Variation of Learning Cycle 5E Implementation with Consideration of Learning Interest on the Effect of Electro Pneumatic Control System Problem Solving Ability

Setiadi Cahyono Putro*, Wiwit Livia Putri, Yogi Dwi Mahandi, Ahmad Mursyidun Nidhom

Department of Electrical Engineering, State University of Malang, Malang, Indonesia
**Email: setiadi.cahyono.ft@um.ac.id*

ABSTRACT
This research was conducted in SMK with students' interest in learning which is still relatively low. The objectives of this study (1) are to reveal the interaction between the application of variations in learning models and interest in learning (2) to reveal the significance of significant differences in problem solving skills with the application of variations in learning models with interest in learning; and (3) revealing the most significant difference in problem solving between the application of various learning models and interest in learning. The research method used is a true experimental design with 2x2 factorial. There are three measurement instruments, namely the final test, observation sheet and questionnaire. The results showed that 1) the significance result was 0.023 which indicated that there was an interaction between the application of the variation of the learning model and the level of interest in learning, 2) the significance value was 0.000, which means that there was a significant difference in solving skills. the problem of applying variations in learning models with the level of interest in learning 3) obtained 3 pairs of classes with a significance value of less than 0.05 which indicates there are 3 pairs of classes that have the most significant differences. Classes with low learning interest are more suitable to use a learning model with a hybrid learning system.

Keywords: *Learning Cycle 5E, STEAM, Hybrid Learning, Interest Learning, Problem-Solving.*

1. INTRODUCTION

The impact of globalization presents a challenge for vocational education to develop 21st century student competencies [1]. One of the competencies that must be mastered in facing the 21st century is problem solving skills [2]. This ability refers to the ability of students to solve complex problems based on real-life situations and requires interaction with the environment [3]. Students who in the learning process are accustomed to facing problems with prepare well mentally when faced with problems in the real world. Therefore, it is necessary to design learning that makes students active and provides opportunities for students to develop thinking processes in order to achieve a maximum learning process [4].

There are several factors that influence the success of the learning process [5]. One of the obstacles in the implementation of the learning process is the lack of interest in learning [6]. Students who have a high interest in learning will give serious effort and never give up when find problems [7]. Based on observations made during teaching assistance activities in class XI TOI students at SMK Negeri 1 Kota Kediri, it was found that some students had a level of interest in learning that was still lacking. This condition occurs due to the selection of an inappropriate learning model so that improvements are needed to increase student interest in learning.

Interest in learning is one of the causes of the low problem-solving ability of students [8]. One way to get students interested in solving problems is to provide problems that can be found in everyday life [4].

A. Kusumastuti et al. (eds.), *5th Vocational Education International Conference (VEIC 2023)*,
Advances in Social Science, Education and Humanities Research 813,
https://doi.org/10.2991/978-2-38476-198-2_215

Therefore, to be able improve problem-solving skills, it is necessary to choose the right learning model [9]. One of the models that can be used to improve problem solving skills is the Learning Cycle 5E learning model [10]. Learning Cycle 5E is a learning model that is more student-oriented with stages of activities that make it possible to master the skills that must be achieved in learning [11].

Another alternative that can be applied in developing student competencies is through STEAM [12]. Learning that integrates STEAM elements into the learning process can increase students' interest in learning and have an impact problem solving skills. In addition, these abilities can also be developed through innovation in learning through ICT [13]. The world education involves a lot of technology in the concept of learning [14]. This condition makes it easier for students to gather information and make it easier for teachers to convey information flexibly [15]. One of these innovations is the applicatication of Hybrid Learning [16]. Hybrid Learning combines face-to-face learning and online learning processes in an organized and effective manner [17].

Based on the explanation that has been described, this experimental research takes the title "Interaction of STEAM-Based LC%E Model Application (Hybrid) and STEAM-Based LC5E Conventional Model with Learning Interest Level on Problem Solving Ability of Electropneumatic Control System (ECS) Problems in Class XI TOI Students at SMKN 1 Kota Kediri" which has the aim of comparing one learning model and one learning base with different variations of learning models to improve problem solving ability.

2. METHODS

In this study, a form of True Experimental Design research with Posttest Only Control Design was used. The subjects were students of class XII TOI at SMK Negeri 1 Kota Kediri. The measurement instruments used in this study consisted of three, namely the final test, observation sheet, and questionnaire. The measurement instruments consist of (1) instruments of high learning interest level and low learning level interest using observation and questionnaire; (2) cognitive ability instruments using tests after being given treatment in the form of multiple-choice questions.

The division of experimental classes are: (1) class with STEAM-based Learning Cycle 5E learning model (hybrid) with high learning interest level; (2) class with STEAM-based Learning Cycle 5E learning model (hybrid) with low learning interest level; (3) class with steam-based Learning Cycle 5E learning model with high learning interest level; and (4) class with STEAM-based Learning Cycle 5E learning model with low learning interest level. This research includes a 2x2 factorial design. To clarify the research design pattern can be seen in Table 1.

Table 1. Research Design.

Learning Interest Level	Learning Model	
	STEAM-based Learning Cycle (Hybrid) (A)	**STEAM-based Learning (B)**
High Learning Interest (M_1)	AM_1	BM_1
Low Learning Interest (M_2)	AM_2	BM_2

There are three stages in this study, namely: (1) the preparation stage, carried out by compiling teaching modules that will be used in experimental classes, preparing instruments that will be used in evaluation and validation of evaluation instruments; (2) the implementation stage, carried out by collecting data from learning interest obtained from observation sheet and questionnaires to group experimental classes according to the level of high learning interest and low learning interest levels. After the classes, treatment will be carried out, namely the STEAM-based Learning model and finally giving posttest questions; and (3) The final stage, carried out to collect data on the result of problem-solving skills derived from the posttest. The collected data will be analyzed using statistical tests.

In this study, the data analysis used is a description analysis conducted to describe the problem-solving ability in the knowledge domain in students who have a high level of learning interest because of being treated with the STEAM-based Learning Cycle 5E (Hybrid) learning model and the STEAM-based Learning Cycle 5E convention model. Interval calculations are carried out to calculate the range of problem-solving abilities using the means and standard deviation formulas.

In this test, the prerequisite test of analysis was carried out as follows: (1) normality test was conducted to determine whether the data had been collected through four groups of students were normally distributed. Normally testing uses the One-Sample-Kolmogorov-Smirnov test; (2) homogeneity test is conducted to determine whether the samples taken have homogeneous data or not after being given a treatment. Homogeneity testing uses the Levene method. After conducting the prerequisite test analysis, the hypothesis in the study was accepted or rejected. Hypothesis testing was carried out in the form of TwoWay Anova test and Post-Hoc Comparisons test.

3. RESULT

Students' problem-solving ability is obtained from the posttest scores given after implementing the learning. The results of students' problem-solving ability are divided into four classes as listed in Table 2.

Tabel 2. Results of Problem-Solving Ability Description.

No	Criteria	Frequency Count			
		AM1	AM2	BM1	BM2
1.	Very High (VH)	15	12	13	1
2.	High H)	1	5	4	14
3.	Medium (M)	-	-	-	2
4.	Low (L)	-	-	-	-
5.	Very Low (VL)	-	-	-	-

In the next test, the normality test was carried out four classes in the form of posttest scores of knowledge domain problem solving skills. Based on the results of testing the normality of problem-solving ability in Table 3 using the Kolmogorov-Smirnov analysis technique. The test results in four classes are normally distributed because they have a significance value > 0.05.

Table 3. Normality Test Results.

Class	Sig Value.	Description
AM_1	0.118	Normal
AM_2	0.200	Normal
BM_1	0.200	Normal
BM_2.	0.116	Normal

The first hypothesis testing is the interaction between the application of variations in learning models with the level of interest in learning on problem solving ability. Hypothesis testing conducted to determine the interaction of student interest in learning and learning models on problem solving skills is done with Two Way Anova analysis technique. The results of hypothesis testing with Two Way Anova are shown in Table 4.

Tabel 4. Two Way Anova Results.

Source	F	Sig.
Corrected Model	23.0292	0.000
Interests	36.806	0.000
Model	27.137	0.000
Model*Interest	5.460	0.023

Based on Table 4, the fourth row of Model*Interest, it is known that the significance is 0.023 where the value is less the 0.5. Based on this value, it can be stated that H_o is rejected, which means that there is an interaction between the application of variations in learning models with the level of interest in learning on problem solving skills in class XI TOI students at SMKN 1 Kota Kediri.

The second hypothesis testing is the test of significant differences in problem solving ability with the application of variations in learning models with the level of interest in learning. Based on Table 4ujhkkksdeeddhnbjp, the first row (Corrected Model), namely the difference in learning interest class and the application of learning models together on problem solving ability, a significant value of 0.000 is obtained, which means that the value is less than 0.05. This condition states that H_0 is rejected so that there is a significant difference in problem solving ability with the application of various learning models with the level of interest in learning in class XI TOI students at SMKN 1 Kediri City.

Furthermore, the post-hoc comparison test obtained 3 pairs of 6 pairs of classes that had the most significant difference in problem solving ability.

Table 5. Post Hoc Comparison Test.

Class	Mean Difference	Std. Err	Sig.
AM1-BM2	19.34	2.444	0.00
AM2-BM2	12.94	2.407	0.00
BM1-BM2	14.41	2.407	0.00

4. DISCUSSION

The problem-solving ability of the first class, namely STEAM-Based Learning Cycle 5E (Hybrid) with a high level of learning interest, includes the result of the knowledge posttest. The class obtained the highest score compared to other classes. Hybrid learning students with high learning interest answer many questions correctly on AND valve material with easy categories. While many students answer questions incorrectly on single acting cylinder material with difficult question categories. The application of Hybrid Learning can make students learn more purposefully and planned in solving problems. The learning processes in Learning Cycle 5E requires students to discuss and explore the material taught and will be developed in the next phase. Students with high interest in learning have awareness in discussing with their groups, looking for material sources on the internet, and helping each other with their groups. The problem-solving ability of the second class, namely STEAM-based Learning Cycle 55E (hybrid) with a low level of learning interest includes the results of the knowledge posttest. Based on the analysis of the average value is in a very high

category because during the implementation of learning using the STEAM-based Learning Cycle 5E model (Hybrid) with low learning interest students experience increased activity in term of student interest in learning. The application of Hybrid Learning is considered capable of increasing students' interest in learning because it adds new knowledge and experiences to students. Hybrid Learning requires students to search and find material provided via the internet. The third-class problem-solving ability, namely the STEAM-based Learning Cycle 5E conventional model with a high level of learning interest, includes the results of the knowledge posttest. Based on the analysis of the average value is in a very high category because students have a high interest in learning. This learning interest arouses students' interest in the material being taught. The Learning Cycle 5E learning model will stimulate students' interest and curiosity in learning topics. The problem-solving ability of the fourth class, namely the STEAM-based Learning Cycle 5E conventional model with a low level of knowledge posttest. During learning, students' desire to collect material concepts from teaching materials is low. The application of Learning Cycle 5E the teacher asks more questions than explained the material and is student-oriented. Some students are not involved in learning activities as indicated by not participating in cooperation with their group members. Students are classified as passive and only a few provide responses or ideas during discussion activities.

Based on the results of the TwoWay Anova test, the significant value of the learning model and interest is below the significant value so that it is stated that there is an interaction between the application of various learning models and the level of interest in learning. There is inteaction between the use of learning models and learning interest on mathematical problem-solving skills in real analysis courses [18]. The existence of interaction can be seen from the significance value between the learning model and learning interest is below the predetermined significance value. Based on the research result and supported by previous research, learning models and learning have an influence on problem solving skills. Related to the interaction of variations in learning models with the level of interest in learning on problem solving ability, [19] explained that the Learning Cycle 5E model consist of several phases that can make students learn actively, such as the Engagement phase which can arouse students' interest and curiosity so that they are provoked to carry out learning activities. Hybrid Learning has an effect on increasing students' interest in learning [20]. Based on the description above, the Learning cycle 5E learning model and Hybrid learning are considered capable of. Internal factors that affect problem solving ability are learning interest, intelligence, and student knowledge while external factors are learning methods/models, environment and motivation [21]. Related to Hanifa's statement, the relevance of this research is in the form of internal factors of learning interest and external factors in the form of learning models. Stated that with interesting and challenging problem designs students will be interested in learning [22]. Students will be encouraged to solve problems.

In the results of Two Way Anova testing, the results obtained state that there is a significant difference between the application of variations in learning models with the level of interest in learning to problem-solving skills. The cause of significant difference in this study is the difference in the level of interest in learning and the learning model applied. There were differences in problem-solving abilities in the interaction of learning models and learning interests [23]. One of the factors that determine the success of the learning process is learning interest [24]. Based on the research result and supported by previous research, the problem-solving ability of students with high learning interest tends to get better results than students with low learning interest. In addition to the level of interest learning, another influential factor is the learning model. Be oriented towards increasing student involvement in the learning process [25].

Based on 6 tests derived from 4 classes that obtained significant problem-solving ability scores consisted of 3 pairs of classes that had the most significant differences. Testing the problem-solving ability between the STEAM-based Learning Cycle 5E (Hybrid) learning model class with high learning interest and the STEAM-based Learning Cycle 5E conventional model class with low learning interest. The results show that there is a difference in the average problem-solving ability. The two classes have an average problem-solving ability that is quite far away. The STEAM-based Learning Cycle 5E (Hybrid) learning model class with high learning interest has the highest average problem-solving ability compared to the other three classes. Meanwhile, the conventional STEAM-based Learning Cycle 5E model with low learning interest has the lowest average value of problem-solving ability. The learning interest factor and the Hybrid learning model used are the influences of the two classes. The learning model that is applied must be able to provide opportunities for students to develop according to the interests, abilities and desires of students [26]. The Learning Cycle 5E model involves student

activeness so that students with the high interest in learning more easily understand the problems given. Moreover, the use of Hybrid Learning in the STEAM-based Learning Cycle 5E learning model class (Hybrid) with high learning interest make students gather more information related to the problem given and students can access material wherever and whenever they want. Testing the problem-solving ability between the STEAM-based Learning Cycle 5E conventional model class with low learning interest. The results obtained show that there is a difference in the average problem-solving ability. The two classes have an average problem-solving ability that is quite far away. This difference is evidence by the significance value obtained of 0.000. These results illustrate the effect of STEAM-based Learning Cycle 5E (Hybrid) model and the conventional STEAM-based Learning Cycle 5E model with the level of interest in learning on problem-solving skills in the XI TOI class SKE subject at SMKN 1 Kota Kediri. Classes with STEAM-based Learning Cycle 5E (Hybrid) learning model classes with low learning interest have an average score on the very high category. While the STEAM-based learning Cycle 5E conventional model class with low learning interest has a value in the high category. The average value shows that students' problem-solving skills with the Hybrid model are better than the conventional model. In accordance with research [27] which states that the problem solving ability of classes that use conventional learning models.

Difference problem solving ability of conventional Learning Cycle 5E STEAM model classes with high learning interest and conventional Learning Cycle 5E STEAM model classes with low learning interest. The results obtained show that there is a significant difference between variations in learning models and levels of learning model, but with difference levels of learning interest. The application of the learning Cycle 5E model directs students to seek and find knowledge independently [28]. Students with high learning interest tend to have an interest in participating in the learning process. This will make students pay attention to lessons with enthusiasm. So that students who have a high interest in learning will have more understanding than students with low interest in learning. Students will learn well as long as it is based on interest rather than students learning without having interest. Students with high learning interest have interest and involvement in the discussion process.

5. CONCLUSIONS

There is an interaction between the application of variations in learning models with the level of interest in learning to the problem-solving ability of SKE subjects in class XI TPI at SMKN 1 Kota Kediri. This is because there is a difference in one of the level of interest in learning. There is a significant difference between the learning model variation class and the level of interest in learning on the problem-solving ability of SKE subjects in class that has a significant difference. The difference in testing the most significantly different classes on the interaction between the application of variations in learning models with the level of interest in learning to the problem-solving ability of SKE subjects in students of class XI TOI at SMKN 1 Kota Kediri obtained three significantly different classes.

6. ADVICE

From the research that has been done and the result that have been obtained, there are several suggestions that can be conveyed, among others:

6.1 All information generated from the research is expected to be used as reference material related to learning models that can increase students' interest in learning so that students' problem-solving skills increase.

6.2 The STEAM Hybrid-based Learning Cycle 5E learning model can be used as an alternative to be applied to students with high learning and low learning interest, while the conventional STEAM-based Learning Cycle 5E model is only suitable for students with high learning interest.

6.3 Students with low learning interest are expected to be more actively involved in the learning process. Meanwhile, students with high learning interest are expected to provide assistance and motivation to students with low learning interest.

6.4 It is hoped that researchers can conduct research on the interaction of difference variations of learning models with aspect of learning interest levels or interacting similar variations of learning models but with different level aspect such as learning motivation levels, initial abilities and or others.

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