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An Interaction of Problem Based Learning Models and Work Motivation on Students' Competence in Programmable Logic Control Subject

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Abstract. This study aims to obtain information about the interaction between the use of learning models and work motivation on the competence of knowledge, attitude, and skill in Programmable Logic Control Subject. The research conducted at this Vocational High School is an experimental research using the "Non Equivalent Control Group Design" research design, which involves two research subject, namely: (1) Class XI Electrical Power Installation Engineering Expertise Program-1 (taught by using a learning model). Based on problem); and (2) Class XI Electrical Power Installation Engineering Expertise Program-2 (taught by using the direct learning model). The study found: (1) there is a significant interaction between the use of learning models and work motivation on knowledge competence in Programmable Logic Control Subjects in Vocational High Schools, (Fcount = 21.261 with a significance level of 0.000 <0.05); (2) there is a significant interaction between the use of learning models and work motivation on attitude competence in Programmable Logic Control Subjects in Vocational High Schools (Fcount = 8.902 with a significance level of 0.004 <0.05); and (3) there is a significant interaction between the use of learning models and work motivation on skill competencies in Programmable Logic Control Subjects in Vocational High Schools (Fcount = 9.206 with a significance level of 0.004 <0.05).

INTRODUCTION

Education is a conscious process and effort made to guide humans so that they can develop their personality and abilities in accordance with the values prevailing in society. Education as a process, can be done anywhere, anytime,

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and applies throughout life. The National Education System Law states that education is a conscious and planned effort to create a learning atmosphere and learning process, so that students can actively develop their potential, so that they have religious spiritual strength, self-control, personality, intelligence, noble character, as well as the skills needed by himself, society, nation, and state [1].

The development of science, technology and information today in the electrical field is very rapid, especially in the control system design technology that can affect people's lives to move forward (modernization), practical, and semi-automatic. Automated equipment systems that override the human role as the subject of work have been found.

Thus the problems that occur in Programmable Logic Control in the world of work, can be transferred to learning in the classroom. While a good problem, according to Ibrahim and Nur [2], meets at least five criteria, namely: (1) the problem must be authentic, which means that the problem must be rooted in experience in the real world rather than experience in a particular academic world; (2) the problem must be effectively defined and subject to nuances of mystery and enigma; (3) the problem must be meaningful to students and appropriate for their level of intellectual development; (4) the problems must be broad enough to enable teachers to accomplish their learning objectives, but limited enough to make the lesson feasible within the constraints of time, space, and resources; (5) a good problem must be profitable for the group's efforts.

Thus, problem-based learning is a learning model, where students work on authentic problems to construct their own knowledge, develop inquiry and thinking skills at a higher level, in order to develop independence and self-confidence for students [3]. Motivation to achieve good learning outcomes, in order to obtain provisions for work is related to work motivation. Work motivation is formed from a person's attitude in dealing with certain situations and conditions [4]. Work motivation can foster a spirit of learning, so that students are encouraged to continue to do learning activities with pleasure.

Based on the explanation above, it can be seen that the effect of the problem-based learning model on learning outcomes is highly dependent on the work motivation of students. For students who have high work motivation, they will study intensively, consistently, and earnestly to achieve their learning goals, in order to gain knowledge, skills and attitudes in Programmable Logic Control subjects as a provision for work. In other words, it can be stated that there is an interaction between the learning model and students' work motivation as mutually influential factors in achieving learning outcomes. This is in accordance with the opinion of Kerlinger [5] which states that interaction is the effect of the independent variable on the dependent variable, depending on the level or level of other independent variables.

Based on the background described above, the formulation of the problem in this study is as follows: (1) is there a significant interaction between learning models and work motivation on learning outcomes in the cognitive domain in Programmable Logic Control subjects?; (2) is there a significant interaction between learning models and work motivation on learning outcomes in the affective domain in Programmable Logic Control subjects?; and (3) is there a significant interaction between learning models and work motivation on psychomotor learning outcomes in Programmable Logic Control subjects?.

The hypotheses of this research are as follows: (1) there is a significant interaction between the learning model and work motivation on cognitive domain learning outcomes in Programmable Logic Control subjects; (2) there is a significant interaction between learning models and work motivation on learning outcomes in the affective domain in Programmable Logic Control subjects; and (3) there is a significant interaction between learning models and work motivation on learning outcomes in the psychomotor domain in Programmable Logic Control subjects.

RESEARCH METHODS

This study is an experimental study with the aim of knowing the interaction of the use of learning models and work motivation on student learning outcomes in Programmable Logic Control subjects. The research design used was a 2 x 2 factorial design, as shown in Fig. 1 below.

E	O_1	X_1	Y_1	O_2
	O_3		Y_2	O_4
K	O_5	X_2	Y_1	O_6
	O_7		Y_2	O_8

FIGURE 1. 2 x 2 factorial design [6]

RESEARCH RESULTS

First Hypothesis Testing

There is a significant interaction between the learning model and work motivation on the cognitive domain learning outcomes in Programmable Logic Control subjects.

From the two-way analysis of variance, F = 21,161 with a significance value of 0.000 < 0.05, which means H0 is rejected, and H1 which reads: there is a significant interaction between learning models and work motivation on learning outcomes in the cognitive domain in Programmable Logic Control subjects, accepted. The cognitive domain learning outcomes for students who study using a problem-based learning model with high work motivation, have a mean value of 86.009, which is higher than the cognitive domain learning outcomes for students who study using direct learning models with high work motivation, obtaining a mean value of 80,924. While the cognitive domain learning outcomes for students who study with problem- based learning models with low work motivation, have a mean value of 75.345 which is lower than the cognitive domain learning outcomes for students who study with direct learning models with low work motivation, which has a mean value of 77,286.

Thus it can be concluded that there is an interaction between the use of learning models and work motivation on cognitive domain learning outcomes in Programmable Logic Control subjects. The interaction of the use of different learning models and work motivation on cognitive learning outcomes in Programmable Logic Control subjects can be seen in Fig. 2 below.

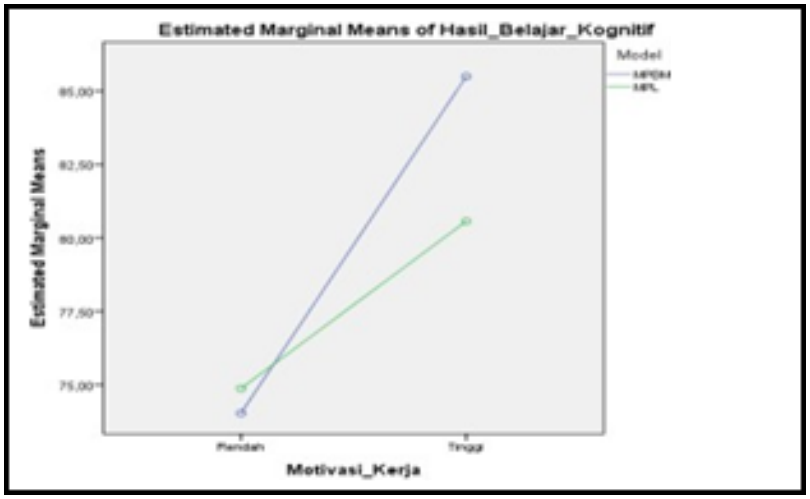

FIGURE 2. Graph of interaction line patterns between the use of learning models and work motivation on learning outcomes in the cognitive domain in programmable logic control subjects

Second Hypothesis Testing

There is a significant interaction between the learning model and work motivation on the affective domain learning outcomes in Programmable Logic Control subjects

From the results of the two-way analysis of variance, the value of F = 18.451 with a significance value of 0.000 <0.05 means that H0 is rejected, and H1 is accepted. Affective domain learning outcomes for students who study using a problem-based learning model accompanied by high work motivation, obtained a mean value of 79,000 which is higher than the affective domain learning outcomes for students who study using a direct learning model with low work motivation, which has a mean value of 77,500. While the learning outcomes of the affective domain for students who study with a problem-based learning model with low work motivation, who get a mean value of 75.333 are lower than the learning outcomes of the affective domain for students who study with a direct learning model with low work motivation, which has a mean value of 75,571.

Thus, it can be concluded that there is an interaction between the use of learning models and work motivation on learning outcomes in the affective domain in Programmable Logic Control subjects. The interaction of the use of different learning models and work motivation on affective learning outcomes in Programmable Logic Control subjects can be seen in Fig. 3 below.

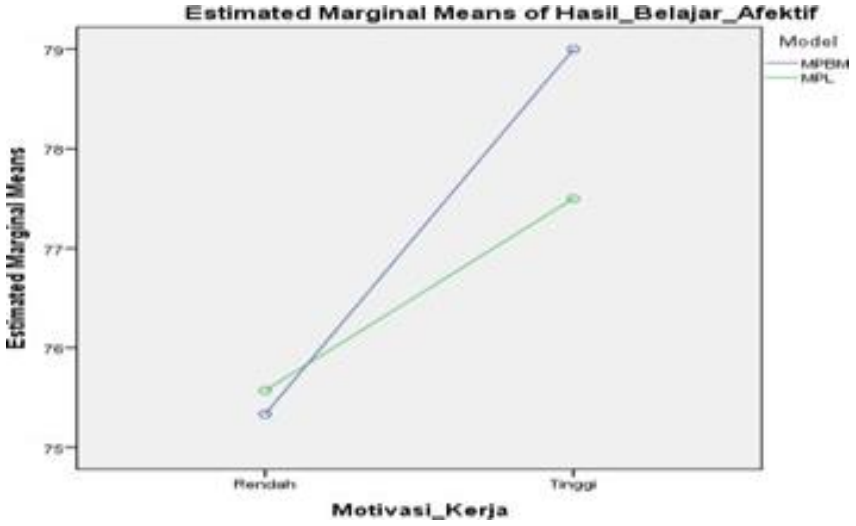

FIGURE 3. Graph of interaction line patterns between the use of learning models and work motivation on learning outcomes in the affective area in programmable logic control subjects

Third Hypothesis Testing

There is a significant interaction between learning models and work motivation on learning outcomes in the psychomotor domain in Programmable Logic Control subjects.

From the results of the two-way analysis of variance, F = 19.256 with a significance value of 0.000 < 0.05, which means H0 is rejected, and H1 which reads: there is a significant interaction between learning models and work motivation on psychomotor learning outcomes in Programmable Logic Control subjects. , accepted. Psychomotor learning outcomes for students who study using problem-based learning models with high work motivation, obtained a mean value of 85.021 which is significantly higher than psychomotor learning outcomes for students who study using direct learning models with high work motivation, which obtain a mean value of 79.988. While the psychomotor domain learning outcomes for students who study with a problem-based learning model with low work motivation, obtaining a mean value of 75.617 is lower than the psychomotor domain learning outcomes for students who study with a direct learning model with low work motivation, which has a lower price. The mean is 76,751.

Thus, it can be concluded that there is an interaction between the use of learning models and work motivation on psychomotor learning outcomes in Programmable Logic Control subjects. The interaction of the use of different learning models and work motivation on psychomotor learning outcomes in Programmable Logic Control subjects can be seen in Fig. 4 below.

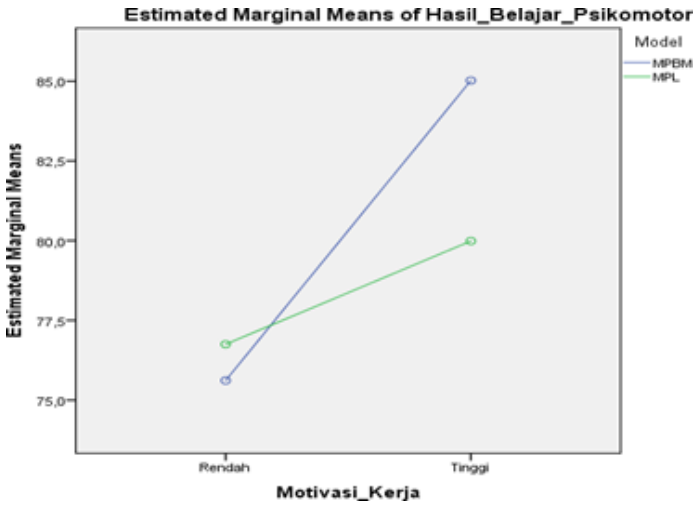

FIGURE 4. Graph of interaction line patterns between the use of learning models and work motivation on learning outcomes in the psychomotor area in programmable logic control subjects

DISCUSSION

This study found that there was an interaction between problem-based learning models, direct learning models and work motivation on Programmable Logic Control learning outcomes. In other words, the effect of problem-based learning models, and direct learning models on learning outcomes in Programmable Logic Control subjects, is highly dependent on the high and low work motivation of the students. This finding is in line with the opinion of Kerlinger [5] which states that interaction is the effect of the independent variable on the dependent variable, depending on the level or level of other independent variables. The interaction between learning models, work motivation on student learning outcomes, describes the relationship between learning models and student work motivation as factors that mutually influence the achievement of learning outcomes.

Two independent variables are said to interact, if the effect of one independent variable on the dependent variable is different at the levels of the other independent variables. From the data above, it can be stated that the independent variable of high work motivation in students who learn by using the problem-based learning model, provides significantly higher learning outcomes (cognitive, affective and psychomotor domains) compared to students who learn by using the direct learning model. The findings of this study provide clues for teachers that the use of problem-based learning models is an appropriate learning model to be applied in teaching Programmable Logic Control subjects for those with high work motivation, while for students with low work motivation it is more suitable to use direct learning models.

CONCLUSION

Based on the results of data analysis and discussion of research results as described above, it can be concluded as follows:

- There is an interaction between problem-based learning models, direct learning models and work motivation on cognitive domain learning outcomes in Programmable Logic Control subjects;
- There is an interaction between problem-based learning models, direct learning models and work motivation on affective domain learning outcomes in Programmable Logic Control subjects; and
- There is an interaction between problem-based learning models, direct learning models and work motivation on psychomotor learning outcomes in Programmable Logic Control subjects.

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