Implementation of the teaching at the right level approach to improve mathematics learning outcomes of class X.15 students

Nur Arif[1], Ibnu Yazid[2], Febrian[3*]

[1,3] Universitas Maritim Raja Ali Haji, Tanjungpinang, Kepulauan Riau, 29124, Indonesia
[2] SMA Negeri 2 Tanjungpinang, Tanjungpinang, Kepulauan Riau, 29113, Indonesia
*Corresponding Author: febrian@umrah.ac.id

Abstract

This research aims to improve student learning outcomes in class X.15 of SMA Negeri 2 Tanjungpinang by applying differentiated learning based on a cognitive level, namely the Teaching at The Right Level approach. This type of research is classroom action research with research subjects of 48 students in class X.15 of SMA Negeri 2 Tanjungpinang. The data collection techniques used are observation, tests, and documentation. This research was carried out in 2 cycles. Before conducting classroom research, a cognitive assessment is first carried out to determine the student's cognitive level. In cycle I, the average student score was 76, and the average classical percentage was 64%. 31 students scored above the KKM, namely ≥75, while 17 others still scored below the KKM. In cycle II, the average student score was 85.6, and the average classical percentage was 87%. 42 students scored above the KKM, namely ≥75, while 6 others still scored below the KKM. Thus, it can be concluded that applying differentiated learning based on cognitive levels, namely the Teaching at the Right Level approach, can improve student learning outcomes.

Keywords: teaching at the right level; learning outcomes

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I. Introduction

Education in Indonesia has changed after being hit by Covid-19. The government has made efforts to improve Indonesia's education system. Starting from the Emergency Curriculum (simplified 2013 curriculum), the Emergency Curriculum (prototype curriculum), and now the Merdeka Curriculum. The Independent Curriculum was implemented after Covid-19, but not all schools have implemented the Independent Curriculum. The government has reviewed the curriculum in 2024 and the study results are that schools are required to implement the Independent Curriculum and will change the name to the National Curriculum (Ariga, 2022:667-668).

The Independent curriculum gives teachers the freedom to choose learning materials that suit students' needs and interests. In Indonesia, this curriculum has been

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implemented in more than 300,000 schools (Sakban et al., 2023, p. 2344). The government is also trying to increase the understanding of school principals and teachers through workshops and training so that more schools can independently implement the Independent Curriculum (Isa et al., 2022:69).

The article Alfaeni et al. (2023:89) explains the characteristics of the Independent Curriculum, including that it provides flexibility for educators in creating learning that suits students' needs and learning environment. Teachers are free to choose various learning materials so that learning can be tailored to student's needs and interests.

The Merdeka Curriculum uses project learning to strengthen the achievement of the Pancasila student profile. These projects are developed based on themes set by the government. The goal of the project was not to achieve specific learning targets. The Independent Curriculum also allows teachers to learn differently according to students' abilities and adjust to local context and richness (Rasdi et al., 2023).

The Independent Curriculum aims to provide freedom for students to develop their full potential (Mulyasa, 2021). This curriculum aims to go beyond traditional boundaries in education and provide space for students to explore their interests and talents creatively and innovatively. The Merdeka Curriculum aims to create a generation that is independent, critical, and competitive, capable of adapting to change and becoming future leaders who positively impact society. This curriculum also aims to strengthen student character development, train life skills, and encourage a deep understanding of life values, ethics, and diversity. With this aim, the Merdeka Curriculum seeks to create education relevant to the times' demands and provides opportunities for every individual to achieve their best potential.

The Merdeka Curriculum has also been implemented in schools in Tanjungpinang, one of which is SMA Negeri 2 Tanjungpinang,

which has been implemented since 2022 until now. Two classes at the school implement the Independent Curriculum. Based on the results of observations made in class X.15 of SMA Negeri 2 Tanjungpinang, mathematics teachers often give assignments to their students using LKS books obtained from the school. Learning in this class looks quite noisy due to several factors, namely how the teacher explains using the lecture method. Hence, they get bored; the class is quite hot because their class is located under the building, and there is also a special space for placing things so that ventilation or air circulation is lacking in the class.

After carrying out the observation stage, three students were taken to be interviewed regarding the learning process in class. They said that they did not understand what the teacher was teaching, the class was quite noisy so concentration was lost, the class was quite hot because there were 48 students in one class so they had to share the air. Learning that often uses LKS books and doing the questions in the book sometimes makes them not understand because they say that the questions in the book are quite difficult, so they can't answer them at all, and some say the questions are quite easy to do. During daily tests, they also admitted that they did not understand what to answer and often asked their classmates because the questions were difficult. As a result of this impact, data was obtained from the daily tests at the previous meeting, and it was found that around 75% of the 48 students had not achieved the learning objectives.

Based on the problems obtained from observations, interviews, and looking at the results of daily tests for class Santika & Khoiriyah (2023:483) explain that differentiated learning in the Independent Curriculum recognizes students' differences and provides learning experiences that suit their needs and interests in terms of content, process, product, and environment. Students are given various choices regarding learning materials, teaching methods, and assessments in this learning.

Differentiated learning is expected for each student to achieve the expected learning goals. In differentiated learning in the Independent Curriculum, it is recognized that each student has different needs and abilities, and the teacher in this lesson will present material and activities tailored to the individual needs of each student in the class. In practice, teachers can use a variety of teaching methods, strategies, and resources that enable students to learn most effectively for them (Ambarita & Simanullang, 2023)

Students have diversity within themselves, such as ability levels, skills, background and culture, interests, talents, learning styles, and even student characteristics (Ambarita & Simanullang, 2023). This was further explained by Jayanti et al, (2024:147) regarding differentiated learning based on cognitive level, commonly known as the Teaching at the Right Level (TaRL) approach, which is a mathematics learning strategy that aims to improve student learning achievement by paying attention to their level of understanding and cognitive abilities. This learning involves the use of different methods and learning for each student to learn with a level of difficulty that suits their abilities. Based on the advantages of differentiated learning, which considers students' cognitive levels, this research aims to provide a solution to overcome low student learning outcomes so that they improve further and are in line with expectations.

II. Research Method

The research carried out is classroom action research, abbreviated as PTK. PTK aims to improve and enhance learning activities in the classroom (Suyatno, 1997) in (Nanda et al., 2023). This research is guided by Kemmis & Taggart's theory (Rohmaniyah et al., 2024), which explains that there are PTK steps, including planning, acting, observation, and reflection. Based on the four steps described by Kemmis & Taggart in (Priyanti and Nurhayati, 2023, p. 98), modifications are arranged in chart form as shown in the following image.
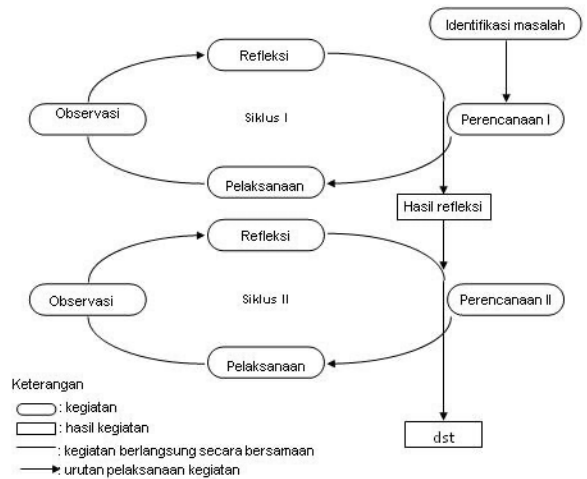

Figure 1. Modified PTK model from Kemmis & Taggart

The subjects in this research were class X.15 students at SMA Negeri 2 Tanjungpinang, totaling 48 students, consisting of 19 men and 29 women. This research was conducted in the even semester 2024/2025 at PPL-II PPG Prajabatan Gelombang 1 Tahun 2023. The material studied by students was quadratic equations. The steps in this classroom action research took the form of two cycles because, in the first cycle, there were no expected results, so a second cycle was carried out. If there are expected results in the second cycle, there is no need to do it again in the next cycle (Sulastri & Rochmiyati, 2023).

The data collection techniques used in this research include three methods, namely tests, observation, and documentation. Before designing a learning plan, students will be given a cognitive diagnostic test. This cognitive diagnostic test aims to assess students' cognitive abilities and group them into advanced, medium, and low groups based on the test results. Apart from that, students will also undergo an initial test before the action is taken and a quiz after each learning cycle to measure the success of the action they have taken. A test instrument in the form of essay questions is used to measure the ability of students' learning outcomes. These learning outcomes are data from this research. Data on student learning outcomes has a maximum score of 100, and students who get a

score greater than or equal to 75 are said to have achieved the learning objectives. At the same time, for classical completeness, it is used to see the percentage of students who have completed learning.

The data obtained in this research was collected using an observation sheet for the Pancasila Student Profile assessment, a psychomotor assessment sheet, and a self-reflection questionnaire using Google Forms. Students are observed during the learning process by filling in the sheets prepared at each meeting, while student learning outcomes are known after a formative assessment (in the form of a quiz) is carried out at the end of the meeting.

Data Analysis Technique, namely data obtained from the formative assessment results, is analyzed to determine the completeness of student learning individually and classically. The formula for determining the percentage of learning completeness is explained in the Ministry of National Education (2023) in Murwindra (2017:5), namely as follows:

(1) The percentage of student learning completeness per individual can use the following formula.

$$IC = \frac{NSO}{MS} \times 100\%$$

Information:
IC = Individual completeness
NSO = Number of scores obtained
MS = Maximum score

(2) The percentage of classical learning completeness can be calculated using the following formula.

$$CC = \frac{NSC}{NAS} \times 100\%$$

Information:
CC = Classical completion
NSC = Number of students who completed
NAS = Number of all students

Student activities can be known after processing the data from observations, namely by filling in the Pancasila Student Profile sheet and the psychomotor assessment sheet. Student

activity assessment categories can use the following Table 1 quoted from Sudjiono (2004) in Murwindra (2017:5).

Table 1. Student Activity assessment categories

Levels	Category
75-100	Very Good
65-74	Good
55-64	Fair
<55	Not Good

III. Results and Discussion

Classroom action research was carried out based on the CAR procedure model modified by Kemmis and Taggart. The details of the activities are explained below.

Identification Stage

The problem identification stage involves conducting classroom observations and interviews with students to discover the problems they face during class learning. In this stage, questions are formulated that help identify problems in the class. The teacher can identify problems that need to be resolved because these questions will show things that are not optimal in the class. Apart from formulating questions, observation sheets were also created during the learning process. The objects observed are students and teachers.

After identification, activities are carried out, which include formulating learning objectives and making initial assessments/cognitive diagnostic tests. The main thing that needs to be considered is the Learning Outcomes (CP), which will later be created as learning objectives. This diagnostic test is useful for forming study groups during discussions in class. The things prepared to carry out a diagnostic test are making a grid of diagnostic questions. The diagnostic test consists of 3 essay questions containing the material to be studied, namely quadratic equations. After that, an answer key and scoring guidelines are created. Student answers are checked and adjusted based on the assessment rubric; if the questions have a maximum score of 4 and 5, then students must get a score of more than 2 to achieve the learning

objectives. After knowing the student's score, continue to group students based on cognitive level. Grouping is also based on cognitive level categories that have been created. Table 2 is as follows.

Table 2. Cognitive level categories

Description	Cognitive Level Categories	Study Groups
Students successfully achieved all learning objectives, namely learning objectives A.10.1, A.10.2, and A.10.3.	High	A
Students successfully achieved only two learning objectives (TP A.10.1 and A.10.2).	Medium	B
Students only succeed in one learning objective or do not achieve the learning objective at all.	Low	C

After carrying out diagnostic tests, the next step is to design a formative assessment. Formative assessments are made based on students' cognitive levels. There are 3 levels, namely low level, medium level, and high level. These three levels are based on the results of previous diagnostic tests that have been carried out, as for what was obtained from the results of the cognitive diagnostic test in class (41.7%), including low-level. Even though they had received the quadratic equation material in junior high school/MTs, they said that they had forgotten the material because when they studied it, it was still during the COVID-19 pandemic. Based on the cognitive diagnostic test results, the learning process uses the Teaching at The Right Level approach.

Cycle I

In planning stage I, a teaching module was designed using the Discovery Learning model. The things prepared are teaching materials, learning videos, psychomotor assessment sheets, and attitude sheets, preparing 3 types of LKPD consisting of LKPD A (high group), LKPD B (medium group), and LKPD C (low group). Each LKPD contains questions at different levels. The LKPD will be distributed when students are seated in the discussion group.

At the implementation stage, the learning process is carried out by the teaching modules that have been designed. The stages in the learning process consist of three steps, namely preliminary activities carried out for 15 minutes, core activities carried out for 60 minutes, and closing activities carried out for 15 minutes. The following is an explanation of the steps in cycle I learning activities:

(1) Preliminary activities begin with students saying hello, paying attention to cleanliness and tidiness, checking students' attendance, doing ice-breaking, telling them about the material to be studied, asking questions to stimulate them, providing meaningful understanding, being told about the learning objectives, forming a study group, and being given an explanation of the instructions for working on the LKPD.

(2) The core activity consists of 6 phases: (a) Stimulation phase, where students are given stimulus questions to start the material. Students were asked questions via PowerPoint, and the questions were about the definition and general form of quadratic equations; (b) Problem statement phase, where students are given a problem. Students are given problems according to their cognitive level. LKPD A with high-level problems, LKPD B with medium-level problems, and LKPD C with low-level problems. In this phase, students are also allowed to ask questions and provide responses regarding the problems; (c) Data Collection phase, students get information from various sources, both YouTube videos and reading materials. Students can look at these sources to be able to solve the problems given; (d) Data Processing Phase, where students are directed to work on LKPD in groups and write down the answers to the problems given; (e) Verification phase, where students are asked to present the results of their answers in front of the class. Students who did not present were allowed to ask questions and respond to the

group presentation; (f) Generalization phase, namely, students make conclusions from the discussion results.

(3) The closing activity involves providing feedback, students doing a formative assessment in the form of a quiz, students being told the material for the next meeting, namely determining the roots of a quadratic equation using the quadratic formula, students doing self-reflection via Google form, students being given motivation to remain enthusiastic about learning, and the lesson ending by reading prayers and saying greetings.

Cycle I observations were carried out during the learning process activities. This observation was carried out by the tutor teacher (GP) and field supervisor (DPL). The observations during the cycle showed that learning was by the Discovery Learning learning model with the Teaching at The Right Level approach. However, some students in the high and low groups were still not active in the discussion process; students were still not used to high and medium questions, students were not yet accustomed to homogeneous grouping, the low group students experienced many difficulties in solving problems (including not being able to understand the steps for solving the LKPD, not being proficient in presenting to the class, there were still students in the medium group who were shy and lacked confidence in conveying the results of the discussion through presentations.

Based on student learning results and observations of the learning process, it was found that there was an increase in students. 31 students got scores above the KKM, and 17 students got scores still below the KKM, so the classical average was 64%. The calculation of student learning activities is 68, including the good category.

Reflection is carried out from the results of students filling out a Google form containing students' self-reflection questions. The results of this reflection are used as material for revising the teaching module. Teacher reflection is also done to determine their teaching obstacles and what must be maintained. Based on observations, the grouping still needs to be changed. Like students previously considered to be at high and medium levels, they have difficulty working according to the level obtained. As for group changes, of the 48 students, there were 6 students (12.5%) belonging to the high level, 17 students (35.4%) belonging to the medium level, and 25 students (52.1%) belonging to the low level. The formation of groups is heterogeneous, that is, each group has students who have low, medium, and high abilities. What must be changed is that the level of questions created must match the student's ability standards. The learning model also needs to be changed. Initially, the Discovery Learning learning model will be changed to the Treasure Hunt model.

Cycle II

At the planning stage II, from the reflection results, the teaching modules were improved, which would be applied in the implementation of cycle II. Planning II is the same as planning I. The prepared things are teaching materials, learning videos, psychomotor assessment sheets, and attitude sheets, preparing only 1 type of LKPD. The LKPD contains a column for students to write their answers. Apart from that, prepare questions for each post; there are 3 questions. Of these three questions, there are different levels. Level 1 questions are for the low question category, level 2 for the medium question category, and level 3 for the high question category.

At the implementation stage, the learning process is carried out by the teaching module designed using the Treasure Hunt model using the Teaching at The Right Level approach. The stages in the learning process consist of three steps, namely preliminary activities carried out for 15 minutes, core activities carried out for 60 minutes, and closing activities carried out for 15 minutes. The following is an explanation of the steps in cycle II learning activities:

(1) The activity begins with students saying hello, paying attention to cleanliness and tidiness, checking student attendance, carrying

out ice breaking, telling them about the material to be studied, providing meaningful understanding, being told the learning objectives, and asking stimulating questions.

(2) The core activities consist of 4 phases of the Treasure Hunt model, namely: a) In the Presenting phase, Students are formed into study groups where 1 group consists of students who have low, medium, and high abilities. Students are also given reading materials and YouTube videos to dig up information about the studied material. Students are informed of the mechanisms and rules that apply during learning outside the classroom; b) Retrieving phase, namely, students explore each post. Students read the instructions to go to the post on the LKPD. When students are at the post, they are asked for keywords so that they are allowed to see the questions that have been posted; c) Developing phase, namely, students look at the questions, students look at sources of information both from YouTube videos and reading materials. Students are free to choose questions according to their abilities, namely level 1 questions for low level, level 2 questions for medium level, and level 3 questions for high level. They must understand the questions they choose. Students work on questions at the post, the teacher also guides students if they have difficulty, and students are required to visit all posts. After students visited 4 posts, they returned to class to present in front of the class. After the presentation, they sat down again according to their groups; d) Evaluation phase, namely students are given feedback, students and the teacher make conclusions, and students carry out evaluations.

(3) In the closing activity, students carry out a formative assessment in the form of a quiz, students are informed of the material they will study at the next meeting, students are given motivation to remain enthusiastic about learning, and self-reflection via Google Form. The lesson ends with reading prayers and greetings.

Observations were carried out by tutor teachers (GP) and field supervisors (DPL). The observations during cycle II showed that learning was by the Treasure Hunt learning model with the Teaching at The Right Level approach. Through learning outside the classroom, students become happy and content and do not get bored studying in the classroom. They are more challenged to work on medium and high-level questions when in the post. This does not rule out the possibility that, initially, low-level students can learn to solve medium-level questions. They said that it was easier to understand the material by learning outside the classroom, and they also said that non-homogenous groups were very helpful because previously, they studied in groups with students who did not understand the same thing.

Based on student learning results and observations of the learning process, it was found that there was an increase in students. 42 students got scores above the KKM, and 6 got scores still below the KKM, so the classical average was 87.5%. The calculation of student learning activities, namely 95, is in the very good category. This can be proven when they study outside the classroom and actively discuss with each other to solve the problems they choose.

Reflection is carried out from the results of students filling out a Google form containing students' self-reflection questions. The results of this reflection are used as material for revising the teaching module. Teacher reflection is also done to determine their teaching obstacles and what must be maintained. Based on observations, students are more active when studying because learning is outside the classroom, and they can discuss to answer questions based on their level. Some students have low ability to try questions with medium or high ability. The Treasure Hunt model does not limit students from choosing questions according to their level. Because based on cycle 1 there are still discrepancies after students are grouped.
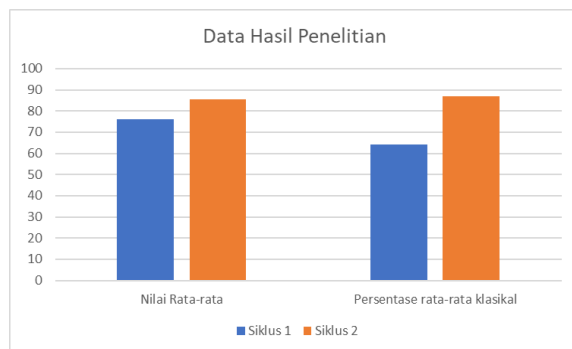
Figure 1. Research result data

Cycle 1 uses the Discovery Learning learning model and the Teaching at The Right Level approach. In contrast, cycle 2 uses the Treasure Hunt model and continues to use the Teaching at The Right Level approach. Data was obtained from the average score of student quizzes taken at the end of each cycle by adding the overall student scores and then dividing by the number of students, namely 48. The classical average percentage is obtained by adding the students who completed it divided by the number of students, namely 48. In cycle 1, the average value is 76, while in cycle 2, the average value is 85.6; it can be seen that there is an increase, namely 9.6. The classical average percentage in cycle 1 was 64%, while in cycle 2, it was 87%; it can be seen that there was an increase of 23%.

Applying the Discovery Learning learning model and the Treasure Hunt model using the Teaching at The Right Level approach has improved student learning outcomes based on the increase in the average score and the classical average percentage. This is by what was stated by Zan (2023) that the TaRL integrated Discovery Learning learning model can increase student motivation and learning outcomes, because learning is designed with students' understanding abilities in mind. Teaching at the Right Level (TaRL) is a learning approach that focuses on adapting learning according to students' abilities. This approach does not look at class level or age but prioritizes students' learning ability levels fairly and on their individual needs (Ahyar et al., 2022). The goal is to reduce learning gaps in the classroom and provide appropriate assistance to Students. In its

application, TaRL can be combined with the Discovery Learning learning model to make the learning process more student-centred (Hadiawati et al., 2024).

IV. Conclusion

Based on the explanation above, there has been a continuous increase in student learning outcomes. Based on the explanation above, there has been a continuous increase in student learning outcomes after implementing the Discovery Learning and Treasure Hunt learning models with the Teaching at the Right Level approach. This is because the learning model with the Teaching at the Right Level approach can help process student learning outcomes through group discussions that are designed homogeneously or heterogeneously by providing LKPD according to their level of ability and providing fair guidance according to their learning needs and giving them questions. are free to choose according to their abilities or there are no limitations in working on the questions.

Based on the results of the research that has been carried out, it can be concluded that the application of the Discovery Learning and Treasure Hunt learning models with the Teaching at the Right Level approach can improve the learning outcomes of class X.15 students at SMA Negeri 2 Tanjungpinang. This can be seen from the increase in the average student score in cycle I of 76 and cycle II of 85.6. The average percentage of classical in cycle I was 64% and in cycle 2 was 87%. This research has the advantage of facilitating students' learning process according to their learning needs. Students can practice critical thinking, discussion, and communication to improve learning outcomes for students.

SMA Negeri 2 Tanjungpinang, who has provided the opportunity for students to become research subjects.

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