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IMPLEMENTATION OF DIFFERENTIATE LEARNING TO IMPROVE STUDENT LEARNING OUTCOMES IN MATHEMATICS SUBJECT

I Gusti Agung Ngurah Trisna Jayantika[1*)], Kadek Yoga Santhika[2]
[1]Universitas PGRI Mahadewa Indonesia, Denpasar, Indonesia; jayantika@mahadewa.ac.id
[2]Universitas PGRI Mahadewa Indonesia, Denpasar, Indonesia; kadekyogasanthika@gmail.com
[*)]Corresponding author; E-mail address: jayantika@mahadewa.ac.id

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Abstract. Student's learning outcomes were low in Mathematics. This study aimed to improve student's learning outcomes with differentiated learning. Differentiated learning was used by differentiating the teaching approach to content and process. This research was a classroom action research which was divided into two cycles and began with pre-cycle. Each cycle consisted of planning, implementing, observing, and reflecting. The research subjects were 40 grade VIII-D student of SMP Negeri 8 Denpasar. This study used test and non-test instruments in the form of lesson observation sheets, interviews, and student's learning outcomes tests. The results showed that in Cycle I the percentage of students who passed the minimum completeness criteria was 50% and then it increased in Cycle II to 77.5%, because it met the specified classical completeness, the research was stopped in Cycle II. Based on these results it could be concluded that there was an increase in student's learning outcomes in Mathematics by applying the Differentiated Learning Approach.

INTRODUCTION

Education is a guidance for the life and development of children, and education develops all the natural strengths that exist in children, so that they as human beings and as members of society can achieve safety and a happy life (Sugiarta et al., 2019). Education serves as a foundation in forming and instilling human values in students. These values will later be used in the process of family, community, nation and state life. The educational process will create changes towards technological progress nor culture according to childhood. With education, children will also have the ability, insight, and wisdom in preparing for a better life order as conveyed by Ki Hadjar Dewantara. Good education will be achieved if it is supported by a good environment as well (Widana et al., 2023).

The family environment, school and surrounding community are the three most influential aspects in a child's education (Hidayati, 2016). The three neighbourhoods are called the three centres of education as a result of the thoughts of Ki Hadjar Dewantara. Even though the influences vary widely, the three environments contribute quite a lot to the formation of the character and personality of a child. From infancy to toddler, the development of a child's

character is greatly influenced by his family. Likewise, when attending school, the family also plays an important role in providing clarification about the experiences they experience at school (Kamila & Abduh, 2022). On the other hand, the school environment provides cultural values and courtesy that children can apply at home and in society. Simultaneously the child will also get influenced from the surrounding environment or the community environment in which the child lives (Yasmini, 2020). Thus, all these environments influence each other's characteristics of the child. Based on the influence of this environment, it is not uncommon for the characteristics of the students to vary greatly in one class (Sumandya et al., 2022).

Character is everything about the habits and behaviours that it has which is relatively the same or fixed (Sukarta, 2020). The characteristics of this student as a whole ability and behaviour as a result of the interaction between himself and the environment. Information related to student characteristics is very necessary for internal purposes of planning learning. A learning process will take place effectively or not, is largely determined by how high the level of understanding of educators about the characteristics of their students in carrying out learning (Hanifah et al., 2020). Understanding of student characteristics determines the learning outcomes that will be obtained. A small example is the learning outcomes of class students VIII-D SMP Negeri 8 Denpasar.

In class VIII-D, the average test scores on the first two topics were 35 and 22. This showed that student learning outcomes were very low. In fact, during the observation activities it was seen that the students were quite active in asking questions but it seemed that the material being absorbed was not maximal. After conducting interviews with several students, it was found that they understood the material discussed in class but when they were at home they immediately forgot. Therefore, when they repeated, the results they gave were less optimal. Some of them also said they preferred flexible learning and not just stuck in class. In addition, some prefer learning with video because they feel it is not boring. There are many other ways they prefer when studying. On this basis, teachers are always required to innovate in learning to suit the conditions and characteristics of students.

Innovation is an important point in bringing quality change to students and schools (Suarti, 2022). This innovation leads to the efficiency of the learning process itself which is appropriate and under the characteristics of the students. Efficient learning will provide better results in the quality of the process and student learning outcomes. Therefore, it is necessary to develop innovation in education as well as skills in education to innovate (Daga, 2021). One of the innovations that can be done by the teacher is to do differentiated learning.

Differentiated learning is an effort to integrate differences to obtain information, create ideas, and express or convey the results that students have learned. Differentiated learning uses a variety of learning approaches (multiple approaches) in content, processes, and products according to student needs which include student learning readiness, student interests, and student learning profiles (Tomlinsonm, 2001). Content differentiation is what will be taught by educators in class or what students will learn in class, process differentiation relates to what kind of process students will carry out while learning to meet planned learning objectives, and product differentiation relates to how students convey what he has learned in front of his friends (Satyani, 2021). In addition, an important concept that should not be forgotten in designing differentiation learning is the learning style of students. Learning that is following with students' learning styles will be more effective and meaningful so that the

knowledge gained will be stored in long-term memory. Examples such as how learning videos can improve student learning outcomes (Biassari et al., 2021). Several research results on differentiated learning in mathematics learning show that differentiated learning can improve student learning outcomes (Aprima & Sari, 2022; Kamal, 2021; Syarifuddin & Nurmi, 2022). Therefore, this study aims to improve the learning outcomes of students in class VIII-D at SMPN 8 Denpasar by implementing Differentiated Learning.

METHOD

This research was a classroom action research to improve student learning outcomes. The research was conducted at SMPN 8 Denpasar with class VIII-D as the research subject. The subjects taken were all students in the class, namely 40 students with 20 female students and 20 male students. Data in the study were collected using observation and test techniques. The data was obtained through the process of observing differentiated learning and the results of evaluation tests at the end of each learning cycle. The instruments used were observation sheets, interviews, and student learning outcomes tests. The use of these instruments was based on data triangulation which aimed to ensure the validity of the data obtained through data collection from several methods (Bachri, 2010). Student learning outcomes test instruments were arranged according to a grid based on indicators of achievement of learning competencies. Furthermore, the data were analysed using descriptive quantitative analysis, concerning to the achievement of Minimum Completeness Criteria per individual of 75, and classical learning completeness of at least 75%.

Classroom action research consists of several stages namely planning, implementation, observation, and reflection (Cahyadi, 2014). All of these stages are arranged in an iterative cycle until the research objectives are achieved. This research is carried out in two learning cycles, namely pre cycle, Cycle I, and Cycle II. The flowchart related to the stages in each class action research cycle is described below.

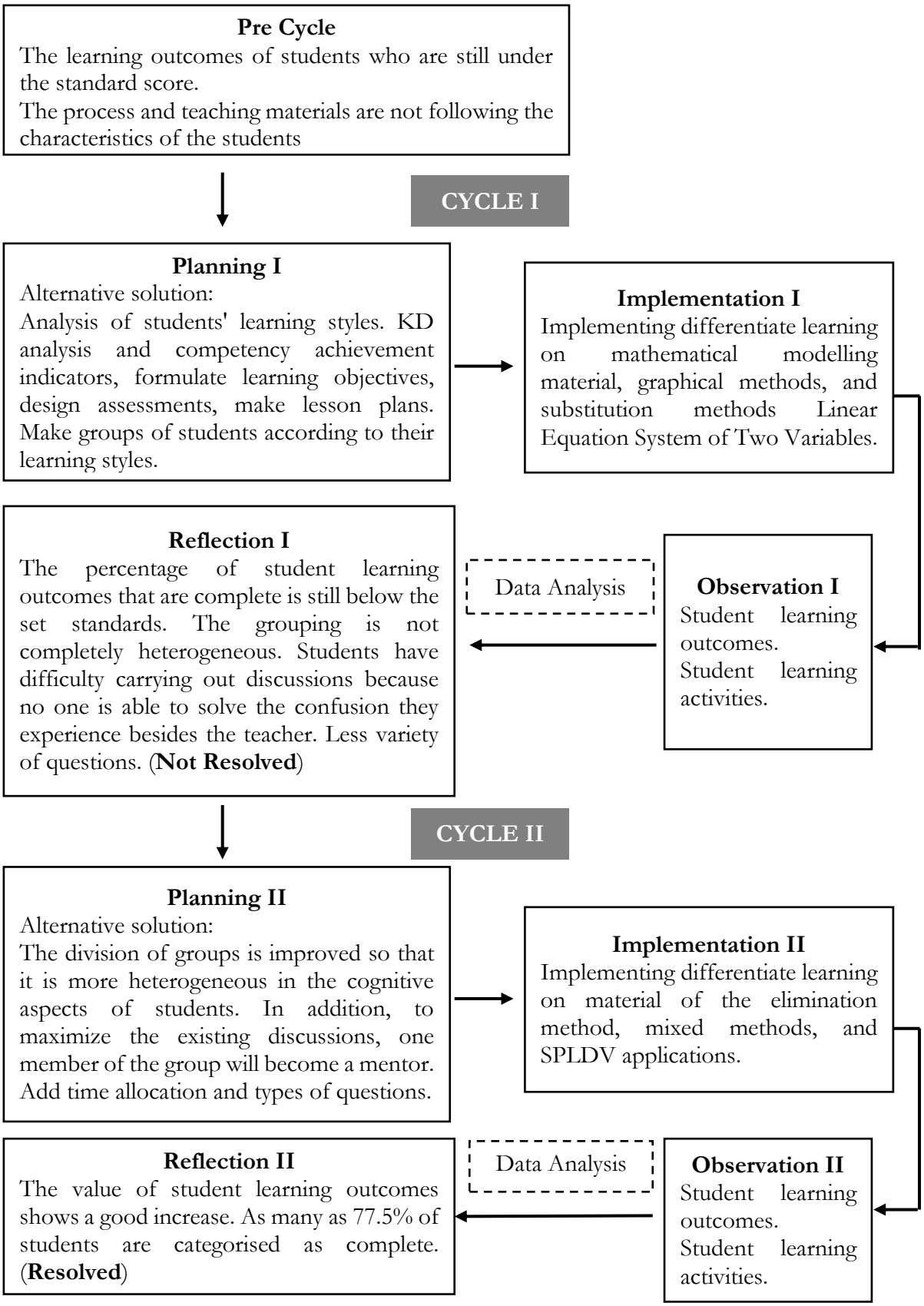

Figure 1. The Implementation Flow of Classroom Action Research

RESULTS AND DISCUSSION

At the end of each cycle, students will be given a learning achievement test to measure their achievement during that one cycle. Related to the results of the analysis of learning outcomes in each cycle, the researcher obtained the percentage of students who fall into the complete category or meet the Minimum Completeness Criteria score of 75. The summary of the results of this study is presented in the following table.

Table 1. The Summary of Research Results

Aspect	Pre Cycle	Cycle	
		I	II
Number of students	40 people	40 people	40 people
Student who pass	12 people (30%)	20 people (50%)	31 people (77.5%)
Students who do not pass	28 people (70%)	20 people (50%)	9 people (22.5%)
Highest student score	100	100	100
Lowest student grades	20	20	40
Number of blades	2150	2690	3309
Average	53.75	67,25	82,73

This research begins with pre-cycle which analyses the problems of student learning outcomes in mathematics. It is found that student learning outcomes are still below the standard score. There are 28 students (70%) categorised as incomplete, namely not achieving the specified Minimum Completeness Criteria. Based on the observations made, it is found that the teaching materials and learning processes are not in accordance with the characteristics of the students. This makes the learning process performed by students not optimal. When the process carried out by students is not maximal, this can have implications for the achievement of learning outcomes. In addition, the psychological condition of students also takes an important influence on the learning outcomes they get. The results of discussions with teachers at school show that during the learning process some students seem active but this activity is not evenly distributed. There are also students who are good on a daily basis but for some reason when they have an examination they get unsatisfactory results. All of these findings then are used as guidelines when planning learning in Cycle I.

Cycle I begins with planning according to the problems found. The planning stage begins with an analysis of the Basic Competencies that must be achieved by students in the material for the Linear Equation System of Two Variables. Results analysis basic competency is then revealed to be an indicator of competency achievement and learning objectives. In addition to the Basic Competency analysis, an analysis of the characteristics of students, especially learning styles, is also carried out at this stage. Analysis of student learning styles is carried out using digital applications so that it is more effective and does not take much time to implement. The results of this learning style mapping are then used as the main basis for designing student study groups. In order to measure the achievement of student learning outcomes, the design of learning assessments such as tests and observation sheets is also

carried out at this stage. Assessment planning at the beginning of the activity aims to facilitate the flow of activities or learning processes carried out. Through the preparation of this assessment, the description regarding what must be successfully achieved by students will become clearer so that the learning flow that is formed will be systematic. The last activity is to determine the flow of learning activities to suit the learning styles of students as well as to achieve learning objectives. Learning content is adapted to students' learning styles, as well as the process. The learning flow is structured in such a way that learning is student-centred to provide independence in compiling their understanding. After planning is complete, the next stage is the implementation of learning in Cycle I.

At the implementation stage, learning mathematics is carried out for the material on the Two Variable Linear Equation System. The material in Cycle I is Mathematical Modelling, Graphical Methods, and Substitution Methods which are carried out in one meeting each. Researchers as teachers are assisted by two observers to observe and record the activities of students while carrying out differentiation learning. In the learning process of the first meeting, it can be seen that students are still not active in interacting with the teacher (Khairunnisa, 2022). They are more focused on working on the given worksheet. After several moments, they finally interacted with the teacher but it is still only in the form of technical problems such as an internet connection that is not good enough to access the teaching materials provided. The interaction begins to occur at the second meeting. Students look more active in responding to the teacher's questions when doing apperception. Even though there are only 5 students, this result shows that students are increasingly familiar with the teacher who teaches. Until the peak, namely at the third meeting, students and teachers already know each other well. When the interviews are conducted, many of them provide input as reflections for Cycle II. At the end of the cycle, the students were given the first learning outcomes test and interviews related to the learning process that had been implemented.

In Cycle I, 20 students out of 40 students who took the test completed the test so the percentage that was completed was 50%. When compared to pre cycle, student learning outcomes have increased quite well. This increase is influenced by learning videos and worksheet which can be accessed even after the learning process. With this, students have time to study independently and organise the knowledge they have acquired at school (Sitorus, 2022). Based on previous observations, it is found that students at school already have a little understanding of the material discussed, but forget it when they get home. This is most likely the reason why when school teachers teach them, even though during the process they are quite active, the learning outcomes are sometimes not satisfactory.

Even though it has experienced an increase, the percentage of student learning outcomes is still less than the specified classical completeness, which is 75%. Incompleteness in Cycle I is closely related to groups that are not fully heterogeneous. The grouping of students in Cycle I is only based on their learning styles, not their cognitive abilities. This causes them difficulties in doing discussions because no one is able to solve the confusion they experience besides the teacher who teaches. In addition, students want to hone their understanding through drilling questions as well as familiarise themselves with the types of questions that exist. They easily understand the material and concepts, it is just that sometimes they experience a little difficulty in implementing their understanding when solving a given problem. Considering this, an improvement is needed to overcome the problems that occurred in Cycle I so that the research continues to Cycle II.

Cycle II begins with planning based on the results of reflection in Cycle I. The division of groups is improved so that it becomes more heterogeneous in the cognitive aspects of students. In addition, to maximize the discussion one member of the group will become a mentor. The group mentor is in charge of leading the discussion as well as facilitating other members if some don't understand. When all group members experience difficulties, the group mentor can hold discussions with the teacher so that learning becomes more directed and systematic. In this way, the time in carrying out group discussions will become more efficient so that later they will have enough time to explore their understanding during presentation sessions between groups.

Materials in the implementation of Cycle II are the elimination method, mixed methods, and the system of linear equations of two variables application, each of which is carried out in one meeting. In Cycle II the researcher acts as a teacher and is assisted by two observers to observe the activities of students while carrying out differentiation learning. The learning process in Cycle II looks better than the previous Cycle I. Each group mentor together with its members seem to work hard in solving the problems given. It is also easier for teachers to facilitate groups that really need guidance in solving existing problems because groups with mentors who have more cognitive abilities are already able to facilitate their friends well. At the end of the cycle, an evaluation is carried out by giving a learning achievement test II and interviewing the learning process.

In Cycle II, again there is an increase in the number of students who complete the test, namely to 31 from 40 students who take the test. The percentage of completeness in this cycle is 77.5% which has fulfilled the classical completeness set at 75% so that the research stops in Cycle II. The success in Cycle II is closely related to the role of the group mentor in managing the group discussion. The mentor also plays a role in dividing the tasks of each group member where this division is expected so that each group member has a task according to his abilities. In addition, the amount and time allocation for drilling questions are also increased according to the requests of the students. In this way they have enough time to familiarise themselves with the types of questions that exist. In this cycle there is also a slight adjustment to the learning design in which students whose understanding of algebra is lacking are given the facilities to catch up with their other friends.

CONCLUSION

Based on the results of the research as previously described, a conclusion can be drawn regarding the research conducted. There is an increase in student learning outcomes in learning Mathematics by applying the Differentiated Learning approach. The first increase occurs in Cycle I, namely the percentage of students who pass by 50%, then in Cycle II it increases again to 77.5%. The increase in each cycle is closely related to the content provided during the learning process. This content can be accessed by students even after the learning process at school so that when at home students have enough time to reinforce their understanding. In addition, groups that are heterogeneous both in terms of learning styles and cognitive abilities also contribute greatly to the learning process carried out by students. Furthermore, each group is facilitated by a mentor so that the discussions that occur become more effective and focused.

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