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The Effectiveness of Blended Learning Combined the Team Game Tournament on the Learning Outcomes of Electrical Engineering Students

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ABSTRAK

Kondisi pandemi memaksa sekolah untuk melaksanakan pembelajaran online. Akibatnya pembelajaran menjadi tidak efektif. Penelitian ini bertujuan untuk mengetahui keefektifan model pembelajaran dan perbedaan hasil belajar pada mata pelajaran Pekerjaan Elektromekanik Dasar dengan model pembelajaran blended learning flipped classroom yang dikombinasikan dengan team game tournament dengan model pembelajaran ceramah. Penelitian ini menggunakan pendekatan eksperimen semu. Subjek penelitian adalah 68 siswa kelas X Teknik Elektro. Desain penelitian menggunakan non-equivalent control group design. Analisis data menggunakan analisis deskripsi, uji prasyarat, dan hipotesis. Pengujian hipotesis menggunakan uji Mann-Whitney dan Wilcoxon. Hasil penelitian menunjukkan bahwa model pembelajaran flipped classroom lebih efektif dibandingkan dengan model ceramah, ditunjukkan dengan peningkatan nilai pretest-posttest sebesar 3,74 dan kelas kontrol sebesar 2,24. Model flipped classrom memiliki perbedaan hasil belajar yang signifikan dibandingkan dengan model ceramah. Bagi siswa, penggunaan flipped classroom learning memudahkan dan meningkatkan minat belajar sehingga menjadi lebih kreatif dan kritis yang berdampak pada peningkatan kemampuan kognitif, afektif dan psikomotorik siswa. Penerapan team game tournament sebagai media pembelajaran mampu menarik minat siswa dalam proses pembelajaran.

ABSTRACT

The pandemic condition forced schools to carry out online learning.As a result, learning becomes ineffective. This study aims to determine the effectiveness of the learning model and the differences in learning outcomes in the subject of Basic Electromechanical Work using the blended learning model of the flipped classroom combined with the team game tournament with the lecture learning model. This study uses a quasi-experiment approach. The research subjects were 68 students of class X Electrical Engineering. The research design used a non-equivalent control group design. Data analysis used description analysis, prerequisite test, and hypothesis. Hypothesis testing using the Mann-Whitney and Wilcoxon tests. The results showed that the flipped classroom learning model was more effective than the lecture model, indicated by an increase in the pretest-posttest score of 3.74 and the control class of 2.24. The flipped classroom model has a significant difference in learning outcomes compared to the lecture model. For students, the use of flipped classroom learning makes it easier and increases interest in learning so that they become more creative and critical which has an impact on increasing students' cognitive, affective and psychomotor abilities. The application of the team game tournament as a learning medium is able to attract students' interest in the learning process.

1. INTRODUCTION

Education has an important role in human life, with education humans can learn and form self-character that used to interact with humans around them. Education is a learning process that runs as long as humans live (Shi et al., 2021; Tebbs et al., 2021). Education will make a human being ready to interact

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and face the changes that occur in society. Education is also a benchmark for measuring the quality of human resources in a nation (Reynolds & Candee, 2019; Tayibnapis et al., 2018). The more qualified the education of a nation, the more intelligent and quality human resources the nation will. Schools as the only formal educational institutions organized by the government play an important role in realizing the goals of national education (Syed Hassan, 2018; Veryaeva & Solovyeva, 2021; Yan & Deng, 2019). One way to achieve this goal is through interaction in the learning process at school which is carried out consciously (Daryono et al., 2021; Kusuma et al., 2021) and directed towards changing student behavior as expected (Lai et al., 2021; Zhou et al., 2020).

The quality of students is determined by the quality of learning activities. Improving the quality of learning activities in schools is an absolute and very urgent need (Coetzer et al., 2020; Reynolds & Candee, 2019). One of the efforts to improve the quality of learning activities is to improve the process of implementing good learning in schools (Al-Alwani, 2014; Saifurrahman et al., 2021). Other research stated that 70% of student learning outcomes are influenced by students' abilities and 30% are influenced by the environment (Coetzer et al., 2020; Guo et al., 2020). Meanwhile, one of the most dominant learning environments influencing learning outcomes in schools is the quality of learning (Al-Alwani, 2014; Coetzer et al., 2020; Daryono et al., 2020). Learning is a process of interaction between students and teachers and learning resources in a learning environment (Coetzer et al., 2020; Shi et al., 2021). The learning process needs to be planned, implemented, assessed, and monitored in order to be carried out effectively and efficiently (Setyadi et al., 2021; Zhou et al., 2020).

Based on the results of observations and interviews with teachers conducted by researchers, the activities and learning outcomes of the Electromechanical Basic Work subject in class X at SMK Negeri 2 Klaten are still not optimal. From the results of field observations conducted by researchers, the number of students who achieved scores according to the Minimum Completeness Criteria (*Kriteria Ketuntasan Minimal*-KKM) was an average of 65%, while 35% of students were still below the KKM. While the level of activity in terms of the ability to ask questions and express ideas is still small, namely 10% of students. One of the causes of learning activities that are not optimal in the subject of Basic Electromechanical Work is the teacher who still uses the lecture learning model.

Seeing these obstacles, a teacher must look for an appropriate learning model in order to increase student activity and learning outcomes (Gough et al., 2017; Syukriah et al., 2020; Zgraggen, 2021). Along with the rapid development of Information Technology (IT), the need for an IT-based teaching and learning concept and mechanism is inevitable (Luthfi et al., 2021; Perusso & Baaken, 2020). The world of Indonesian education in the future is more likely to develop in the form of open education by implementing a distance education system or distance learning (Kusuma et al., 2021; Veryaeva & Solovyeva, 2021). Sharing learning resources among educational institutions in a network, using interactive information technology devices (Ismaeel & Al Mulhim, 2021; Luthfi et al., 2021). Such as multimedia CDROMs, in education gradually replacing television and video and making optimal use of internet technology in learning development (Huang et al., 2020; Nurdiansah et al., 2018). One of the goals and roles of information and communication technology in education is to improve the quality of learning and teaching (Berić-Stojšić et al., 2020; Grønlien et al., 2021; Lapitan et al., 2021). The learning developed tends to combine conventional learning with Information And Communication Technology (ICT) based learning (Reynolds & Candee, 2019; Zhou et al., 2020). Learning that combines conventional learning with information and communication technology-based is called blended learning (Bahtiar 2021; Grønlien et al., 2021; Prescott et al., 2018; Shi et al., 2021). Through blended learning, the learning system becomes more flexible and not rigid (Bahtiar, 2021; Broadbent et al., 2021). Blended learning as a formal education program for students, where students learn some learning materials and assignments are distributed online, while others learn with supervision by the teacher (Staker & Horn, 2012).

One of the existing models in blended learning is the flipped classroom model, flipped classroom is learning by means of the teacher delivering learning materials before face-to-face learning in class begins in the form of videos that have been made face-to-face learning (Bhat et al., 2020; Rodríguez et al., 2019). Face-to-face in class is spent interacting and discussing with the students. In this study, flipped classroom combined, stated by research Teams Game Tournament (TGT) is an activity that encourages students to play while thinking, work in a team and be competitive against other teams (Warsono & Hariyanto, 2012). In flipped classroom combined with a team game tournament, students are involved not only face to face in a classroom or laboratory but also involve students in activities outside the classroom by integrating web technology online (Lombardini et al., 2018; Wagner & Urhahne, 2021).

In several studies on the effectiveness of learning, many learning models have been developed (Berić-Stojšić et al., 2020; Bhat et al., 2020; Gough et al., 2017; Lai et al., 2021; Lombardini et al., 2018; Rodríguez et al., 2019; Wagner & Urhahne, 2021). One of them is the flipped classroom, which is a reverse learning model that is applied by the teacher to students. The flipped classroom learning model dismantles

traditional classes which in general have become a routine for teachers, namely providing material in class and then giving assignments to be done in class and outside the classroom (Albahuoth, 2020; Fidan et al., 2021; Lombardini et al., 2018). Recent technological developments have given rise to blended learning classes. Flipped classroom is a particular type of blended learning design that uses technology for learning outside the classroom and carries out learning activities in the classroom by practicing understanding of the material (Broadbent et al., 2021, 2021; Prescott et al., 2018).

With the increasing availability of the Internet and computer applications over the past 20 years, colleges and schools have strengthened their commitment to using computer technology to enhance learning. As with any educational tool, there are many strategies for using computer technology (Chen & Tsai, 2021; Fidan et al., 2021). One such strategy relies on technology to introduce students to learning outside the classroom so that students can maximize their cognitive abilities in the classroom. As for the traditional classroom arrangement pattern, students generally understand the material when in class, while the flipped classroom gives assignments to students in the form of homework to understand the subject matter more deeply or flip class (Fidan et al., 2021; Lombardini et al., 2018).

Several studies that aim to determine the effectiveness of using the Flipped Classroom model reveal the effect of applying the learning model in the classroom, one of which is the results of research which states that Flipped Classroom has a positive effect on students from improving academic achievement (Munir et al., 2018; Ranellucci et al., 2021). Flipped Classroom learning model has a strong influence in honing student skills and makes students have high awareness and responsibility in participating in learning activities (Ranellucci et al., 2021; Rodríguez et al., 2019). Meanwhile, the results of research that using Flipped Classroom can help students to learn independently by encouraging them to adjust to their new learning experience (Fisher et al., 2021; Prescott et al., 2018). From several studies above, the Flipped Classroom model is thought to be able to help students understand concepts more quickly and is considered capable of increasing self-efficacy and student learning outcomes. If students have a high conceptual understanding, they will always try to achieve their achievements as targeted, in this case enabling learning activities to be successful in helping students minimize misconceptions and change students' misconceptions (Ranellucci et al., 2021; Zarrinabadi & Ebrahimi, 2019).

Another recommendation comes from the literature and is confirmed here, that students in reverse classes are more aware of their own learning process than students in traditional learning (Munir et al., 2018; Wozny et al., 2018). Thus, students in reverse classes need to have more space to reflect on their learning activities so that they can make connections to the content of the subject matter. Herein lies the opportunity to reconceptualize the learning environment for blended learning offerings (Prescott et al. 2018; Zimba et al. 2021). Using the right online communication tools to create space for reflection is critical to the success of a reverse classroom. Furthermore, because this technology provides opportunities to interact with other people, this reflection can occur at various levels and can be carried out in society. Based on the existing problems, the researchers wanted to examine the effectiveness of using a blended learning model with the flipped classroom model combined with a team game tournament. The research basically makes the learning process student-centered that learning will be more effective if it is held through a student-centered learning model. In practice, this research refers to the basic competencies of doing electromechanical electrical work.

2. METHOD

This study uses a quasi-experimental type of research to compare the application of blended learning with the Flipped classroom model (Berić-Stojšić et al., 2020; Bhat et al., 2020; Lombardini et al., 2018; Ölmefors & Scheffel, 2021). The research combined team game tournament using the lecture model (Rodríguez et al., 2019; Turan & Akdag-Cimen, 2020; Wagner & Urhahne, 2021). This research design uses a non-equivalent control group research design as the experiment and control class group. The research subject is the Electrical Engineering Basic Work course. The respondents of this study were students of class X majoring in Electrical Engineering (TITL) at SMK Negeri 2 Klaten. Class X TITL A as the experimental group and X TITL B as the control group. The number of students in each group is 34 students so that the number of subjects is 68 students. This research was conducted in the learning process by applying a blended learning model with a flipped classroom model combined with a team game tournament. Blended learning with the flipped classroom model combined with the game tournamanet team is expected to be able to improve student learning outcomes both from the cognitive, affective and psychomotor aspects. Figure 1 illustrates the related research framework.

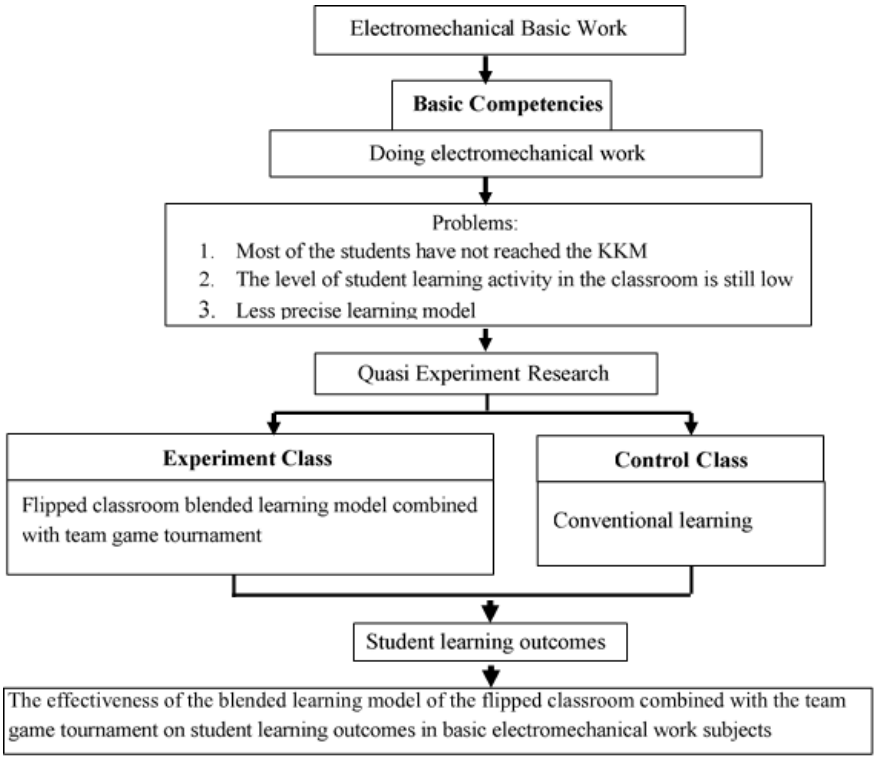

Figure 1. Research Framework

The data collection method in this study used instruments in the form of pre-test - post-test for the assessment of the cognitive domain, the observation sheet for the assessment of the affective domain and the assessment of the psychomotor domain. Both instruments used have been validated. Cognitive instruments also go through the stages of testing the validity of items using the product moment correlation formula, reliability testing using the Cronbach alpha formula, difficulty index testing, and different power tests. The results of the validity test of 30 questions contained 20 valid questions. Assessment of students' cognitive domains in writing can be measured through tests given twice, namely pre-test and post-test. Pre-test is a test given to students to determine the initial ability of students before being given treatment, while post-test is a test given to find out how much achievement of student learning outcomes after being given treatment. Pre-test and posttest using the same instrument (Table 1).

Table 1. Grid of the Pretest and Posttest Assessment Instruments

Basic Competencies	Aspects	Indicators
Electro-mechanical Basic Work	Knowledge	Determine electromechanical electrical work tools. Determine the work materials of electromechanical electricity
	Comprehension	Classify electromechanical electrical work tools Classify electromechanical electrical work materials
	Application	Function electromechanical electrical work tools Apply electromechanical electrical work materials
	Analysis	Determine work procedures using hand tools Analyze work procedures using hand tools

The affective assessment uses an observational instrument in the form of a rating scale. This rating scale is used to determine the attitudes shown by students during teaching and learning activities. Each of the students' affective aspect criteria has the lowest score range of 1 to 4 (Table 2). The assessment of the psychomotor domain uses an observational instrument in the form of a rating scale. This rating scale is used to determine the attitudes shown by students during teaching and learning activities. Each of the students' psychomotor aspect criteria has the lowest score range of 1 to 4 (Table 3).

Table 2. Grid of Affective Aspect Instruments

No	Components of the Affective Aspects	Criteria for Assessment of Student Affective Aspects
1	Attention	Attention of students in following the learning of basic electromechanical work
2	Enthusiastic	Students' enthusiasm for learning to learn basic electromechanical work subjects
3	Participation	Desire to ask the teacher
4	Organization	Group cooperation
5	Evaluation	Carry out a task

Table 3. Grid of Psychomotor Aspect Instruments

No	Components of the Psychomotor Aspects	Criteria for Assessment of Student Psychomotor Aspects
1	Preparation	Equipment check Selection of tools and materials
2	Process	Cutting procedure Welding procedure Gluing procedure
3	Work attitude	Work safety
4	Time	Completion time
5	Results	Project output form

The results of the reliability test showed a value of 0.789. The data analysis technique used is non-parametric statistics because the data is not normally distributed and is not homogeneous. Hypothesis testing using the Mann-Whitney U and Wilcoxon tests with the help of SPSS software using the Independent Sample t-test (Kalfa et al., 2016; Syukriah et al., 2020). In this study, there are at least six procedures as proposed by Emzir (2015) including: (1) selecting and formulating problems, (2) selecting subjects and research instruments, (3) selecting research designs, (4) carrying out procedures starting from pres test, giving treatment, and post-test , (5) analyzing data, and (5) formulating conclusions.

3. RESULT AND DISCUSSION

Result

The research data were obtained from the experimental class and the control class which included three aspects, namely cognitive, affective, and psychomotor.Assessment in this domain is carried out by giving a pre-test and post-test which are measured through multiple-choice tests and matched with a correct score of 1 and an incorrect score of 0. The data for calculating the highest pre-test score of experimental class students compared to the control class is 13 with an average of 9.91 compared to 13. with an average of 9.41. The distribution of the pre-test score category can be seen in Table 4. The data for calculating the highest post-test score for experimental class students compared to the control class was 17 with an average of 13.65 compared to 14 with an average of 11.65. The distribution of post-test scores can be seen in Table 5.

Table 4. Distribution of Pre-test Score Category

Category	Experiment		Control	
	Number of Students	Percentage	Number of Students	Percentage
Very Good	0	0.00%	0	0.00%
Good	16	47.06 %	27	79.41%
Enough	18	52.94%	7	20.59%
Not Enough	0	0.00%	0	0.00%

Table 5. Distribution of Post-test Value Category

Category	Experiment		Control	
	Number of Students	Percentage	Number of Students	Percentage
Very Good	10	29.41%	0	0.00%
Good	19	55.88%	27	79.41%

Category	Experiment		Control	
	Number of Students	Percentage	Number of Students	Percentage
Enough	5	14.71%	7	20.59%
Not Enough	0	0.00%	0	0.00%

The effectiveness of the blended learning model with the Flipped classroom model combined with the team game tournament. A gain score is a comparison of the value of learning outcomes with the maximum value obtained by students. The average Gain score for the experimental class is in the high category, which is 0.36 while the average Gain score for the control class is in the medium category, which is 0.19. The gain score calculation can be seen in Table 6.

Table 6. Score Gain

Category	Experiment		Control	
	Number of Students	Percentage	Number of Students	Percentage
High	2	5.88%	0	0.00%
Medium	15	44.12%	5	29.41%
Low	17	50.00%	2	70.59%

The assessment of the affective domain was measured using a non-test instrument in the form of an observation sheet consisting of 5 rubrics. Measurements were taken at the beginning to the end of the meeting by the observer using an assessment rubric. Each question rubric has a score of 1-4. The data obtained from the highest score in the affective domain of the experimental class students compared to the control class was 19 with an average of 15.62 compared to 17 with a mean of 14.02. The distribution of affective value acquisition categories can be seen in Table 7.

Table 7. Distribution of Affective Value Categories

Category	Experiment		Control	
	Number of Students	Percentage	Number of Students	Percentage
Very Good	18	52.94%	4	11.76%
Good	16	47.06%	30	88.24%
Enough	0	0.00%	0	0.00%
Not Enough	0	0.00%	0	0.00%

Assessment of the psychomotor domain was measured using a non-test instrument in the form of an observation sheet consisting of 5 rubric items with 8 assessment sub-components. Measurements were taken at the beginning to the end of the meeting by the observer using an assessment rubric. Each sub-component has a score of 1-4. The data obtained from the highest score in the psychomotor domain of experimental class students compared to the control class was 29 with an average of 23.97 compared to 24 with an average of 21.79. The distribution of psychomotor score acquisition categories can be seen in Table 8.

Table 8. Distribution of Psychomotor Value Category

Category	Experiment		Control	
	Number of Students	Percentage	Number of Students	Percentage
Very Good	10	29.41%	0	0.00%
Good	24	70.59%	30	100.0%
Enough	0	0.00%	0	0.00%
Not Enough	0	0.00%	0	0.00%

Normality test in this study using Kolmogorov-Smirnov. Data can be said to be normally distributed if it is greater than the significance value of 5% (0.05). The homogeneity test in this study used Levene's test. Data can be said to be homogeneous if it is greater than the significance value of 5% (0.05). The results of the normality and homogeneity test of the three aspects can be seen in the Table 9.

Table 9. Normality Test Results

Normality Test Results			Homogeneity Test Results		
Aspects	**Asymp. Sig**	**Decision**	**Aspects**	**Asymp. Sig**	**Decision**
Cognitive	0.053	Accepted	Cognitive	0.116	Accepted
Affective	0.003	Rejected	Affective	0.006	Rejected
Psychomotor	0.000	Rejected	Psychomotor	0.165	Accepted

Test the hypothesis in this study using Mann-Whitney U. The results of the study can be said to have a significant difference if it is smaller than the significance value of 5% (0.05). The results of the three realms of hypothesis testing can be seen in the Table 10.

Table 10. Hypothesis Test Results

Aspects	Sig.(2-tailed)	Decision
Cognitive	0.000	Accepted
Affective	0.005	Accepted
Psychomotor	0.002	Accepted

Discussion

Based on the data obtained on the pre-test scores of the experimental class students, it is known that the percentage of the experimental class students' pre-test scores in the very good category is 0.00%, while the results of the control class pre-test scores in the very good category are also 0.00%. The results of the post-test value of the experimental class showed a percentage value of 29.41% which was included in the very good category, while the post-test value of the control class showed a value of 0% which was included in the very good category. The effectiveness of using blended learning with the Flipped classroom model combined with a team game tournament can be seen from the Gain score (Rodríguez et al., 2019; Zainuddin & Perera, 2017). The Gain score in the experimental class has an average in the high category of 0.36, while the control class has an average in the medium category, which is 0.19. The average Gain score of the experimental class is higher than the Gain score of the control class as evidenced in the first hypothesis testing, the significance value is smaller than the 5% probability value of 0.000 <0.05. Based on the results of these tests, it can be concluded that the use of a blended learning model with the model combined with a team game tournament is more effective in improving learning outcomes in the cognitive domain of students compared to the use of the lecture model (Ölmefors & Scheffel, 2021; Turan & Akdag-Cimen, 2020).

Assessment of learning outcomes in the affective domain of students was carried out in the experimental class and the control class. Assessment in the affective domain of students aims to determine student activities during the learning process. Based on the data obtained on the affective scores of the experimental class and control class students, it is known that the average affective value of the experimental class students is 15.62 and the average affective value of the control class students is 14.02. The average affective score of the experimental class is higher than the affective score of the control class. The difference between the experimental class and the control class is 1.6. This is evidenced in the first hypothesis testing, the significance value is smaller than the 5% probability value of 0.005 <0.05. Based on the results of these tests, it can be concluded that the use of a blended learning model with the model combined with a team game tournament is more effective in improving learning outcomes in the affective domain of students compared to the use of the lecture model (Albahuoth, 2020; Wagner & Urhahne, 2021).

Assessment of learning outcomes in the psychomotor domain of students was carried out in the experimental class and the control class. Assessment in the psychomotor domain of students aims to determine student activities during the learning process. Based on the data obtained on the psychomotor scores of the experimental class and control class students, it is known that the average psychomotor value of the experimental class students is 23.79 and the average psychomotor value of the control class students is 21.79. The mean psychomotor score of the experimental class was higher than the psychomotor score of the control class. The difference between the experimental class and the control class is 2. This is evidenced in the first hypothesis testing, the significance value is smaller than the 5% probability value of 0.002 <0.05. Based on the test results, it can be concluded that the use of a blended learning model with the Flipped classroom model combined with a team game tournament is more effective in improving student learning outcomes in the psychomotor domain compared to the use of the lecture model (Rodríguez et al., 2019; Wozny et al., 2018).

The effectiveness of learning is a measure of the success of a learning to improve student learning outcomes. Effectiveness in learning can be seen from the activeness of students in learning activities and mastery of students' concepts of teaching materials. The effectiveness referred to in this study is the effectiveness of the blended learning model of the flipped classroom combined with the team game tournament on the basic competencies of doing electromechanical electrical work in the cognitive, affective and psychomotor domains. In the cognitive domain, the effectiveness of learning can be seen in the comparison of the increase in the average score of the pretest-posttest pair test using the Wilcoxon technique in the experimental class and control class, besides that it can be seen from the difference in the average gain value between the experimental class and the control class. The results of the pair test test, the pre-test value of the experimental class has an average score of 9.91 and the post-test has an average score of 13.65 so that there is an increase of 3.74, the value of sign. is 0.000, the mean gain is 0.36. The results of the pair test test, the pre-test value of the control class has a mean score of 9.41 and the post-test has an average score of 11.65 so that there is an increase of 2.24, the value of sign. is 0.000, the mean gain is 0.19.

The effectiveness of learning in the affective domain can be seen in the comparison of the average results of observations in the affective domain of the experimental class of 40.97 and the control class of 28.03. The effectiveness of learning in the psychomotor domain can be seen in the comparison of the average results of the psychomotor domain observations in the experimental class of 41.81 and the control class of 27.19. The experimental class experienced a higher increase than the control class for both pre-test and post-test. The same thing is also shown in the observation data in the affective and psychomotor domains. It can be said that students in the experimental class succeeded in improving their learning achievement by using the Flipped Classroom learning model because it was influenced by a good learning experience, this is evidenced by seeing the results of the student's concept mastery test in the experimental class which was higher than the control class. This is in accordance with the factors that make students high Cognitive, affective, and psychomotor experience when achieving self-efficacy can increase students' Cognitive, affective, and psychomotor (Munir et al., 2018; Wozny et al., 2018). Furthermore, the experience of seeing other people's success can affect Cognitive, affective, and psychomotor.

In the learning process using Flipped Classroom in the experimental class consisting of several discussion groups, when one of the groups can answer the questions given by the teacher, the motivation of students from other groups increases with the number of students competing to answer the next question that the teacher gives (Bhat et al., 2020; Lai et al., 2021; Wagner & Urhahne, 2021). The purpose of the experience of seeing the perceived success of others is when students feel that they must study better when they experience anxiety when they see their friends are superior to themselves, so that experience increases their motivation and can make cognitive, affective, and psychomotor which is increasing. In addition, the factors that affect students' cognitive, affective, and psychomotor increases are the positive support/feedback given by the teacher when students express their opinions and also the psychological state of students. Based on the description above, applying the Flipped Classroom learning model to learning activities has a significant effect on improving students' cognitive, affective, and psychomotor skills when compared to using the conventional/lecture model. So, it can be said that the Flipped Classroom model is more effectively applied to learning activities to improve students' cognitive, affective, and psychomotor compared to the conventional model. The higher the cognitive, affective, and psychomotor, and student motivation, the higher and better the learning outcomes achieved. Furthermore, the research states that cognitive, affective, and psychomotor show that the average posttest score of the experimental class is higher than that of the control class (Fisher et al., 2021; Lai et al., 2021). In addition, in the experimental class, there were more students in the high category than in the control class.

Based on the explanation above, shows that the application of the Flipped Classroom model has a good influence on students' conceptual understanding of the basic electromechanical work material, this is evidenced by the significant difference in the N-Gain average on the concept mastery test in the experimental class and the control class. After being given treatment, the average N-Gain result in the experimental class was higher than the control class. In addition, in the experimental class, the N-Gain is categorized as high and in the control class, the N-Gain is categorized as medium. The difference in increasing students' conceptual mastery is due to differences in treatment in the learning process, namely in the experimental class using the Flipped Classroom model while the control class uses a conventional/lecture model. In applying the Flipped Classroom model, students are first asked to watch a home learning video given by the teacher before the learning process takes place. The use of instructional video media also has an effect on increasing students' mastery of concepts because students can watch videos repeatedly to understand what is contained in the learning videos. The use of video media in learning activities is something that a teacher should do to help solve problems faced by students in class because a learning video can add abstract knowledge to be more interesting (Ranellucci et al., 2021; Zarrinabadi & Ebrahimi, 2019). This will allow students to collect data or information, analyze it, find answers

independently. Using audio-visual media, one of which is video media in learning activities, can improve student learning outcomes because learning videos can convey comprehensive information to students even though students have different learning styles (Bhat et al., 2020; Lai et al., 2021; Rodríguez et al., 2019; Wagner & Urhahne, 2021). Students who use video-based media experience an increase in learning outcomes compared to those who do not use video media (Ranellucci et al., 2021; Wagner & Urhahne, 2021). Based on the description above, applying the Flipped Classroom learning model to learning activities has a significant effect on students' mastery of concepts in basic electromechanical work material when compared to using conventional/lecture models. So, it can be concluded that the Flipped Classroom model is more effectively applied to learning activities compared to the conventional/lecture model.

Based on the data on the effectiveness of the application of blended learning model flipped classroom combined with team game tournament on the basic competence of doing electrical work electromechanical class X TITL SMK N 2 Klaten it can be concluded that the effectiveness of learning in the experimental class is higher than the control class to improve student learning outcomes in terms of the cognitive domain , affective and psychomotor. The blended learning method in the form of a flipped classroom makes students prepare thoroughly for face-to-face learning so that students will be better prepared in preparing the material to be delivered (Elyakim et al., 2019; Heng Ngee Mok, 2014). Other research found that a learning will be more effective if it is held through a student-centered learning model (Rodríguez et al., 2019; Wagner & Urhahne, 2021). Based on the teacher's statement that the application of the flipped classroom combined with cooperative learning such as team game tournaments makes students more prepared and excited before face-to-face learning is carried out and students can repeat the learning material that has been given, so that when the quiz is held students are ready to do it. The application of the flipped classroom combined with cooperative learning such as team game tournaments also supports the government in implementing the 2013 Curriculum because learning becomes student-centered, isolated learning becomes networked learning. Overall, the results of the study indicate that the minimum hours of lectures and the limitations of practicum on Basic Electromechanical Work Subjects can be used by the flipped classroom model as an effective strategy in maximizing student responsibilities in exploring online learning materials so as to support motivation and produce maximum projects. Based on direct observations during the learning process and data analysis, the researchers provide suggestions, namely, the Flipped Classroom learning model can be used as an alternative for teachers to create interactive learning activities in the classroom so that the learning outcomes produced are in accordance with the targets to be achieved.

4. CONCLUSION

Learning with Flipped Classroom makes class meetings more effective and meaningful. Students can apply learning materials at their own pace, are flexible but full of responsibility, and have the freedom to obtain in-depth studies in class based on data acquisition and projects being worked on. The analysis above shows that there is a strong relationship between the flipped classroom model, teaching style, motivation, and high interest in learning on learning outcomes.

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