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DIFFERENTIATED LEARNING WITH ADIDACTICAL SITUATIONS ASSISTED BY MATHEMATICAL ACTIVITY TASK WORKSHEETS RELATED TO ELEMENTARY SCHOOL STUDENTS' NUMERACY

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Abstract
Students' numeracy skills are currently a topic of interest in many educational research studies due to their urgency towards the skills needed in this century. Numeracy skills are closely related to critical thinking in solving problems in everyday life. However, the current phenomenon shows that this numeracy skill still needs to be improved. One of the learning approaches offered to overcome this is differentiated learning, which accommodates diversity according to the characteristics of elementary school students. The purpose of this research is to improve the numeracy skills of elementary school students through differentiated learning with an adidactic situation assisted by mathematics activities task worksheet. This research utilizes an action research approach with 18 elementary school students as participants. The research methods used were the completion of the Mathematics Activities Task Worksheet by students, special observations, and numeracy test results. Data analysis was carried out by looking at the average student numeracy scores, reflecting through FGDs with observers, and filling out observation sheets by teachers. The results of the observation sheet score showed an increase as well as the average numeracy score also increased, namely pre-cycle (45.80), cycle 1 (60.50), and cycle 2 (67.83). Based on this research, it can be concluded that differentiated learning with an adidactic situation assisted by mathematics activities task worksheet can improve the numeracy skills of elementary school students on the material of distance, time, and speed.

Keywords: Adidactic Situation, Differentiated Learning, Mathematics Activities Task Worksheet, Numeracy Skills

INTRODUCTION

The basic skills that are important for students to have today include numeracy. Numeracy is also included as the ability to analyze and interpret quantitative information found around us displayed in various forms (graphs, tables, charts, etc.) and then use the interpretation of the analysis results to predict and make decisions (Han et al., 2017). The PISA draft assessment framework (Golsteyn et al., 2016) states that numeracy is the ability to apply and interpret mathematical concepts in various problems. Numeracy skills help students understand the importance of math in every aspect of daily life. In PISA 2022, Indonesia's mathematical literacy has increased 5 ranks compared to PISA 2018 (Kemendikbudriset, 2023) In 2018, Indonesia's overall position was ranked 72 out of 77 participating countries (OECD, 2019). So, currently, Indonesia's ranking in mathematical literacy is still in the lower position. It is a common task to continue to strive in various ways so that Indonesia's numeracy literacy can continue to increase. About 72% of Indonesian students are at level 1 and below. In fact, most of them are below level 1 (about 41%), while the rest are at level 1 (about 31%). Those at level 1 are unable to answer questions involving familiar contexts where all the required information is provided and the question is clearly stated. They are unable to identify information and perform routine procedures based on direct directions in explicit situations. In fact, they are unable to take action even when given a clear and direct stimulus (OECD, 2019).
There are several choices of learning strategies to improve students' numeracy literacy understanding, one of which is by applying differentiated learning strategies (Rahmah et al., 2022). Differentiated learning is learning

that is done to meet the needs of each learner according to their inherent talents and interests. This learning contains three things, namely content (material taught), process (media used), and product (product produced). These three things cannot be separated and must all be contained in a lesson so that the learning objectives can be achieved (Herwina, 2021). Student learning readiness, student interest, and student learning profiles are among the needs in differentiated learning that teachers must prepare for (Tomlinson & Imbeau, 2021). Several studies have shown a significant effect of differentiated learning models on elementary school students' numeracy skills (Abdillah et al., 2023; Aisyah, 2014; Samsiyah, 2022). Significant learning occurs when students learn independent of the teacher's presence, students use mileu in adidactic situations, or students have independence in the learning process without teacher intervention (Miyakawa & Winsløw, 2009). The mileu can consist of: tasks to be completed; material or symbolic tools provided (e.g., artifacts, informative texts, data); students' prior knowledge; and classroom settings and rules for operating in those situations that determine how students interact with other students (Strømskag, 2017). While the adidactic situation is a learning situation where the teacher deliberately chooses, designs, or creates a milieu to minimize didactic intervention, promote student-centered inquiry-based learning, encourage students to explore and build mathematical concepts independently, and encourage discovery and self-understanding (Purnomo, 2023), In the early stages of learning, teachers must create learning activities that allow students to use their prior learning experience and knowledge (González-Martín et al., 2014). Currently, there are not many studies that discuss differentiated learning integrated with didactical activities for elementary school students. Based on this opinion, it is appropriate to implement differentiated learning with didactical activities so that learning is significant.

Based on teacher interviews in one school, it was found that teachers used direct learning methods with lectures and questions and answers without utilizing Mathematics Activities Task Worksheet (MATW) tools and learning media. The teacher also admitted that a variety of other suitable learning methods are needed so that they can improve students' numeracy skills. Other information shows that the difficulty of grade 6 material is mainly found in distance, time, and speed. Based on the documentation of grade 6 scores submitted by the teacher, the numeracy scores on distance, time, and speed are still below the Minimum Completion Criteria, and students always struggle when completing Minimum Competency Assessment questions on these materials. According to a study (Marsanto, 2021), the failure rate for learning achievement in calculating distance, time, and speed is 70%, even though the minimum completion criteria value is only 30%. Students' level of understanding of story problems is still lacking, especially in the material of distance, time, and speed (Fatmasari, 2021; Unaenah et al., 2023). This is supported by the opinion that students have difficulty understanding the known information in story problems, especially story problems that are related to everyday life (Nurhayati et al., 2021). When learning distance, time, and speed mathematics, students encounter three challenges: difficulty understanding concepts, difficulty calculating, and difficulty in language and writing (Febrina et al., 2022). Therefore, a variety of learning methods, accompanied by appropriate learning tools, are needed. MATW is one of the teaching materials that is very practical and effective for use in the mathematics learning process (Fairuz et al., 2020; Marhaeni et al., 2021). A study also stated that MATW can improve students' numeracy skills (Miftah & Setyaningsih, 2022).

In addition, numeracy has become a topic of interest and is receiving increasing attention in mathematics education research, especially since the results of several international surveys, such as PIAAC, PISA, and TIMSS, provide an overview of the state of literacy in some of the countries involved (Asmara & Purnomo, 2023). Some studies show differentiated learning by utilizing MATW (Apriyantini & Sukendra, 2023; Fitriana & Juwana, 2023; Juwana & Fitriana, 2023; Prawijaya et al., 2023). However, it has not been oriented towards the numeracy of elementary school students and has not integrated adidactic situation into differentiated learning. Considering these conditions, class action research was conducted by utilizing differentiated learning with adidactic situations assisted by MATW to improve the numeracy skills of elementary school students on the material of distance, time, and speed. The research question posed is whether differentiated learning in adidactic situations assisted by MATW can improve the numeracy skills of elementary school students.

LITERATURE REVIEW

Differentiated Learning

Each student in the class has different abilities and understandings. Differences in the classroom need to be understood by the teacher to determine the right learning model. One of the learning models that can be used is the differentiated learning model. Differentiated learning is learning that pays attention to the needs and abilities of each student (Hariyati, N. et al., 2023). Differentiated learning methods allow teachers to use different ways of teaching that are tailored to the needs of students (Smale-Jacobse et al., 2019). Differentiated learning activities paying attention to each individual does not mean treating learners differently, but teachers sometimes need to work occasionally with one class, occasionally in groups, and occasionally with individuals (Tomlinson, 1999). Through differentiated learning, teachers can pay more attention to the needs and abilities of each student and form a class that is able to bring out the potential of each individual efficiently with the stimulus provided (Faiz et al., 2022; Peteros et al., 2019).

There are three aspects used to determine the needs of learners in differentiated learning, namely students' readiness to learn and master new material; learners' interest in learning; and students' learner profiles with diversity in language, culture, and residence that affect learners' learning styles (Basir et al., 2023). These three aspects are consistent with the strategies in differentiated learning, namely content, process, and product. Content is the material and media that will be taught to students and is presented according to the readiness, interest of students related to learning materials or media, and learning styles of students. The process can be interpreted as the stages until students understand the material with a learning model that has been prepared according to their interests and learning styles. Products produced by students after the learning process are adjusted by the teacher according to the conditions of the students, this product is the result of students expressing themselves towards learning (Tomlinson & Imbeau, 2023). Teacher adjustment with students in learning makes students able to independently understand the material in their own way (Kamarulzaman et al., 2022).

Adidactic Situation

An adidactical situation is a situation when the teacher poses a problem to students that is deliberately chosen so that students can understand it and encourage students to move, express their opinions, think, and develop with their own motivation (Brousseau, 2002). In the adidactic situation, students as a group try to solve the problems given to them based on existing environmental conditions and facilities without significant assistance from the teacher (Purnomo, 2022).

Adidactical situation is one type of adaptation process from the Theory of Didactical Situation (TDS) besides milieu (Artigue et al., 2014). Milieu is the interaction of students with a system in a didactical situation. The didactical situation is a systematic framework for investigating the learning process and supporting didactical design in mathematics learning (Strømskag, 2017). Teachers or educators have an important role in organising this milieu (Brousseau, 2002). In TDS, the teacher provides opportunities for students to build their own knowledge through the problems given, and the teacher has full control over students by not helping them find the solution to the problem (Jonsson et al., 2014). This theory consists of several concepts of situations, namely didactic situations, non-didactic situations, basic situations, and adidactic situations. Based on the concept of the situation, the didactic situation is the most basic component, where the didactic situation is a situation with a hidden purpose and is taught indirectly (Yenil et al., 2014).

Mathematics Activities Task Worksheet (MATW)

The teaching and learning process requires learning tools to assist teachers and students in the learning process, one of which can be used by teachers is the Mathematics Activities Task Worksheet. The Mathematics Activities Task Worksheet is a guide for students that contains a collection of tasks and instructions that facilitate students in learning and increase interaction between teachers and students (Ardiansah & Zulfiani, 2023). MATW contains sheets in which there are materials, summaries, and instructions for doing tasks that will direct students to learning (Iswatiningsih et al., 2021). In the MATW, there are instructions for experiments, practice questions, and material that can make students active when learning (Rizkiah et al., 2018). Through MATW, students and teachers can interact effectively with the use of the Mathematics Activities Task Worksheet as a means of assisting teaching and learning activities (Zamrodah, 2020).

There are four functions of MATW, namely: (1) teaching materials that make students active and teachers less involved; (2) as a means for students to more easily understand the material; (3) concise but meaningful teaching materials; and (4) facilitating the teaching process for students (Lase & Zai, 2022). In addition, MATW is useful as a means of training students' learning independence and arousing students' interest in learning, as well as saving time when the teacher delivers learning materials (Pawestri & Zulfiati, 2020). The use of MATW is able to improve various student abilities, including comprehension ability, problem solving ability, and students' creative thinking ability (Gustiningsi et al., 2022).

Numeracy

Numeracy skills are the ability to understand information with mathematical terms in everyday life, in the form of counting operations including addition, subtraction, multiplication, and division (Adi Suarman Situmorang & Dahlia Fortuna Sinaga, 2022; Rakhmawati & Nugrahimi, 2023). According to Cockcroft (Getenet, 2022), numeracy is the use of mathematical skills to solve problems encountered in everyday life. Numeracy can also be interpreted as the ability possessed by a person to use his mathematical knowledge to explain events, solve problems, or make decisions in everyday life (Wijaya & Dewayani, 2021). Mathematics includes counting operations and language that can be used to explain a problem and solve it (Rachman & Nuriadin, 2022; Ragil & Puji Astuti, 2023). Whether or not problem solving in various fields depends on a person's decision making. This is influenced by numeracy skills; the higher a person's numeracy skills, the better the decisions taken to solve problems (Garcia-Retamero et al., 2022). Indicators of mathematical numeracy skills are (1) being able to use various kinds of numbers or symbols related to basic mathematics in solving everyday life problems, (2) being able to analyze information displayed in various forms, (3) interpreting the results of the analysis to predict and make decisions (Nurhayati et al., 2022).

METHOD

This research is classroom action research, using the research design of the Stephen Kemmis and mc Taggart model (Kemmis et al., 2014) which is illustrated in the following chart.

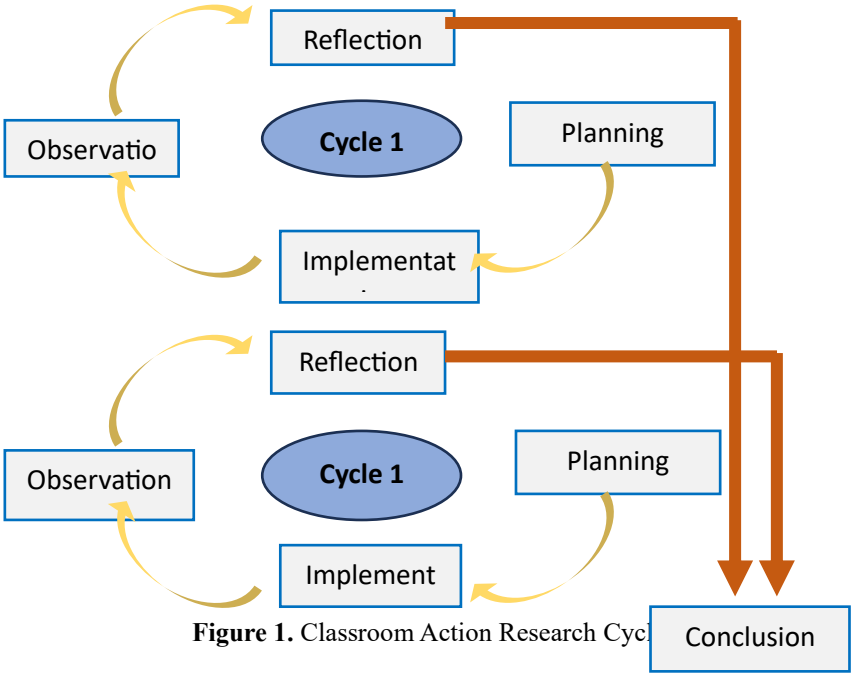

Figure 1. Classroom Action Research Cyc

The classroom action research used was designed in two cyclical stages, where each cycle consisted of four processes. There are four stages, namely the first stage of planning (plan), the second stage of action (act), the third stage of observation (observe), and the fourth stage of reflection (reflect). The research procedures carried out were: (1) preparing the research class; (2) making teaching modules and MATW; (3) discussing teaching modules and MATW between teachers and experts; (4) preparing a summary of cycle I and II material; (4) making practice questions; (5) preparing observation guidelines for the student learning process; (6) determining cycle success indicators with the class teacher; and (7) preparing end-of-cycle test questions.
The research was conducted at SDN Bungkus Kretek, Bantul, with the research subjects being grade VI students of SDN Bungkus Bantul. The total number of students was 18 students, consisting of 10 female students and 8 male students. This study used three research data collection methods, namely MATW completion, observation by lecturers and doctoral students, and numeracy tests. MATW was used to measure the problem solving process on the material in terms of distance, speed, and time. The observation sheet was used to see the learning process in the classroom in terms of speed, distance, and time. Numeracy tests were used to measure student learning success on distance, speed, and time materials. The data analysis used in this study is descriptive data analysis, which is carried out so that we can get to know the data well (Nanda et al., 2021). The minimum completeness criteria are used as an indicator of the achievement of learning success through numeracy tests. Researchers conducted a reflection through focus group discussion activities with observers (lecturers and doctoral students) to improve interventions in the next cycle. The observation sheet contains scores to show the improvement of the learning process carried out by the teacher. Teachers filled in the observation sheet so that *cross-section* data could be collected during the reflection process. This is done to maintain the validity of the data collected in the field.

RESULT AND DISCUSSION

Result

Pre-cycle

In the pre-cycle, namely before preparing for learning, teachers first understand in depth the differentiated learning process. This needs to be done so that, in addition to being able to carry out learning well, teachers can also pay attention to student learning readiness, student interest, and student learning profiles. Furthermore, the teacher makes a lesson plan in the teaching module where learning outcomes are formulated, namely:

- With the help of MATW, students are able to solve problems related to numeracy with material speed distance and material time passing with the same departure time correctly.
- With the help of MATW, students are able to solve problems related to numeration with speed, distance, and time of passing materials with different departure times correctly.
- With the help of MATW, students are able to solve problems related to numeration with speed, distance, and time by following the material correctly.

Other things that need to be prepared include props in the form of imitation clocks to remind students of the concept of time, as well as illustrations through videos of passing or following events so that students get a more concrete picture of the problem.

Another research preparation prepared is the MATW, which is systematically arranged in accordance with the differentiated learning design with planned add-on activities so that students are actively involved through the MATW. MATW has gone through an expert validation process by conducting FGDs to get input on the MATW. MATW is prepared using distance, speed, and time material consisting of three subtopics, with the mileu design in table 1 below.

Table 1. Outline of milieu design for distance, speed, time sub-materials

Crossing paths with the same departure time	**Crossing paths with different departure times**	**Followed by**
concept method of multiples	using a number line	concept method of multiples
using the table	using the table	using the table
using the formulas of distance, time, speed	using the formulas for distance, time, and speed.	using the formulas for distance, time, and speed.
using graphics		
using sketches/drawings		

MATW is organised into three series according to the division of the above sub-materials, namely the passing series, the following series, and the combination of passing series.

Figure 2. Worksheet se

Each MATW series contains alternative methods used to solve problems. While the problem illustrations refer to *high-order thinking skills problems* so that students get an idea of solving numerical problems, MATW is prepared accompanied by *scaffolding* on problem solving from numerical problems to support the realisation of an addictive situation, namely that students can interact with the ongoing learning environment without full assistance from the teacher. In this case, the teacher will divide the class into small groups, each group consists of four to five students, so it is divided into five groups. Groups are selected based on the cognitive level of students in order to identify the method of completion in accordance with their cognitive level. In the discussion, each group is allowed to use one method that is considered appropriate to the group's way of thinking.

1. Pre-cycle and cycle 1 numeracy improvement

The previous problem was that the numeracy-related scores on distance, speed, and time were still below the minimum completion criteria. In addition, students tend to be passive and less enthusiastic about the material presented. Students with high cognitive levels dominate, so learning in this material is not interesting, which ultimately affects learning outcomes. At the first meeting in the first cycle, learning began with the first sub-topic, namely passing with the same departure time. Students have been conditioned to sit according to the groups formed by the teacher. Based on observation, each group seemed unique. Each group has chosen the appropriate method to solve the problem according to their understanding. One group could solve the problem by utilising MATW without involving the teacher in problem solving. Two groups were able to solve the problem by making sure several times that it was done according to the instructions. The other two groups did not seem confident or shy to ask the teacher, but all group members seemed passive, so the MATW was not completed smoothly.


Figure 3. Learning process in cycle 1

In the second meeting of the first cycle, learning began with the second sub-topic, namely crossing paths with different departure times. In the observation at this meeting, information was obtained that the two groups that did not complete the MATW well in the first meeting had begun to be confident to ask the teacher, even though they looked rowdy and some group members were not involved in group discussions. In terms of MATW preparation, there are findings that can be evaluated including, 1) The MATW given to each group of one MATW is less effective, so not all students can freely access the MATW. The impact is that there are active students and passive ones; 2) scaffolding for solving problems presented in MATW is less systematic so that some groups are still confused about solving MATW independently. The observation score, according to the observation instrument used is 44.

The research success indicator for numeracy problems has not been achieved in cycle 1 even though learning is going well. The following is a recapitulation of student scores in pre-cycle and cycle 1.

Table 2. Data on student grades in cycle 1

No.	Indicator	Pre Cycle	Cycle 1
1	Lowest Score	35,50	50,00
2	Highest Score	60,50	75,00
3	Mode	45,00	60,00
4	Many students with scores below the KKM	15	5
5	Number of students with scores above the KKM	3	13
6	Average	45,80	60,50

Based on the table above, the average score is still low, namely 60.50 with a difference in the Minimum Completion Criteria (KKM) score of 60.00, although the increase in students with scores above KKM is 13 students or 72% with an increase in the average score of 14.7. Therefore, more treatment is needed in cycle 2 so that the increase in scores is more significant.

2. Improvement in pre-cycle, cycle 1 and cycle 2 numeracy

Based on the learning and scores obtained in cycle 1, an evaluation was conducted to improve the learning. The evaluation was conducted on the learning process and the MATW. In cycle 2, the division of groups was changed from four to five students per group to three students per group. The division of the group was intended to make the discussion more effective because there were fewer group members. In addition, the division of groups was randomized to consist of group members with evenly distributed cognitive levels in each group. This division aims to ensure that students with high cognitive levels can share information with students with moderate and low cognitive levels in their groups. In addition, each group member holds a MATW so that they can focus more on the MATW being completed. The material studied in cycle 2 is the following sub-material with MATW, which has been clarified as *scaffolding in* order to help with the expected addictive activities.


Figure 4. Learning process in cycle 2

Based on the observations made, almost all groups can carry out learning in accordance with the expected addictive activities. All group members were actively involved, and their enthusiasm was high in problem solving

discussions, so that learning became meaningful. The observation score according to the observation instrument used was 45, an increase compared to cycle 1. The recapitulation of student scores in cycle 2 is presented as follows.

Table 3. Student score data in cycle 2

No.	Indicator	Cycle 1	Cycle 2
1	Lowest Score	50,00	60,00
2	Highest Score	75,00	80,00
3	Mode	60,00	65,00
4	Many students with scores below the KKM	5	0
5	Number of students with scores above the KKM	13	18
6	Average	60,50	67,83

Based on the table above, it appears that there has been a better increase than the previous increase. The average value has also increased from the Minimum Completion Criteria (KKM) value of 60.00. Likewise, the increase in grades above the KKM has reached 18 students, in other words 100% of students are above the KKM. Therefore, it can be concluded that the learning went well and there was an increase in students' numeracy skills.

The increase in student scores from pre-cycle, cycle 1, and cycle 2 is shown in the following graph.

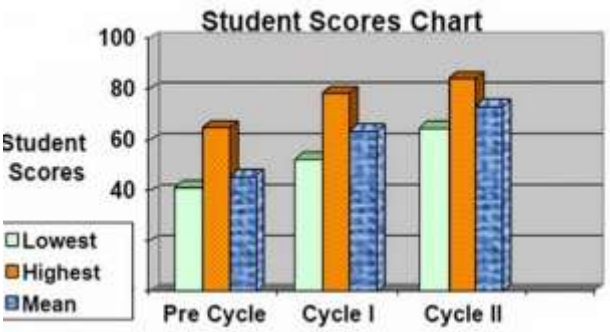

Figure 5. Graph of the increase in student scores in pre-cycle, cycle 1, and cycle 2

Based on this graph, it can be seen that the increase in student scores from pre-cycle to cycle 1 was 24.5%. Cycle 1 to cycle 2 by 12% while when viewed from pre-cycle to cycle 2 there was an increase in value of 36.7%. This shows a gradual increase between cycles which is quite significant.

The following are the results of problem solving on MATW by students from cycle 1 to cycle 2.

Figure 6. MATW completion results cycle 1

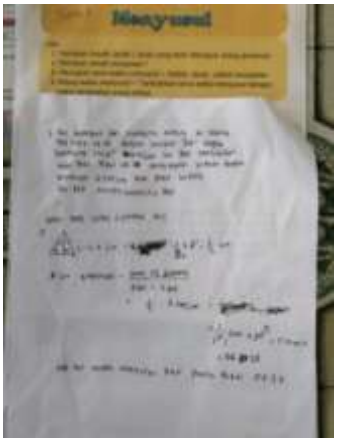

Figure 7. MATW completion results cycle 2

Based on the results of students' MATW solutions from cycle 1 to cycle 2, it was found that in cycle 1 the MATW solution steps were not systematic and tended to be brief. Whereas in cycle 2 students began to solve problems more completely and systematically. This shows that students are increasingly systematic in solving problems on MATW from cycle 1 to cycle 2.

DISCUSSION

The results of this study indicate that differentiated learning through MATW-assisted adidactic activities sustainably improved student learning outcomes in pre-cycle, cycle 1, and cycle 2. This is relevant to a study that showed an increase in numeracy after differentiated learning was carried out (Kurniasih & Priyanti, 2023; Samsiyah, 2022). With the improvement of student learning outcomes, in this case numeracy skills, the purpose of differentiated learning is also realized, as stated that one of the objectives of differentiated learning is to increase student motivation and learning outcomes (Marlina, 2019). In addition, with teacher preparation in realizing differentiated learning, namely interest, learning profile, and learning readiness, it will make learning more meaningful. By considering students' interests in designing learning, it will 1) help students realize that there is a match between school and their own desire to learn; 2) show the connection between all learning; 3) use skills or ideas that are familiar to students as a bridge to learning ideas or skills that are unfamiliar or new to them; and 4) increase students' motivation to learn (Tomlinson, 2000). Furthermore, the learning profile is related to one's learning style. When students have ongoing opportunities to think and talk about how they learn best, they become more aware of their learning strengths and needs. Teachers also become more sensitive to students' individual differences (Herwina, 2021). Third, readiness is the capacity to learn new material. An assignment that considers students' readiness level will take students out of their comfort zone. But with the right learning environment and adequate support, they can still master the new material. Understanding students' learning readiness is an important concept in differentiated learning (Herwina, 2021). These three differentiate between traditional learning and differentiated learning, where differentiated classes recognize multiple intelligences because learning is based on students' readiness, interests, and learning profiles (Marlina, 2019).

Group division in this study also facilitates differentiated learning, as the opinion states that group formation will be flexible, where students who have strengths in certain areas will join and cooperate with their other friends (Herwina, 2021). Based on the observation results in this study, it appears that as the cycle increases, group learning is getting better and more directed. Studies show that in a class that implements differentiated learning, teachers must think that students have diverse learning needs and are different from one another. Teachers must proactively find and plan various ways to express how their students can learn (Herwina, 2021). In line with previous findings reported in the study of differentiated learning, practice more open skills so that students who have different characteristics have an indication of the need for curriculum and learning modifications (Savelsbergh et al., 2010).

In differentiated learning, teachers should have innovations in choosing methods, models, and learning strategies so that students are more motivated to participate in the learning process, In an effort to improve the quality of learning in the classroom, the role of the teacher is very important in determining the success of a lesson (I Komang Sukendra, 2014). Therefore, in this study, differentiated learning with MATW-assisted addictive situations is one of the alternative methods that can be integrated. Students discuss with each other in groups so that the purpose of the didactic situation is also achieved, namely encouraging students to formulate a mathematical object that is built from interactions between students (Ruthven et al., 2009). In the didactical situation, there is no teacher intervention. Students are charged with the responsibility of mathematics to solve the problems given, while the teacher must refrain from providing assistance and not involve themselves directly in the process of achieving mathematical knowledge so that the adaptation process can run as well as possible (Fuadiah, 2021). In this case, the role of the teacher is to provide space in the form of stimuli and information that is expected to appear when students process the problem at hand and in the condition of students to find solutions (Purnomo, 2022). The methodology that supports mathematics learning in this study is MATW, which is arranged to create a didactical situation. A study states that MATW is able to increase student involvement in learning activities and guide students in understanding concepts (Putri Amara & Rafiq Zulkarnaen, 2022).

In this study, MATW which was prepared according to the characteristics of grade 6 elementary school students and learning objectives and accompanied by problem solving scaffolding, was able to facilitate the adidactic situation in mathematics learning. A study shows that MATW with cognitive *scaffolding* supports students' construction directly and also provides a basis for students' independent learning in the future (Fitriati & Novita, 2018). In addition, the effect is also shown by the gradual increase in the average student numeracy scores from the pre-cycle, cycle 1, and cycle 2 stages on distance, time, and speed materials. Problems related to distance, time, and speed are often presented in the form of story problems (Fatmasari, 2021). Students should have the ability to solve story problems related to time, distance, and speed (Sembiring, 2021). Indicators of story problems that are applied as an evaluation to understand students' numeracy skills also affect students' mastery of working on mathematical problems in daily activities (Alfarisi et al., 2023).

Likewise, in this study, the problems applied to MATW are story problems related to distance, time, and speed material, which aim to hone students' numeracy skills. Therefore, numeracy skills are needed, which are interpreted as the ability to apply, formulate, and interpret mathematics in various contexts (Fiad Uluf; Suharto; Kurniati, 2017). In addition, with numeracy skills, students can collaborate mathematical knowledge and understanding effectively to face various challenges in everyday life (Ermiana et al., 2021). Numeracy skills can

help learners recognize the role of mathematics in real life so that they can make the necessary judgments and decisions and become responsible humans who are able to reason or think logically (Wijaya & Dewayani, 2021). Differentiated learning with didactical situations assisted by MATW is proven to be able to improve the numeracy skills of elementary school students.

CONCLUSION

Based on the data analysis of learning outcomes in differentiated learning with MATW-assisted adidactic situations, it can be concluded that the learning has a positive impact on improving students' numeracy skills in the areas of distance, time, and speed, which is marked by an increase in the average score of students in each cycle, namely pre-cycle (45.80), cycle 1 (60.50), cycle 2 (67.83). The increase in the percentage of scores above the completeness criteria in the class also increased every cycle, namely pre-cycle (16%), cycle 2 (72%), cycle 3 (100%). Differentiated learning in adidactic situation assisted by MATW, also has a positive influence, which can increase student learning participation. This is shown by the results of observations made during the learning process.

The direct implication of this research is that it can provide improvements in mathematics learning in elementary schools, especially distance, time, and speed materials in the classroom. Differentiated learning design with an adidactic situation assisted by MATW is proven to improve students' numeracy skills on distance, time, and speed materials. This finding can be a reference for teachers to design mathematics learning in their respective classes. Furthermore, this finding can also be followed up in experimental research to see the statistical effect of differentiated learning in MATW-assisted adidactic situations.

REFERENCES

- Aisyah, E. S. (2014). Comparison of Students' Mathematics Learning Achievement Between Those Who Get Active Learning Model Type Giving Question And Getting Answer With Conventional. *Journal of Mathematics Education*, *3*.
- Alfarisi, A., Suryaningrum, C. W., & Firdaus, H. P. E. (2023). Analysis of students' mathematical numeracy skills in solving TIMSS problems in terms of gender. *Delta-Pi: Journal of Mathematics and Mathematics Education*, *12*(1), 64-78. https://doi.org/10.33387/dpi.v12i1.6046
- Apriyantini, N. P. D., & Sukendra, I. K. (2023). Application of differentiated learning assisted by E-Lkpd to increase students' mathematics learning activeness. *Journal of Education (Widyadari)*, *24*(1), 55-63. https://doi.org/10.5281/zenodo.7813406
- Artigue, M., Haspekian, M., & Corblin-Lenfant, A. (2014). *Introduction to the theory of didactical situation (TDS)*. Ahsbahs & Prediger (Eds.), Networking of theories as a research practice in mathematics education (pp.47 - 65).
- Asmara, S. D., & Purnomo, Y. W. (2023). Context of Data and Uncertainty: One of the Challenges for Numeracy Provision in Elementary School Teacher Education. *Acta Sci. (Canoas)*, *25*(6), 235-271.
- Basir, R. M., Muhaqqiqoh, S., S., & Pandiangan, B. P. A. (2023). Differentiated Learning as a Strategy to Achieve Learning Objectives in the Merdeka Curriculum. *Innovation: Scientific Journal of Educational Development*, *1*(2), 132-138. https://ejournal.lpipb.com/index.php/inovasi
- Brousseau. (2002). Theory of Didactical Situations in Mathematics. In *Theory of Didactical Situations in Mathematics*. Kluwer Academis Publisher. https://doi.org/10.1007/0-306-47211-2
- Ermiana, I., Umar, U., Khair, B. N., Fauzi, A., & Sari, M. P. (2021). Numeracy Literacy Skills of Inclusive Elementary Students in Solving Story Problems. *COLLASE (Creative of Learning Students Elementary Education)*, *4*(6), 895-905.
- Fairuz, F. R., Fajriah, N., & Danaryanti, A. (2020). Development of Lkpd Number Pattern Material Based on Sasirangan Ethnomathematics in Class Viii Junior High School. *EDU-MAT: Journal of Mathematics Education*, *8*(1), 29-38. https://doi.org/10.20527/edumat.v8i1.8343
- Faiz, A., Pratama, A., & Kurniawaty, I. (2022). Differentiated Learning in the Driver Teacher Program in Module 2.1. *Basicedu Journal*, *6*(2), 2846-2853. https://doi.org/10.31004/basicedu.v6i2.2504
- Fatmasari, I. (2021). Analysis of the Misconceptions of Elementary School Students in Solving Story Problems on Distance, Time, and Speed Using Certainly Of Response Index (CRI). *Journal of Research on Elementary School Teacher Education*, *9*(1), 1299-1312.
- Febrina, M., Hermansyah, B., & Marleni, M. (2022). Analysis of Mathematics Learning Difficulties in Distance, Time and Speed Materials for Grade V Students of SDN 24 Banyuasin 1. *ANTHOR: Education and Learning Journal*, *1*(1), 14-20. https://doi.org/10.31004/anthor.v1i1.3
- Fiad Uluf ;Suharto;Kurniati, D. (2017). Identification of *Mathematical* Literacy Ability of SMP Negeri 12 Jember Students in Solving PISA Questions on Space and Shape Content Uluf Fiad 1, Suharto 2, Dian Kurniati 3: *Journal of Mathematics Education*, 72-78.

- Fitriana, A., & Juwana, I. D. P. (2023). IMPLEMENTATION OF DIFFERENTIATED LEARNING ASSISTED BY E-LKPD TO IMPROVE STUDENTS' MATHEMATICS LEARNING OUTCOMES. *Widyadari*, *09*(2), 276-285. https://doi.org/10.59672/widyadari.v24i2.3191
- Fitriati, F., & Novita, R. (2018). Designing student worksheet for rich mathematical tasks. *Journal of Physics: Conference Series*, *1088*. https://doi.org/10.1088/1742-6596/1088/1/012029
- Fuadiah, N. F. (2021). Theory Of Didactical Situation (TDS), Review of Characteristics and Application in Mathematics Learning. *Journal of Mathematics Education (JUDIKA EDUCATION)*, *4*(2), 160-169. https://doi.org/10.31539/judika.v4i2.3054
- Garcia-Retamero, R., Sobkow, A., Petrova, D., Garrido, D., & Traczyk, J. (2019). Numeracy and Risk Literacy: What Have We Learned so Far? *Spanish Journal of Psychology*, 1-11. https://doi.org/10.1017/sjp.2019.16
- Getenet, S. T. (2022). Teachers' Knowledge Framework for Designing Numeracy Rich Tasks across Non-Mathematics Curriculum Areas. *International Journal of Education in Mathematics, Science and Technology*, *10*(3), 663-680. https://doi.org/10.46328/ijemst.2137
- Golsteyn, B. H. H., Vermeulen, S., & de Wolf, I. (2016). Teacher Literacy and Numeracy Skills: International Evidence from PIAAC and ALL. *Economist (Netherlands)*, *164*(4), 365-389. https://doi.org/10.1007/s10645-016-9284-1
- González-Martín, A. S., Bloch, I., Durand-Guerrier, V., & Maschietto, M. (2014). Didactic Situations and Didactical Engineering in university mathematics: Cases from the study of Calculus and proof. *Research in Mathematics Education*, *16*(2), 117-134. https://doi.org/10.1080/14794802.2014.918347
- Han, W., Susanto, D., Dewayani, S., Pandora, P., Hanifah, N., M., Nento, M. N., & Akbari, Q. S. (2017). Numeracy Literacy Support Materials. In *Ministry of Education and Culture, GLN Team Kemendikbud* (Vol. 8, Issue 9).
- Hariyati, N., Y. Riyanto, Sujarwanto, Suyatno, N. I. (2023). Actualization of Principal Instructional Leadership in the Implementation of Differentiated Lear ning to Realize Students' Well-Being. *Journal of Education: Journal of Research Results and Literature Review in the Field of Education, Teaching and Learning*, *9*(1), 188-199.
- Herwina, W. (2021). Optimizing Student Needs and Learning Outcomes with Differentiated Learning. *Perspective of Education Science*, *35*(2), 175-182. https://doi.org/10.21009/pip.352.10
- I Komang Sukendra. (2014). THE APPLICATION OF PROGRESSIVE DIFFERENTIATION LEARNING STRATEGIES ASSISTED BY LKS IN AN EFFORT TO INCREASE THE ACTIVITY AND LEARNING OUTCOMES OF MATHEMATICS STUDENTS IN CLASS X SMA N 7 DENPASAR IN THE 2014/2015 ACADEMIC YEAR. *Available [Online] Https://Repo.Mahadewa.Ac.Id/Id/Eprint/13/1/Artikel2015.Pdf*, *21*(1), 1-9.
- Juwana, I. D. P., & Fitriana, A. (2023). Application of Differentiated Learning Assisted by Online Lkpd (Liveworksheet) to Increase Students' Motivation to Learn Mathematics. *Emasains: Journal of Mathematics and Science Education*, *12*(2), 76-87. https://doi.org/10.59672/emasains.v12i2.2765
- Kamarulzaman, M. H., Kamarudin, M. F., Sharif, M. S. A. M., Esrati, M. Z., Saali, M. M. S. N., & Yusof, R. (2022). Impact of Differentiated Instruction on the Mathematical Thinking Processes of Gifted and Talented Students. *Journal of Education and E-Learning Research*, *9*(4), 269-277. https://doi.org/10.20448/jeelr.v9i4.4253
- Ministry of Education Research. (2023). Pisa 2022 and learning recovery in Indonesia 5. *Ministry of Education* and Culture Research.
- Kemmis, S., McTaggart, R., & Nixon, R. (2014). The action research planner: Doing critical participatory action research. In *The Action Research Planner: Doing Critical Participatory Action Research.* https://doi.org/10.1007/978-981-4560-67-2
- Kurniasih, E., & Priyanti, N. (2023). The effect of differentiated learning approach on reading, writing and numeracy literacy skills. *Potensia Scientific Journal*, *8*(2), 398-408.
- Lase, N. K., & Zai, N. (2022). Development of Contextual Teaching and Learning Based Learner Worksheet (LKPD) on Human Excretory System Material in Class VIII SMP Negeri 3 Idanogawo. *Minda Education Journal*, *3*(2), 99-113.
- Marhaeni, N. H., Andriyani, & Rusmilah. (2021). The effectiveness of Problem Based Learning-based LKPD to improve the mathematical problem solving skills of students at SMA Negeri 1 Imogiri. *Journal of Surya Edukasi Education (JPSE)*, *7*(2), 85-96.
- Marlina. (2019). *LEARNING MODEL IMPLEMENTATION GUIDE*. Padang State University.
- Marsanto, M. (2021). Application of Snowball Throwing Learning Model to Increase Independence and Learning Achievement in Calculating Distance, Time, and Speed for Grade V Students. *Indonesian Journal of Education and Technology*, *1*(1), 35-44. https://doi.org/10.52436/1.jpti.10

- Miftah, R. N., & Setyaningsih, R. (2022). Development of Lkpd Based on Minimum Competency Assessment (Akm) on Geometry Materials to Improve Numeracy Literacy Skills. *AKSIOMA: Journal of Mathematics Education Study Program*, *11*(3), 2199. https://doi.org/10.24127/ajpm.v11i3.5780
- Miyakawa, T., & Winsløw, C. (2009). Didactical designs for students' proportional reasoning: An "open approach" lesson and a "fundamental situation." *Educational Studies in Mathematics*, *72*(2), 199-218. https://doi.org/10.1007/s10649-009-9188-y
- Nanda, I., Pohan, H. S. R., Fakhrurrazi, D. S. W., Khermarinah, Mulasi, S., Hurit, J. W. R. U., Harizahayu, Arianto, D., Wahab, A., Romdloni, Bawa, A. N. A., & Rai, I. D. G. A. (2021). *Classroom Action Research for Inspirational Teachers* (1st ed., Issue 2018). Adab.
- Nurhayati, N., Asrin, A., & Dewi, N. K. (2022). Analysis of Numeracy Skills of High Grade Students in Problem Solving on Geometry Materials at SDN 1 Teniga. *Scientific Journal of Education Profession*, *7*(2b), 723-731. https://doi.org/10.29303/jipp.v7i2b.678
- OECD. (2019). Program for international student assessment (PISA) results from PISA 2018. *Oecd*, 1-10.
- Pawestri, E., & Zulfiati, H. M. (2020). Development of Learner Worksheets (Lkpd) to Accommodate Student Diversity in Class Ii Thematic Learning at Muhammadiyah Danunegaran Elementary School. *TRIHAYU: Journal of Early Childhood Education*, *6*(3). https://doi.org/10.30738/trihayu.v6i3.8151
- Prawijaya, S., Irsan, Halim Simatupang, & Maulana, S. W. (2023). DIAGNOSTIC TEST ASSISTANCE AND E-LKPD IN SUPPORTING DIFFERENTIATED LEARNING IN ELEMENTARY SCHOOL 104193 TANDAM HILIR II, NORTH SUMATRA. *Unimed*, *14* (November). https://doi.org/https://doi.org/10.24114/jh.v14i2.52517
- Purnomo, Y. W. (2022). *Didactical Engineering Research. An effort to develop mathematical knowledge for teaching in elementary schools* (1st ed.). UNY Press.
- Purnomo, Y. W. (2023). Conceptualization and Representation of Didactical-Mathematical Knowledge for Teaching in Elementary School. Professor Inaugural Speech. *State University of Yogyakarta*, *August 26*.
- Putri Amara, & Rafiq Zulkarnaen. (2022). Development of Student Worksheets Based on Theory of Didactical Situation in Statistics Material. *EduMatSains: Journal of Education, Mathematics and Science*, *6*(2), 317-332. https://doi.org/10.33541/edumatsains.v6i2.3609
- Rachman, A. B. R., & Nuriadin, I. (2022). Improving Learners' Numeracy Skills with Problem Based Learning Model and TPACK Approach. *Cognitive: Journal of HOTS Research in Mathematics Education*, *2*(2), 81-93. https://doi.org/10.51574/kognitif.v2i2.522
- Rahmah, S., Dalila, A. A., Liliawati, W., & Setiawan, A. (2022). Differentiated Learning Approach in Inquiry Model on Students' Numeracy Ability. *Scientific Journal of Education and Learning*, *6*(2), 393-401. https://doi.org/10.23887/jipp.v6i2.50838
- Rakhmawati, I., & Nugrahimi, Y. (2023). Strengthening Literacy and Numeracy at SDN 4 Bungur. *Journal Of Human And Education (JAHE)*, *3*(2), 211-217.
- Ricky Ardiansah, & Zulfiani, Z. (2023). Development of interactive e-LKPD based on creative thinking skills on the concept of environmental change. *JPBI (Indonesian Journal of Biology Education)*, *9*(2), 179-197. https://doi.org/10.22219/jpbi.v9i2.22389
- Rizkiah, A. W., Nasir, N., & Komarudin, K. (2018). Islamic Integrated Discussion Activity LKPD with Pictorial Riddle Approach on Fraction Material. *Decimal: Journal of Mathematics*, *1*(1), 39. https://doi.org/10.24042/djm.v1i1.1926
- Ruthven, K., Laborde, C., Leach, J., & Tiberghien, A. (2009). Design tools in didactical research: Instrumenting the epistemological and cognitive aspects of the design of teaching sequences. *Educational Researcher*, *38*(5), 329-342. https://doi.org/10.3102/0013189X09338513
- Samsiyah. (2022). Analysis of Literacy and Numeracy Learning Implementation in Primary Schools. *PEDADIDAKTIKA: Scientific Journal of Primary School Teacher Education*, *9*(3), 461-470. https://doi.org/10.17509/pedadidaktika.v9i3.53452
- Savelsbergh, G. J. P., Kamper, W. J., Rabius, J., De Koning, J. J., & Schöllhorn, W. (2010). A new method to learn to start in speed skating: A differential learning approach. *International Journal of Sport Psychology*, *41*(4), 415-427.
- Sembiring, S. (2021). *Analysis of Mathematics Learning Difficulties in Distance, Time and Speed Materials for Grade V Students of SD Negeri 040551 Lau Pakam in the 2020/2021 Academic Year.* portaluniversitasquality.ac.id.
- Strømskag, H. (2017). A methodology for instructional design in mathematics-with the generic and epistemic student at the center. *ZDM - Mathematics Education*, *49*(6), 909-921. https://doi.org/10.1007/s11858-017-0882-4
- Tomlinson, C. A. (1999). *The Differentiated Classroom: Responding to the Needs of All Learner.* ASCD.
- Tomlinson, C. A. (2000). Differentiation of Instruction in the Elementary Grades. *ERIC Digests*, 1-7.
- Tomlinson, C. A., & Imbeau, M. B. (2023). *Leading and Managing a Differentiated Classroom*. ASCD.

- Unaenah, E., Amalia, N., & Mutiara, R. (2023). ANALYSIS OF STUDENT'S HARDNESS IN SOLVING STORY SOURCES IN MATHEMATICS LEARNING MATERIALS OF DISTANCE AND SPEED IN CLASS V SDN PONDOK BAHAR 3. *Journal of Education: SEROJA*, *2*(4).
- Wijaya, A., & Dewayani, S. (2021). Minimum Competency Assessment (MCA) Framework. *Ministry of Education and Culture*, 1-107.
- Yenil, T., Arslan, Ç., & Tapan Broutin, M. S. (2023). Triangle inequality concept teaching: The theory of didactic situations case. *Journal of Pedagogical Research*, *7*(4), 14-29. https://doi.org/10.33902/JPR.202318961
- Zamrodah, Y. (2020). The importance of LKPD in the Scientific Approach to Muslimah Mathematics Learning. *SHEs: Conference Series*, *3*(3), 1471-1479.