Application of the Constructivist Model (CM) on Interactions and Learning Initiative Factors for Improvement Results in Learning

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Abstract. Using concept map-based handouts, this study aims to establish whether there are interactions and disparities in the reading and writing learning outcomes across groups of students with high and low levels of initiative. A 2×2 factorial True Experimental research design was employed. Students from Universitas Negeri Malang's Mandarin language study program served as the study's subjects. Following the hypothesis testing, it is possible to infer that there is an interaction between the level of initiative and the learning model, that there is a difference in average learning outcomes between groups, and that the group that is most significantly different is the group of students with a high level of initiative who participate in Discovery Learning and the group of students with a low level of initiative which follows Discovery Learning. Furthermore, based on the discussion results, model learning Discovery Learning is only effective for students with a high level of initiative. On the other hand, the Problem Based Learning model is ideal for students with a wide range of abilities and high and low initiative.

Keywords: initiative · problem-solving · and discovery learning

1 Introduction

It is impossible to avoid problems when implementing learning to improve educational quality [1–3]. One example is the issue of student initiative. The initiative is significant for students learning technology because students who do not have the initiative cannot dig deeper into information or create work. This will almost certainly have an impact on student competence and learning outcomes. On the other hand, students with a high level of initiative can solve problems that become a burden on students with a high level of initiative because the student with a high level of the initiative will participate more in learning activities to solve problems effectively. In this study, a constructivist model in the form of Problem Based Learning (PBL) was chosen as a solution to this problem. Discovery Learning in this learning model requires students to construct or seek information actively and solve a problem based on the student's wishes so that students can develop their abilities and initiatives [2, 3].

When researchers used the PBL learning paradigm, students' problem-solving abilities improved, their understanding of content related to real-world applications increased, they developed leadership and cooperative skills, and they were more motivated to learn [4, 5]. While the Discovery Learning model must be implemented, it can help students learn and advance by utilizing their potential. Discovery Learning also encourages students to learn by helping them find their knowledge, a component of the constructivist learning model [4–6].

According to Brooks and Brooks, constructivism is an approach in the learning process that directs an invention draft born from students' views, images, and initiatives. Constructivist meaning is a situation in which individuals create their understanding based on what they know and believe and the ideas and phenomena with which they relate [6–9].

Constructivist learning uses a student-centred learning approach where students must be the centre of the learning process [7, 8], and students must try to get their information for their knowledge. At the same time, a teacher acts as a mediator and facilitator who helps the student learning process run well.

PBL and Discovery Learning are the most included in the constructivist learning model. Problem-based learning was developed to help students develop thinking, problem-solving, and intellectual skills. With the implementation of this PBL model, students are more often trained to solve problems so that students will be more accessible To do investigation and inquiry. This learning can also increase the growth and development of student learning activities, both individually and in groups [8, 9].

The core activity in learning PBL is orienting students to problems, organizing students to learn, assisting students in problem-solving, developing and presenting problem-solving results, and analyzing and evaluating the problem-solving process. In this learning model, the teacher is a facilitator, giving students instructions and guidance. On the other hand, students complete all stages of PBL learning to solve problems [10, 11].

Studying with *Discovery* is learning to find where a student is faced with a problem or situation that seems odd so that the student can look for a solution [12, 13]. The procedure for implementing discovery learning, according to the stimulation stage, namely providing stimulation to students, identification the problem by formulating the situation into a hypothesis, the data collection stage is the stage collect information to prove the truth of the theory, the data processing stage is the activity of processing the data that students have ordered, the proof stage is to prove the truth of the hypothesis based on the data that have been collected, and the stage draw conclusions from all stages of Discovery which has conducted by students.

The investigation of students' abilities following their learning experience [12, 13]. Learning outcomes can be divided into two categories: student learning outcomes and teacher learning outcomes. According to Dimyati and Mudjiono [12, 13], learning outcomes result from an interaction between the acts of learning and teaching. The teaching show concludes with the final learning evaluation process from the teacher's perspective. From the student's perspective, learning outcomes are the final cut and the culmination of the learning process.

This study aims to determine the interaction between using a constructivist model and a concept map-based handout and the level of student initiative toward reading

and writing learning outcomes. With a concept map-based handout, the Problem Based Learning model and the Discovery Learning model determine the significance of differences in reading and writing learning outcomes with level student initiative. And to become acquainted with groups that are significantly different, which is influenced by the level of student initiative and the use of Problem Based Learning models and handout-assisted Discovery Learning models based on concept maps.

2 Method

This study uses an accurate experimental method with a 2 x 2 factorial design which aims to determine the significance of differences in the use of constructivist models in learning, namely by using Problem Based Learning and Discovery Learning models, which are carried out on students with high initiative and students with the low initiative on reading and writing learning outcomes. By using media-assisted handouts based on concept maps in each learning model.

The subject in the study is a student of the Mandarin language study program at Universitas Negeri Malang. Instruments used in this study, namely the treatment instrument and measurement instrument. The treatment instrument consisted of a syllabus, lesson plans, concept map-based handouts, lattice questions, assessment guidelines, and answer keys. The measuring instrument consists of questionnaire level initiative student, which is used to group students based on their level of initiative, then the instrument test to measure student learning outcomes after treatment on students.

2.1 Data Analysis in This Experimental

The study aims to determine the significance of differences in Web Programming learning outcomes between (a) groups of students with a high level of initiative who participate in learning with the Problem Based Learning model, (b) groups of students with a low level of initiative who participate in learning with the Problem Based Learning model, (c) groups of students with a high level of initiative who participate in learning with the Discovery Learning model, and (d) a group of students with a low level of initiative who participate in learning with the Discovery Learning model.

2.2 Technique Analysis Data in the Study

This study uses a two-way ANOVA and *Post Hoc Comparison* with the condition that the normality and test were previously carried out as homogeneity tests. Data analysis was carried out on *post-test* scores such as knowledge values, skills scores, and attitude scores. A variable is said to be different if the probability or significance is less than 0.05. A variable is declared no other if the likelihood or importance is more than 0.05.

3 Findings

Knowledge value, attitude value, and skill value are the learning outcomes data that have been documented. The students' post-test scores are used to determine the value

Table 1. Results Test Precondition Analysis

Test Precondition	Score Significance	Conclusion
Test Normality Score Knowledge	0.371	Data distributed normally
Test Normality Score Skills	0.162	Data distributed normally
Test Normality Score Attitude	0.188	Data distributed normally
Test Homogeneity Score Knowledge	0.573	Fourth class homogeneous
Test Homogeneity Score Skills	0.263	Fourth class homogeneous
Test Homogeneity Score Attitude	0.238	Fourth class homogeneous

Table 2. Results Test Hypothesis with *Post Hoc Comparison*

(I) Initiative	(J) Initiative	Score Knowledge	Score Skills	Score Attitude
PBL Tall	PBL Low	0.60	0.07	0.061
PBL Tall	Discovery Low	0.000	0.000	0.000
PBL Low	Discovery Tall	1	0.802	0.95
PBL Low	Discovery Low	0.02	0	0.072
Discovery Tall	Discovery Low	0	0	0
Discovery Tall	PBL Low	0.6	0.4	0.014

of knowledge. The assessment rubric in the lesson plans is where the attitude and skill values are found when the student is learning. Table 1 in the prerequisite analysis test findings shows the relative importance of knowledge, skills, and attitude for each group.

After the data to be analyzed is usually distributed and homogeneous, a test hypothesis is conducted using the two-way ANOVA calculation to find out the interactions and differences between the levels of initiative and implementation of a constructivist model with the help of a handout based on a concept map.

Based on the analysis results, there is an interaction between the level of initiative and the learning model because the significance value is below 0.05, namely 0.031 for the knowledge value, 0.031 for the valuable skills, and a value of 0.033 for the attitude value.

Whereas the analysis of differences in learning outcomes in the four groups indicates significant differences because the significance value is less than 0.05, which is 0.000 on the knowledge value, skill value, and attitude value of results interaction and contrast on the four groups, it can be concluded that the level of initiative and constructivist learning models influence learning outcomes. So that the following analysis can be carried out, the post-test comparison to determine which groups are significantly different can be carried out.

Hypothesis test results using Post Hoc Comparison can be seen in Table 2.

4   Discussion

According to the previous analysis, there is a relationship between student initiative and using a handout-assisted constructivist model based on a concept map of reading and writing learning outcomes. According to these findings, the Problem Based Learning model is better suited for students in a single class with diverse abilities because it can distinguish between students with a high level of initiative and students with a high level of initiative and a low level of initiative. In addition, according to Smith, students who use the Problem Based Learning model will gain a better understanding and knowledge of the real world.

According to the findings of the second hypothesis test in this study, there is a significant difference in the learning outcomes of Reading and Writing based on the level of student initiative when using the Problem Based Learning model versus the Discovery Learning model aided by concept map-based handouts. This can occur as a result of interactions between students with high levels of initiative who are taught using the Problem Based Learning model or Discovery Learning and students with low levels of initiative who are taught using the Problem Based Learning model or Discovery Learning.

Problem Based Learning was developed to help students develop thinking, Problem-solving, and intellectual skills [12, 13]. With the application of this model, students are more often trained to solve problems. In addition, it makes it easier for students to conduct investigations and inquiries. In the Discovery Learning model, students must have the readiness, ability, and courage to know their surroundings better [10]. Therefore, students with low initiative are unsuitable if using the Discovery Learning model.

According to the test hypothesis third to using Post Hoc Comparison, the groups are significantly different, namely PBL with a high level of initiative and Discovery Learning with a low level of initiative, PBL with a low level of initiative and Discovery Learning with a low level of initiative. Students in Problem Based Learning groups outperformed those in Discovery Learning.

This can occur because students who participate in Discovery Learning are stimulated to find or solve existing problems, resulting in a desire to investigate themselves. So following the learning with the Discovery Learning model will be difficult for students who lack initiative and a desire to learn. On the other hand, problem-based learning can increase students' growth and development activity, individually and in groups, so students with high and low initiative can use the Problem Based Learning model.

Based on the results, it is clear that the Discovery Learning model is the one that can distinguish between students' levels of initiative in classes with similar aptitudes. According to the findings, each class taught using the Discovery Learning model values knowledge, skills, and attitudes that differ from the other classes.

On the other hand, Model Problem-Based Learning is more suited to students in a class with a range of skills because it can distinguish between those who show a high level of initiative and those who do not. This is so because the problem-based learning approach places more emphasis on the learning process than it does on the learning results. Therefore, if the learning process is at its most effective, the likelihood of achieving the best possible learning outcomes is likewise at its highest.

5 Conclusion

This study identified the interactions and differences between the use of the model and the degree of initiative in the learning outcomes of the Reading and Writing course with a significance level of 0.031 and 0.000. Thus, it may be inferred that the model and level of initiative used can affect the reading and writing learning outcomes. According to the findings of the research and discussion, it can be said that the Discovery Learning approach is better suited for usage in courses with students who have similar academic backgrounds. Contrarily, the Problem Based Learning approach is more suited for courses with a range of abilities because it can be used with both high- and low-ability students.

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