

Differentiation Learning Based on Joyful Learning to Improve Numeration Understanding

Pembelajaran Berdiferensiasi Berbasis *Joyful Learning* untuk Meningkatkan Pemahaman Numerasi Siswa

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Abstract

Differentiated learning allows students to learn more effectively according to their learning styles and interests. The purpose of this study is to describe the application of differentiated learning based on learning pleasure to student's numerical comprehension. The participants in this study were 25 junior high school students in Indonesia (12 female students and 13 male students) aged 9 to 10 years old. Observation results in cycle I showed that student activity reached 70%, and in cycle II, student activity increased to 80%. Data analysis techniques using classroom action research. Techniques carried out in the data collection process, namely observation, interviews and tests. The research was conducted in two cycles, with one meeting per cycle. The results showed that learning in cycle I and cycle II at each stage of learning could be carried out well. The results of this study indicate that learning activities using differentiated learning based on learning pleasure can improve students' numerical understanding. So, based on the results and discussion, differentiated learning based on joyful learning affects students' numerical understanding.

Keywords: *differentiated learning, joyful learning, numeracy literacy.*

Abstract

Pembelajaran berdiferensiasi adalah pembelajaran yang memungkinkan siswa untuk belajar lebih efektif sesuai dengan gaya belajar dan minat mereka. Tujuan dari penelitian ini adalah untuk mendeskripsikan penerapan pembelajaran berdiferensiasi berdasarkan kesenangan belajar terhadap pemahaman numerik siswa. Partisipan dalam penelitian ini adalah 25 siswa sekolah menengah pertama di Indonesia (12 siswa perempuan dan 13 siswa laki-laki) yang berusia 9 hingga 10 tahun. Hasil observasi pada siklus I menunjukkan bahwa aktivitas siswa mencapai 70%, dan pada siklus II, aktivitas siswa meningkat menjadi 80%. Teknik analisis data menggunakan penelitian tindakan kelas. Teknik yang dilakukan pada proses pengumpulan data, yaitu dilakukan observasi, wawancara dan tes. Penelitian dilakukan dalam dua siklus, dengan satu kali pertemuan per siklus. Hasil penelitian menunjukkan bahwa pembelajaran pada siklus I dan siklus II pada setiap tahapan pembelajaran dapat terlaksana dengan baik. Hasil dari penelitian ini menunjukkan bahwa kegiatan belajar menggunakan pembelajaran berdiferensiasi berdasarkan kesenangan belajar dapat meningkatkan pemahaman numerik siswa. Sehingga berdasarkan hasil dan pembahasan, pembelajaran berdiferensiasi berbasis *joyful learning* berpengaruh terhadap pemahaman berhitung siswa.

Keywords: *pembelajaran berdiferensiasi, literasi numerasi, joyful learning.*

1. Introduction

Numeracy Literacy is a person's ability to use reasoning. Reasoning means analysing and understanding a statement through activities such as manipulating mathematical symbols or language in everyday life and expressing these statements through writing and speaking (Perdana & Suswandari, 2021). Numeracy literacy consists of three aspects, namely counting, numeracy relations, and arithmetic operations. Counting is the ability to count an object verbally and identify the number of objects (Murniatiningsih & Utami, 2023). Numeracy relates to the ability to differentiate the quantity of an object, such as more, less, taller or shorter. At the same time, arithmetic operations are the ability to perform basic mathematical operations such as addition and subtraction. The three aspects of numeracy literacy previously described are essential aspects of mathematics learning that are important to introduce early until children enter the lower grades (Dini, 2018).

Based on the observation that the low level of numeracy understanding of grade 1 students is due to several factors, including 1) influenced by distance learning with a pandemic that lasts about two years, kindergarten should have started to introduce numeracy even though it is not visible, but these conditions prevent children from learning numeracy, 2) the intensity of assistance from parents/guardians during distance learning. Parents of students sometimes find it difficult to assist with distance learning. When the teacher gives assignments, those who do the work are parents, not students, 3) teachers have yet to use methods that allow students to process and develop products according to each student's learning style or interests. With this, children are left behind and need help understanding numeracy (Perdana & Suswandari, 2021).

When solving mathematical problems, students need help understanding the concept of the material, and they only memorise the formula. Mathematics is abstract, so understanding concepts is required to make it easier for us to learn complex mathematics. Numeracy literacy is essential because it prepares students to face life outside the classroom, in society, and in the world of work. Students have the knowledge and skills to plan and manage activities well. Numeracy refers to a person's ability to apply logical thinking. They analyse and understand a claim through everyday activities such as using mathematical symbols and language and expressing claims orally or in writing (Gusteti & Neviyarni, 2022). Numeracy is the ability to count objects and verbally identify the number of objects. Numeracy consists of three aspects: counting, arithmetic relationships and counting operations. Counting is the ability to verbally count objects and identify the number of objects (Setiawan & Sukamto, 2021). The three aspects of numeracy literacy previously described are essential aspects of mathematics learning that are important to introduce early until children enter the lower grades. A person's literacy skills are directly proportional to improving one's intellectual and social qualities. Literacy can help improve a person's ability to infer and respond to the social environment. Literacy is expected to enable a person to critically assess events (Hutauruk et al., 2023; Ellefson et al., 2020).

Numeracy education, which incorporates information and skills related to understanding numbers and images and analysing quantitative data, is essential for today's era. Numeracy education can be learned through habituation, coordination of learning, and extracurricular enhancement. Learning in primary schools can be implemented continuously and incrementally, starting from the local government level to specific educational units and classes (Raza et al., 2022). One of the basic proficiency skills that must be created is numeracy literacy, a subordinate or department of scientific proficiency. This capacity enables people to recognise the role of science in life and make sound judgments and choices (Rakhmawati & Mustadi, 2022). Numerical literacy is one part of scientific proficiency, but there is a difference between checking and arithmetic.

Numerical literacy combines two abilities: the ability to use various types of numbers and images related to problem-solving and analysing data shown in some charts, tables, and graphs to make choices (Wood & Ashfield, 2008).

The problem of low numeracy comprehension in grade 1 students of SDN 1 Jogopaten was obtained from several sources of information, including observation, documentation and interviews with grade 1 students. The results showed that numeracy literacy was still low, as evidenced by student scores before pre-action. Only eight students scored above KKTP or 40%, with a class average 60.5. Literacy and numeracy are prerequisites for 21st-century skills through integrated family, community and school education. Literacy and numeracy are about mastering reading and writing or counting skills and developing critical and creative thinking skills. Implementing literacy and numeracy in schools can help students acquire the skills needed for success. Strengthening numeracy literacy in primary school students must be done continuously and gradually, starting from the local government, education unit and classroom levels in schools. Numeracy literacy consists of three aspects, namely counting, numeracy relations, and counting operations (Anawati et al., 2023).

Counting activities are the ability to count objects verbally and identify the number of objects. The relationship between counting is related to the ability to distinguish the magnitude of an object, such as more, smaller, taller, or shorter (Saefurohman et al., 2021). The three aspects of numeracy literacy previously described are essential aspects of mathematics learning that are important to introduce early until children enter the lower grades. Children's numeracy skills can be known through the stages of development of informal counting, numeracy knowledge, and formal counting. Numeracy literacy skills, as knowledge and skills closely related to understanding numbers and symbols and analysing quantitative information, are critical to be learned by the current generation; by having good numeracy literacy skills, students can skillfully apply their mathematics knowledge in real life (Saefurohman et al., 2021). Numerical literacy is the information and ability to utilise various numbers and images related to basic arithmetic to uncover reasonable problems in various lifestyle settings and analyse data displayed in various forms. This research focuses on how the application of differentiated learning based on joyful learning to students' numerical understanding.

This is undoubtedly reinforced by the search for research that has similar discussions with this study: First, Candra Ditasona (2017) states that Differentiated instruction (DI) learning positively influences mathematical reasoning skills. It can be concluded that (1) The mathematical reasoning ability of students who follow differentiated learning is more improved than that of students who follow conventional learning, (2) the mathematical reasoning ability of students who follow differentiated learning is better than students who follow conventional learning in terms of student's initial mathematics ability, (3) there is an interaction between learning (conventional and differentiation) and initial knowledge of mathematics (upper and lower) on the improvement of mathematical reasoning ability.

In differentiated learning, teachers have innovations in choosing methods, models and learning strategies to motivate students to participate in the learning process. So, to improve the quality of learning in the classroom, the teacher's role is very important in determining the success of a lesson. Differentiated learning is adjusting students' interests, learning profiles, and learning readiness to achieve improved learning outcomes.

2. Literature Review

2.1 Differentiated Learning

Differentiated learning is a teaching method in which teachers apply various strategies to meet the needs of each student individually based on pre-existing knowledge, learning styles, interests, and understanding of the subject (Purnawanto, 2023). The aim is to accommodate students' needs to develop their potential according to their different learning readiness, interests, and learning profiles. In this learning, teachers act as facilitators who focus on meeting students' learning needs, allowing teachers to interact with students according to their level of knowledge and adapt teaching methods to their learning preferences (Lisnawati et al., 2023).

Schools can apply differentiated learning processes to liberate students because students are not required to be uniform in all aspects but can express themselves according to their uniqueness. Differentiated learning supports a flexible and non-rigid curriculum, avoiding dependence on a single method in achieving educational goals in schools (Tomlinson, 2017). Differentiated learning is expected to create equality in learning for all students and overcome the gap between high achievers and low achievers. In short, differentiated learning is a learning process designed to make students feel challenged to learn.

Differentiated learning is the provision of different materials according to each student's level of learning readiness. Process differentiation is learning that provides variations for students in understanding material, discovering theories or other processes (MS, 2023). One example is that the teacher records students' interests and talents before implementing learning. Teachers create guiding questions placed in the interest corners of the classroom. Meanwhile, product differentiation is giving different tasks to students. The difference is inseparable from students' learning readiness, interests, and learning profiles (Kelly, 2007; Mirawati et al., 2022)

Meanwhile, product differentiation is the provision of different tasks to students. These differences cannot be separated from students' learning readiness, interests and learning profiles (Kelly, 2007; Turner et al., 2017). Differentiated learning is considered to optimise students' learning process to produce better achievement (Sharp et al., 2020). Differentiated learning is a collection of best practices that can be strategically applied to maximise student learning at every opportunity, including giving them the tools to handle anything that does not discriminate (Sharp et al., 2020).

2.2 Numeracy Literacy

Numeracy literacy is the ability to use various numbers and symbols related to basic mathematics to solve practical problems in various daily situations . It also includes analysing information presented in various formats, such as graphs, tables, and diagrams, and interpreting the analysis results to make predictions and decisions (Shabrina, 2022). Strengthening numeracy literacy in primary schools can be done continuously and gradually, starting from the local government, education unit, and classroom levels. Numeracy literacy can be learned through habituation, integrated into learning, and developed through extracurricular activities (Anawati et al., 2023)

Numeracy literacy is essential in everyday life, including learning, working, and interacting. Students with good numeracy literacy skills excel in understanding lessons and solving problems. In addition, numeracy literacy is a component of the Minimum Competency Assessment (MCA), which starts at the primary school level and aims to measure students' basic literacy and numeracy abilities (Yayuk et al., 2023).

2.3 Joyful Learning

Joyful learning is a process where there is a close connection between educators and learners without any coercion or pressure. In this learning, a harmonious relationship between teachers and students is created. The teacher acts as a partner in the learning process; sometimes, the teacher can also learn from the students (Ashari et al., 2023). This is made possible by the rapid development of information technology, which sometimes makes students get information faster than the teacher. Fun learning creates an exhilarating learning atmosphere so students can fully concentrate on learning, increasing their focus time (Trinova, 2012).

3. Research Methods

This research includes classroom action research. Classroom action research examines learning activities in the form of actions deliberately made and occurring together in the classroom. Classroom teachers carry out action research cyclically to solve problems until the problem is resolved. Classroom action research aims to improve learning and learning support components through cyclical actions. The number of research subjects was 25, with details for 12 male and 13 female students. This research procedure consists of 4 main activity components in one recurring cycle: planning, action, observation, and reflection. The data collection techniques used were test and non-test techniques (questionnaire). The test is a problem-solving ability test, and the non-test technique (questionnaire) is used to determine students' learning readiness, learning interests, and learning styles. The test technique used includes a problem-solving ability test in this study consisting of 5 questions in the form of descriptions. The test in the form of descriptions was chosen because the students' work process in solving math problems can be seen in the texts. Problem-solving ability can be measured from the questions given, including: (1) Understand the problem, (2) Develop a solution plan, (3) Solve the problem according to plan, and (4) Recheck. The non-test technique in the form of a questionnaire in this study aims to determine students' learning readiness, interest and learning style, each of which consists of 15 statement items.

4. Results and Discussion

4.1 Research Results

From the results of the research that has been conducted, teacher activities in implementing differentiated learning based on joyful learning in students' numeracy comprehension have progressed in a better direction. The percentage of teacher activity proves this increased by 10% from 70% in cycle I to 80% in cycle II. This can be seen from the observation of student activity where in cycle I, after the action student, student activity reached 70%, and in cycle II, student activity increased to 80%. The average student activity also increased, as the data visualised in the following diagram shows.

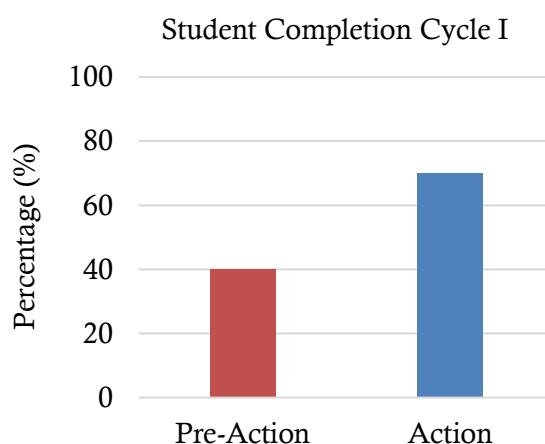


Figure.1. Diagram of Student Completion Cycle I

The diagram below illustrates the increase in student completeness after the application of differentiated learning based on joyful learning. In the pre-action stage, the average student score was 60.5. After the intervention, this score increased to 80.5. The number of students who achieved mastery also increased by 42.85% from 8 students to 14 students.

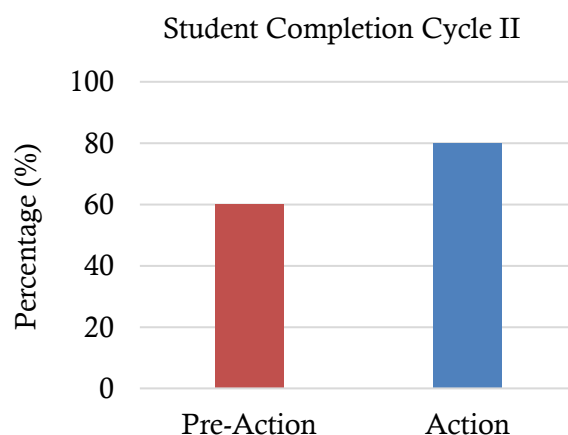


Figure.2. Diagram of Student Completion Cycle II

4.2 Discussion

The results showed significant progress in teacher and student activities, as well as learning completeness, which is strong evidence of the effectiveness of this approach. The observation results showed that student activity increased from 70% in the first cycle to 80% at the second cycle level. Similarly, the student's average score in numeracy comprehension increased from 60.5 in the pre-action to 80.5 after the action. The number of students who achieved mastery also increased by 42.85% from 8 students to 14 students. This increase shows that the applied learning method improved students' understanding and performance in numeracy. The improvement in numeracy comprehension is achieved through the application of differentiated learning based on joyful learning, which provides learning experiences that are in accordance with students' needs and learning styles. Also, the joyful learning atmosphere can help students be more focused and motivated in learning numeracy, increasing their understanding. This approach allows students to engage more actively in learning numeracy, significantly improving their understanding and ability. Learning strategies tailored to students' characteristics can help them master numeracy.

Numeracy learning with the application of joyful learning is implemented based on learning that can accommodate each student's abilities, thus arousing students' interest in learning. Joyful learning, when teachers apply a series of learning strategies suitable for students' learning types, students will find learning in the classroom easy and fun. The use of learning models follows the characteristics of each student's learning style. To improve students' problem-solving skills, teachers must be able to differentiate learning instructions in the classroom. Each student has differences in ability, interest, cultural background, and learning style. One of the learning strategies that can meet the learning needs of students with diverse abilities is differentiated teaching.

Currently, differentiated learning is in the spotlight in the world of education, which relies on the diversity of learner potential. Because this impacts improving the quality of the process and student learning outcomes. In planning differentiated learning, there are several strategies: content and the material taught to students. The teacher is responsible for determining the subject matter that students must master, but the teacher is not obliged to teach the material to students. In other words, students who have mastered the material should be able to shorten the time needed to master the material. In this content strategy, the researcher condenses the material into a learning activity (Pane et al., 2022). With differentiated learning with the content used in learning, the process carried out in delivering learning materials and the products resulting from learning can ultimately be a solution to meeting students' different learning needs based on their readiness, interests and learning profiles. This will help students achieve their learning targets optimally.

4.2.1. Implementation Process of Differentiated Learning

Differentiated learning based on joyful learning allows teachers to meet students' learning needs in a fun and efficient way, reflected in improving students' numeracy comprehension. The following is differentiated learning based on joyful learning on numeracy literacy in mathematics learning.



Figure.3. Material Delivery Process by Teacher



Figure.4. Teacher's Process of Guiding Students in Study Groups



Figure.5. Teacher's Process of Organizing Students in Study Groups



Figure.6. Teacher's Process of Providing Evaluation to Students

Implementing differentiated learning allows students to feel cared for, valued and challenged to learn content that matches their learning readiness. Interesting learning processes and challenging activities, as well as the use of engaging media, will increase students' learning motivation. Teachers' expertise in building a positive classroom atmosphere is needed so that the Pancasila learner profile can be realised more easily. Differentiated learning based on joyful learning increases responsiveness to students' learning needs, making numeracy learning more relevant and effective. Teachers encourage students to realise their individual needs because each student has different characteristics and cannot be treated the same. In realising differentiated learning, teachers must consider appropriate activities to be carried out next. An approach that combines differentiated learning with joyful learning can be an effective model for teaching numeracy and help students overcome various challenges in the learning process.

5. Conclusion

The results showed increased students' understanding of counting through differentiated learning based on joyful learning, which pays attention to content, process, and media in the learning process. Students' activeness and enthusiasm in learning make learning more effective. Differentiated learning reflects the totality of teachers in teaching because teachers are required to present diverse content, interesting processes and products according to the characteristics and differences in student abilities. This adds new and exciting value to students and encourages them to learn and understand differences and work together to achieve a common goal. Differentiated learning can help students achieve optimal learning outcomes because the material delivered is tailored to the needs and abilities of each student. Therefore, a differentiated learning approach should provide sufficient space for students to demonstrate their understanding and illustrate what they have learned.

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