Bruner's learning theory has four principles, namely: (1) Construction Theorem, (2) Notation Theorem, (3) Difference and Variation Theorem, and (4) Connectivity Theorem. Based on Bruner's theory, students are expected to learn actively and independently to construct their knowledge and find answers from a concept and instrument.

Based on the analysis of the latest developments in education issues, problems, solutions and rationalizations above, the research raises issues about how to overcome learning gaps, interests and student learning outcomes in mathematics learning in grade 5 (five) of SDN 182 North Bengkulu. This study will raise the title The Effect of Differentiated Learning Implementation to Overcome Gaps and Improve Student Learning Achievement in Mathematics Learning in Class 5 (Five) SD Negeri 182 North Bengkulu.

B. Research Methods

The type of research used in this study is the research and development method (Research and Development). According to Borg & Gall, research and development (Research and Development) is a process used to develop and validate educational products. In (Putra et al., 2020), Sugiyono (2010) explains the notion of Research and Development (R&D) is often interpreted as a process or steps to develop a new product or perfect an existing product and Effendi, & Hendriyani., 2018 explains that model development research with interactive media can also be done online. In this research a product will be developed and produced in the form of a Differentiated Learning Implementation Plan (RPP) design for grade 5 mathematics. This research was designed as a Research and Development (R&D) study with the ADDIE version of the development model.

This differentiated learning development research uses the ADDIE model (Analyze, Design, Development, Implementation, Evaluation). This model was chosen because it is often used in classroom action research and its systematic approach to instructional development (Sugihartini & Yudiana, 2018). The procedure for product development with the ADDIE model can be seen in the picture.

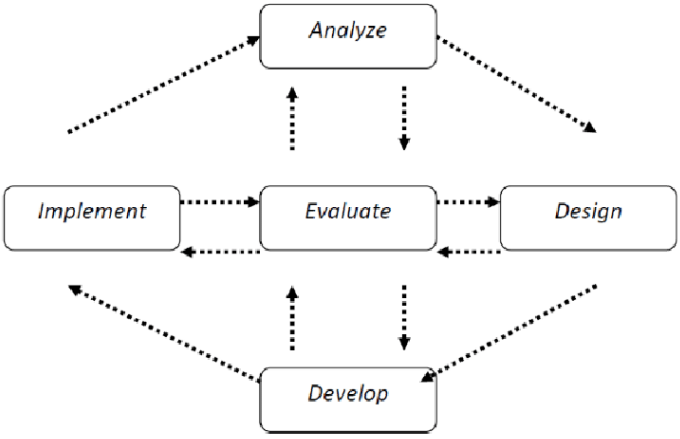

Figure 1. The ADDIE Model

The ADDIE model consists of several stages: analysis, design, development, implementation, and evaluation. In the analysis phase, two main analyses are conducted: content requirements analysis based on the curriculum and software requirements analysis. The analysis of content needs involves identifying the development materials for elementary mathematics learning according to the syllabus. The analysis of software needs aims to assess the impact of differentiated learning on student outcomes.

During the design stage, modules, media, and learning models are created. The development stage involves developing instructional materials, compiling material based on the syllabus, conducting evaluations (such as assignments and practice questions), and creating necessary models and learning media for students and teachers. In the implementation stage, various forms of media, such as interactive media, learning videos, and games, are used in differentiated learning.

The evaluation stage is crucial for assessing the success of the learning system developed, comparing it against the initial expectations and goals. The research focuses on fifth-grade students at Public Elementary School Number 182 in Bengkulu Utara, specifically in the second semester of mathematics during the 2022/2023 academic year. The research objective is to develop learning tools, including lesson plans and interactive media, for the differentiation learning model in mathematics. The study utilizes various techniques for data collection and analysis. The techniques used in this study are as follows:

1. Interview technique. According to Saroso (2017: 47) in (Yusra et al., 2021), interviews are a tool that is often used in collecting qualitative research data. This tool helps researchers collect diverse data from respondents in various situations and contexts. Interviews were conducted face-to-face with the participants. Interview activities use techniques and prepare questions that are relevant to student and teacher respondents.
2. Observation Techniques According to Fuad & Sapto (2013: 11), the observation method used in this study is a form of direct observation of an object, condition, situation, process, or behavior. In this study, the researchers chose to collect data using participatory observation techniques, so that researchers were able to observe events that occurred and involve themselves directly in collecting data and information sought to answer questions that were a problem in research (Yusra et al., 2021).
3. Library Studies
   The method of writing this article uses library research, a method of collecting information by understanding and studying theories from various literature related to this research. This research involved four stages of literature review, namely preparing the necessary equipment and preparing functional bibliography, time management, and reading or saving research materials (adapted from Zed, 2004). In collecting data, methods are used to find sources and build on it from various sources. For example, from books, journals and studies. Library materials obtained from various sources are analyzed critically and must be comprehensive to support suggestions and ideas.

The instrument used in collecting this data is using a validation sheet and a questionnaire sheet (questionnaire).

a) Validation sheet. The validation sheet is used to determine how far the learning needs are differentiated for teachers and students to increase student motivation and learning outcomes.
b) Questionnaire sheet (questionnaire). The questionnaire sheet is used to find out the expert validator's response to the math lesson plans. The questionnaire was given after the RPP design had been completed. The questionnaire was used to carry out student observation.
c) Observation sheet. The form of the observation sheet is a structured guideline. Observation grids are used as a guide for researchers when carrying out observations.
d) Documentation. Documentation was obtained from data and documents for class V SDN 182 North Bengkulu relating to students' interest, aptitude, readiness level and learning style.

The stages of carrying out this research started with determining the research subject, namely grade 5 elementary school even semester in the 2022/2023 academic year, with a total of 26 students and 5 class teachers. Then the researchers compiled instruments in the form of observation sheets and questionnaires for the needs of teachers and students. Whether or not the data is correct depends on whether the data collection instrument or measuring object of a research variable is good or not (Arikunto, 2010) in (Febrianawati, 2018). Whether or not a research instrument is determined by its validity and reliability. The validity of the instrument is concerned with the extent to which a measurement is precise in measuring what is to be measured, while reliability is concerned with the extent to which a measurement can be trusted because of its constancy (Syamsuryadin & Wahyuniati, 2017). Researchers distributed questionnaires to respondents. The final step taken by the researcher is to analyze the data. According to Sugiyono in (Budiaji, 2013) likert scale is a scale used to measure attitudes, opinions, and perceptions of a person or group of people about social phenomena. With a Likert scale, the variables to be measured are translated into variable indicators. Then these indicators are used as a starting point for compiling instrument items which can be in the form of statements or questions. The following is a 5-point Likert scale as shown in Table 1.

Table 1. Likert scale

Alternative answer	Score
Strongly agree	4
Agree	3
Don't agree	2
Strongly Disagree	1

The next step is to analyze the percentage. The needs of teachers and students for differentiated learning are used in the percentage of assessments as shown in table 2.

Table 2. Assessment criteria

Percentage	Interpretation
0%-24,99%	Strongly disagree
25-49,99%	Don't agree
50-74.99%	Agree
75-100%	Strongly agree

C. Results and Discussion

The purpose of this study was to analyze the needs of teachers and fifth grade students for differentiated learning. In this study the respondents consisted of 16 students and 5 class teachers. The student needs analysis questionnaire consists of 3 assessment aspects, while the teacher needs questionnaire consists of 2 assessment aspects. Each question item consists of 4 answer choices. Research conducted in 1 class at SDN 182 North Bengkulu obtained an average results of a needs analysis of 62.7% of 26 students including the strongly agree category according to the table 2.

This shows that students want learning resources that can make students learn independently so that they can repeat the subject matter that has been explained by the teacher. In the teacher needs questionnaire with an average result of 100% of 5 class teachers including the very agree category, this shows that the teacher also wants a differentiated learning implementation.

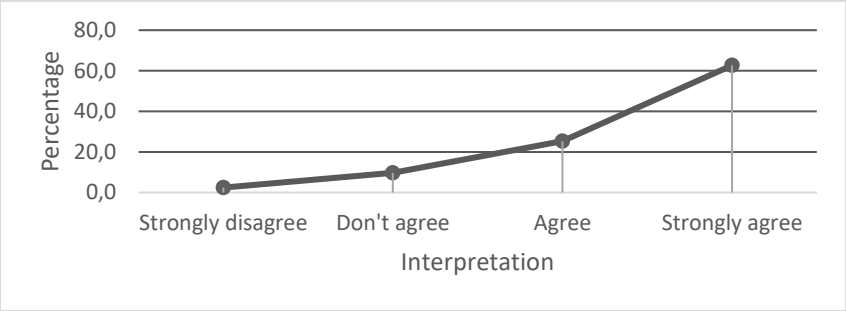

Figure 2. Graph of Results Analysis of learning needs of differentiation

The analysis of the questionnaire regarding the implementation of Differentiated Learning reveals that both students and teachers desire a learning approach that allows students to collaborate independently and caters to their individual needs. The current practice of using the same learning resources and methods for all students diminishes motivation because it fails to consider students' readiness levels, interests, and learning styles. Students and teachers recommend the development of differentiated learning to better address students' learning needs. Based on the research findings, the implementation of differentiated learning is crucial.

According to ASCD (Association for Supervision and Curriculum Development), differentiation learning aims to maximize students' learning growth by understanding their current learning abilities and supporting their further development. The Access Center defines differentiation learning as a process that enhances student learning by adapting teaching and assessment to accommodate students' individual characteristics, utilizing a combination of various strategies instead of relying on a single approach (Defitriani, 2018). Implementing differentiated learning does not imply that a teacher with 20 students must utilize 20 distinct teaching methods. It is important to note that differentiated learning does not involve categorizing students based on their intelligence levels. Differentiated learning is not synonymous with a disorganized or chaotic learning process where the teacher needs to create multiple lesson plans simultaneously. It is crucial to understand that teachers are not superhumans capable of being in multiple places at once and resolving all problems simultaneously. So, it can be concluded that differentiation learning is a series of decisions made by the teacher through an initial assessment to meet the diverse learning needs of students.

Differentiated learning is characterized by creating a learning environment that fosters student engagement, having clearly defined learning objectives in the curriculum, implementing ongoing assessment, teachers responding to individual student learning needs, and effective classroom management. When implementing differentiated learning in the classroom, teachers should adhere to several principles. One of these principles is mapping the learning needs of students, which involves assessing their readiness, interests, and learning profiles through methods such as interviews, observations, or questionnaires. This approach confirms the necessity of implementing differentiated learning based on the specific learning needs of students.

D. Conclusion

The results of the analysis of research data on the implementation of differentiated learning in fifth grade of elementary school, the result of a needs questionnaire was 62.7%, meaning that students needed differentiated learning. The results of distributing the teacher's needs questionnaire by obtaining a result of 66.7% were in the very agree category. Based on the results of data analysis, it can be concluded that teachers and students want the Development of Differentiated Learning Implementation in the classroom.

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