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# Implementation of Teaching at the Right Level with Problem-Based Learning Model to Increase Student Learning Outcomes

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**ABSTRACT**

Schools must provide learning experiences that enhance students' abilities that aligned with the learning outcomes. Teaching at the Right Level (TaRL), combined with a Problem-Based Learning (PBL) model, is applied in Class X D at SMA Negeri 5 Bandung. TaRL offers a solution to the issue of disparities in students' abilities within a classroom. Considering the learning objectives to be achieved, the PBL model was chosen because it aligns well with programming material. The TaRL approach, using the PBL method, is designed to improve the learning outcomes of students with varying ability levels. This research successfully demonstrated an increase in average student learning outcomes, reaching 76% as measured by the n-gain score. Students with moderate ability levels achieved improvements in the "High" category, while students with high ability levels achieved improvements in the "Medium" category. These findings highlight the effectiveness of the TaRL approach with the PBL model in enhancing learning outcomes. It is recommended that TaRL combined with the PBL model be considered, as it allows students to learn at their own pace, making the learning process more student-centered and meaningful, which serves as a target for improvement.



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## 1. INTRODUCTION

Education is the most important factor in preparing a generation capable of advancing the country. The quality of education needs to be taken seriously by teachers in carrying out classroom learning. With high-quality education, students, as the nation's next generation, can develop strong knowledge, skills, and affective abilities. These competencies equip students to meet future needs relevant to the times. Learning outcomes have been designed by the Ministry of Education and Culture according to the developmental phases of learning (Riyadi & Budiman, 2023). These outcomes emphasize the development of competencies expected by Indonesia in preparing the golden generation of 2045. However, in reality, many students have yet to achieve optimal learning outcomes. This is due, in part, to gaps in abilities, both in terms of knowledge and skills. These gaps often occur within the same level and class. Therefore, adjustments to students' abilities are necessary to ensure that learning benefits all students. One solution to addressing these gaps is the implementation of the Teaching at the Right Level (TaRL) approach. Initially, the TaRL approach aimed to improve literacy and numeracy among elementary school students (Amoah et al., 2022).

TaRL is a learning approach that groups students based on their learning level (not their class) and provides customized activities and materials (Beery, 2017). This approach can be applied to various subjects, including Informatics. Several studies on TaRL show an increase in competence after its implementation in classroom learning. Some of the impacts of using the Teaching at the Right Level approach include increased interest, motivation, and learning outcomes (Cahyono, 2022; Jauhari et al., 2023; Listyaningsih et al., 2023).

This research aims to apply the TaRL approach to Class X Informatics subjects at SMA Negeri 5 Bandung. The learning materials covered by TaRL include algorithms and programming. The learning model used in this research is Problem-Based Learning (PBL). PBL is considered suitable because the thinking process required for programming skills involves problem-solving. Moreover, programming includes elements of computational thinking, which align with the PBL model (Zhang & Nouri, 2019). However, this research does not discuss the computational thinking process in detail.

## 2. METHODS

This research was conducted to evaluate the improvement in learning outcomes following the implementation of the Teaching at the Right Level (TaRL) learning approach and the Problem-Based Learning (PBL) model. The research employed the Classroom Action Research method, using the model proposed by John Elliot (Hilmi & Prastowo, 2023). Elliot's model was chosen because it provides a seamless flow between stages in the process of translating ideas into action within teaching and learning. In this study, the solution to the problem was a teaching module developed using the TaRL approach combined with the PBL model.

The objective of the research was to improve learning outcomes based on the learning objectives set by the subject teacher. Student learning outcomes were measured through assessments, including pre-tests and post-tests. Student worksheets were also used as part of the assessment to track progress in achieving the learning outcomes. The learning objectives, assessments, and learning activities conducted by students and teachers were documented in the teaching module. The teaching modules were designed sequentially, following the curriculum development approach of Understanding by Design (UbD).

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### 2.1. Research Design

The research design employed was a pre-experimental design using a one-group pre-test and post-test approach. This design is a type of quasi-experiment in which a group of research subjects is measured both before and after receiving the treatment (Fraenkel et al., 2012). The design is illustrated in **Table 1** below.

**Table 1.** One Group Pre-test and Post-test Design Experimental Design

| Pretest | Treatment | Posttest |
|---|---|---|
| $O_1$ | X | $O_2$ |

Where,
$O_1$ : Pre-test Score
X : Treatment
$O_2$ : Post-test Score

### 2.2. Sample and Population

The population in this study consisted of Class X students at SMA Negeri 5 Bandung for the 2023/2024 academic year. The research was conducted during the second semester. This study employed a purposive sampling technique to select participants relevant to the problem being addressed. The sample consisted of one class from the entire population of Class X, specifically Class X D. The sample size in this study was 35 students.

### 2.3 Research Procedure

This research was conducted using Classroom Action Research with the Elliot model. The research was carried out in one cycle. Classroom Action Research following the Elliot model consists of six stages: a) identification and clarification; b) recognition and review; c) planning; d) action; e) observation; and f) reflection (Sáez Bondía & Cortés Gracia, 2022). The stages of the research process using the Elliot model are illustrated in **Figure 1**.


**Figure 1.** Classroom Action Research Procedure

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### 2.3 Identifiy and Clarify Stage

At this stage, problem identification was conducted through field studies and observations of learning activities. Interviews were also carried out with model teachers to clarify the situations, conditions, and problems they experienced, as well as to identify practical solutions. The output of this stage is presented in the introduction.

### 2.3.2. Recognition and Review Stage

At this stage, an explanation of the situation and the facts that occurred was provided. The teacher then determined what aspects of the learning problems faced by students in class needed to be addressed. Explanatory hypotheses were also developed as a description of the research findings based on the observed situations and facts. Similar to the Identify and Clarify stage, the output from this stage is presented in the introduction section.

### 2.3.3. Planning Stage

At the planning stage, identification is conducted regarding what, why, when, where, by whom, and how the actions will be carried out. During the planning process, learning designs are also created. These learning plans and designs need to be documented in teaching modules, which serve as the teacher's guide in teaching. Teaching modules are also an output of this stage. The teaching module designed is the result of curriculum development using the Understanding by Design (UbD) approach. The UbD approach, also known as backward design, differs from conventional curriculum development methods due to its unique steps (McTighe & Wiggins, 2012). This approach was chosen because it focuses on achieving clearly defined goals. In this research, the primary goal is to improve student learning outcomes. Using the TaRL approach, several treatments are provided for groups of students with varying abilities. The treatments differ for each group in terms of content, processes, and products (Griful-Freixenet et al., 2020). Learning activities were also designed with syntax adapted to the PBL model. To support these activities, learning media such as presentation slides and student worksheets were developed.

### 2.3.4. Action Stage

At the action stage, the planned actions are implemented according to the learning plans and designs outlined in the teaching module. Additionally, the previously developed learning media are also utilized. This research was conducted in one meeting, with each meeting lasting three class hours. The process begins with an initial assessment or pre-test. Following this, the treatment process is carried out, consisting of learning activities as described in the teaching module. The TaRL approach is implemented by dividing students into groups based on their pre-test results. The PBL model is also applied to structure the steps of the learning activities. At the end of the learning session, a formative assessment or post-test is conducted to measure students' success in understanding the subject matter.

### 2.3.5. Observation Stage

At the observation stage, recording and documentation of events during the implementation of the action are conducted. The results of these observations serve as a basis for identifying improvements that can be made to enhance the quality of learning in future sessions. Additionally, assessments are carried out to evaluate students' skills in group work and their ability to present the results of their work using student worksheets. These assessments also include evaluating their participation in question-and-answer discussions during the presentation of their group work.

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### 2.3.6. Reflection Stage

At the reflection stage, the teacher evaluates the activities carried out during the learning process. This evaluation involves identifying aspects that were successful and areas that need improvement. The primary basis for this evaluation is the post-test assessment scores. In this research, post-test scores are particularly important as they illustrate the success of the learning activities conducted. The assessment scores are then analyzed to determine the improvement in learning achievement following the treatment process. This quantitative analysis also serves as a basis for teacher reflection, helping to identify the most effective ways to design and implement future learning activities. Post-test scores provide concrete evidence of improved learning outcomes through the numerical data obtained.

### 2.4. Research Instrument

The research instruments used in this study included pre-tests and post-tests in the form of multiple-choice questions, as well as student worksheets containing work steps and related questions. The pre-tests and post-tests were used to measure improvements in learning outcomes, while the student worksheets were utilized to monitor students' learning progress.

### 2.5. Data Analysis Technique

In this research, test results were analyzed using the n-gain test to evaluate improvements in student learning outcomes. The n-gain test offers advantages as it is a non-parametric statistical test, meaning it does not require the data to be normally distributed. The n-gain is calculated using the formula in **Equation 1**:

$$G = \frac{posttest\ score - pretest\ scorescore}{score - pretest\ score}$$

**Equation 1.** N-gain formula

The results are classified based on the criteria presented in Table 2.

**Table 2.** Gain Index Classification

| G Value | Criteria |
|---|---|
| $G < 0.3$ | Low |
| $0.3 \leq G \leq 0.7$ | Medium |
| $G > 0.7$ | High |

## 3. RESULTS AND DISCUSSION

### 3.1. Planning Stage

At the planning stage, teaching modules as outputs from this stage are developed using the Understanding by Design (UbD) curriculum development approach. There are 3 stages in the UbD procedure: 1) identify desired results; 2) determine assessment evidence; 3) plan learning experiences and instruction (McTighe & Wiggins, 2012). The UbD stages in this research can be depicted in **Figure 2**.

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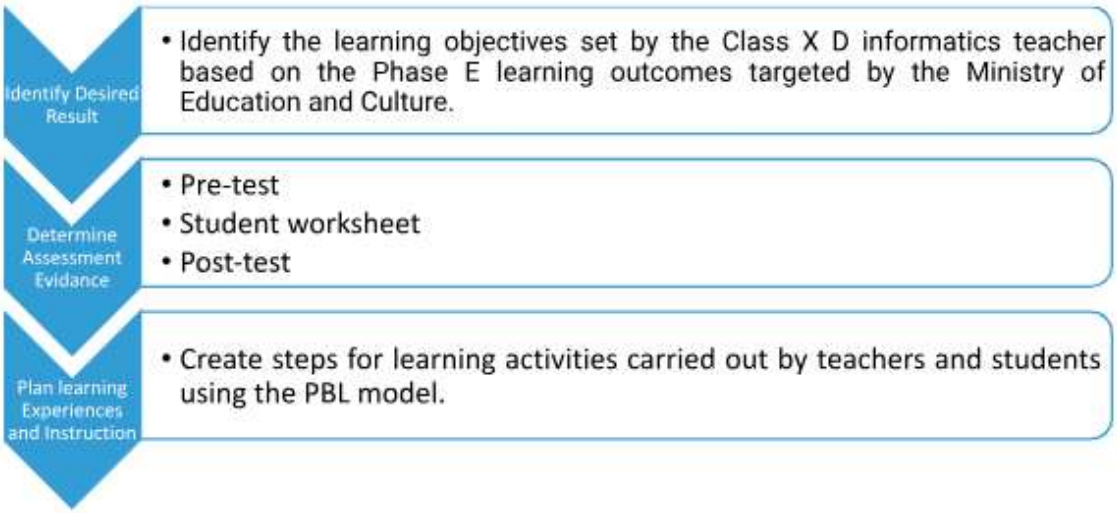


**Figure 2.** Stages of Curriculum Development with an Understanding by Design (Ubd) Approach

The targets that must be achieved by students have been previously formulated by the Class X D Informatics teacher and identified in accordance with the learning outcomes. The learning targets that will be carried out in this research are algorithm and programming. This subject is included in the computational thinking element. In the next step, formative assessments on student worksheets are created by adapting them to the students' abilities. In the final UbD step, learning activities are designed based on the PBL model syntax.

In this research, the learning design uses the TaRL approach, also known as differentiated learning. Different treatments were applied based on the students' abilities. Student groups were divided into those with high and medium abilities. In Class X D, groups were divided based on ability, with one group of high ability and five groups of medium ability. An explanation of the TaRL approach applied in this research is depicted in **Figure 3**.

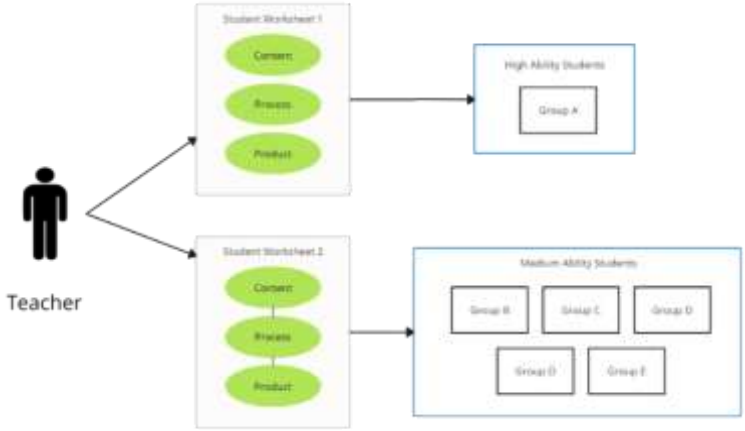


**Figure 3.** Teaching at The Right Level Scheme that has been implemented.

Student worksheets serve as a learning medium that plays an important role in implementing the Teaching at the Right Level approach. Differentiated learning is applied to students by providing problems according to their abilities. The differentiation of learning referred to includes the expected content, processes, and products

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Another consideration in designing learning in the teaching module is that this research uses a PBL model. Therefore, learning activities are carried out using the steps shown in **Table 3**.

**Table 3.** Design Learning Activities Using The PBL Model

| No | Learning Activities | Syntax |
|---|---|---|
| 1 | **Introduction** | Orientation<br>Apperception<br>Motivation<br>Giving references |
| 2 | **Core Activities**<br>PBL Model<br>(Fidan & Tuncel, 2019) | Presentation of the problem<br>Definition of the problem<br>Data gathering and sharing<br>Verify of solution |
| 3 | **Closing** | Reflection<br>Evaluation |

### 3.2. Action and Observation Stage

All learning activity plans written in the teaching module, as shown in **Table 3**, are implemented in Class X D. In carrying out learning, presentation slides are used to provide learning material. Presentations on the projector are conducted to equip students to solve problems given on student worksheets. In solving problems, students collaborate with group partners who have the same abilities. The number of group members working together to complete the worksheet ranges from 5 to 6 students. The results of the assessment of students' worksheet work are presented in **Table 4**.

**Table 4.** Assessment of Student Worksheet (Formative Assessment)

| No | Ability | Group | Score | Achievement of learning objectives |
|---|---|---|---|---|
| 1 | **High** | A | 95 | Achieved |
| 2 | **Medium** | B | 82 | Achieved |
| | | C | 97 | Achieved |
| | | D | 90 | Achieved |
| | | E | 95 | Achieved |
| | | F | 86 | Achieved |

Apart from reviewing the results of the assessment, observations were also made of each student's worksheet activity. By walking around the class and paying attention to each activity carried out by the group, the learning process became more conducive. After the worksheet activity, the next selected group presented the results of their work. Then, students were given time to ask questions to the presenting group. The group presentation activities can be seen in **figure 4a** and **figure 4b**.

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**Figure 4a.** Observing group work

**Figure 4b.** Presentation of student worksheet results

### 3.3. Reflection Stage

In general, the learning process went well. Based on the assessment results shown in **Table 4**, the entire group was able to carry out all the tasks and answer the questions given on the worksheet. Through the observations made, it can be seen that students seemed to be focused on working on the worksheets. However, it appeared that some students did not help their group members complete the worksheet. Encouragement was given to these students until they were willing to participate in group work.

### 3.4. Data Analysis

The pre-test and post-test results are used to analyze the increase in learning outcomes using the n-gain formula. The data obtained were divided based on student ability levels, including high and low ability students. Then, the average n-gain was calculated for each group. The results of the increase in student learning outcomes are presented in **Table 5**.

**Table 5.** N-Gain Result Data

| No | Respondent | Pre-test Score | Post-test Score | n-Gain | Ability | Gain Average |
|---|---|---|---|---|---|---|
| 1 | Student 31 | 100 | 100 | - | High | 0.4 |
| 2 | Student 9 | 80 | 80 | 0 | | |
| 3 | Student 10 | 80 | 80 | 0 | | |
| 4 | Student 12 | 80 | 100 | 1 | | |
| 5 | Student 30 | 80 | 100 | 1 | | |
| 6 | Student 32 | 80 | 80 | 0 | | |
| 7 | Student 6 | 80 | 100 | 1 | Medium | 0.79 |
| 8 | Student 13 | 80 | 100 | 1 | | |
| 9 | Student 16 | 80 | 100 | 1 | | |
| 10 | Student 17 | 80 | 60 | -1 | | |
| 11 | Student 29 | 80 | 100 | 1 | | |
| 12 | Student 35 | 80 | 100 | 1 | | |
| 13 | Student 7 | 60 | 100 | 1 | | |
| 14 | Student 14 | 60 | 100 | 1 | | |
| 15 | Student 19 | 60 | 80 | 0.5 | | |
| 16 | Student 21 | 60 | 100 | 1 | | |
| 17 | Student 22 | 60 | 80 | 0.5 | | |

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| | | | | |
|---|---|---|---|---|
| 18 | Student 24 | 60 | 100 | 1 |
| 19 | Student 1 | 40 | 80 | 0.67 |
| 20 | Student 4 | 40 | 80 | 0.67 |
| 21 | Student 8 | 40 | 30 | -0.17 |
| 22 | Student 11 | 40 | 80 | 0.67 |
| 23 | Student 20 | 40 | 100 | 1 |
| 24 | Student 23 | 40 | 60 | 0.33 |
| 25 | Student 25 | 40 | 100 | 1 |
| 26 | Student 27 | 40 | 100 | 1 |
| 27 | Student 28 | 40 | 100 | 0.92 |
| 28 | Student 2 | 20 | 95 | 1 |
| 29 | Student 3 | 20 | 100 | 1 |
| 30 | Student 5 | 20 | 100 | 1 |
| 31 | Student 26 | 20 | 60 | 0.5 |
| 32 | Student 33 | 20 | 100 | 1 |
| 33 | Student 34 | 20 | 100 | 1 |
| 34 | Student 15 | 0 | 80 | 0.8 |
| 35 | Student 18 | 0 | 80 | 0.8 |
| | **Average** | **52** | **88.71** | **0.76** |

Based on the results shown in **Table 5**, it is known that, on average, students—both those with a high level of ability and those with a medium level of ability—experienced an increase in learning outcomes. The overall student average increased in the "High" category, with a percentage of 76%. An increase in the "High" category occurred for students with a medium level of ability, with an increase percentage of 79%. Meanwhile, the increase for students with high abilities was in the "Medium" category, with a percentage of 40%. For student 31, the pre-test score was perfect, so the student was not included in this calculation. However, student 31 also achieved a perfect score on the post-test.

## 4. CONCLUSION

Based on the research that has been carried out and the discussion that has been described, it can be concluded that the Teaching at the Right Level (TaRL) approach using the Problem-Based Learning (PBL) model is effective in improving student learning outcomes. Learning plans are documented in teaching modules developed through the Understanding by Design curriculum development approach. Learning plans using the TaRL approach consider content, processes, and products presented in different worksheets according to students' ability levels. In general, all students were able to follow all learning activities based on observations and worksheet results. An increase in learning outcomes also occurred at all student ability levels. For students with a high level of ability, there was an increase in the "Medium" category, while for students with a medium level of ability, there was an increase in the "High" category.

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