Research Article

Comparation: Learning Results Engineering Mechanics Subjects Using Conventional Learning Model and Learning Cycle in Vocational High School

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Abstract
Vocational high school aims to develop the students' competence of job career that must appropriate with the necessary of company. Therefore, required a program of teaching strategy in order to obtain better result of learning process. The purpose of this study was to know the learning different result from mechanics learning using conventional learning and learning cycle in vocational high school. The method used in this study is comparative quantitative, by using the simple random sampling, sample that used in this study is the students of mechanics program from vocational high school. Testing-T used to know the learning different result from two different learning models. The result of this study shows that learning process in mechanics program of vocational high school using learning cycle is more effective than conventional method. This learning model would be effective to develop scientific abilities, explore material, find concepts and apply these concepts to the other problems, thus the learning results by using this model was increase.

Keywords:
learning result, conventional learning, and learning cycle

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Introduction

In 2017, the Central Statistics Agency (BPS) released the number of unemployed SMKs to 23.15% or totaling 1,962,786 people. The diagram of open unemployment by education level is shown in Figure 1. The average number of unemployed over the past 5 years shows that SMKs hold the most unemployment positions after high school, namely: (1) No school 0.92%; (2) Didn't finish elementary school (SD) 5.63%; (3) Elementary School (SD) 15.22%; (4) Junior High School (SMP) 19.84%; (5) 27.65% Senior High School (SMA); (6) Vocational High School (SMK) 20.18%; (7) Diploma 3.02%; (8) University 7.65%. The occurrence of unemployment shows that there is something wrong / there is a problem found in vocational schools that causes graduates not absorbed properly in the business world and in the industrial world.
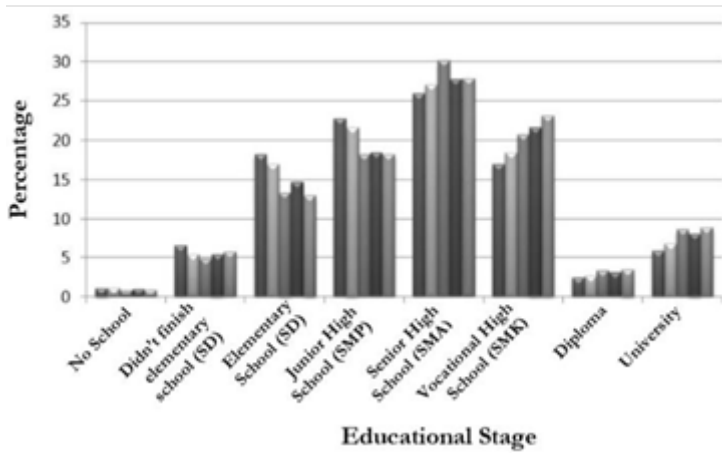
Figure 1.
Open Unemployment According to Level of Education in 2013-2017 (Source: BPS, 2017)

One of the problems that occurs is that the curriculum in SMK is not yet relevant to the needs of the business world and the industrial world. Reporting from the Jakarta Post on May 17, 2016, the current curriculum still does not meet the needs of the industrial world. Utaminingsih (2011: 170) also states that there is still a mismatch between what is learned in schools and the needs of the business world and the industrial world. This certainly makes vocational graduates become not ready to use, which means that they cannot directly work in the business and industrial world.

The enactment of the MEA (Asian Economic Community) from the end of 2015 provides increasingly greater challenges and increasingly fierce competition. In Addition, the development of science and technology is increasingly rapid (Hartinah et al, 2019). According to the ASEAN Community 2015: Managing Integration for Better Jobs and Shared Proverty in Bangkok in the Directorate of PSMK (2017a: 6), in 2010 to 2025 it is predicted that there will be an increase in the need for skilled

workers in the ASEAN region by 41% or around 14 million people, where half of that amount is Indonesia's needs. This challenge must be really considered especially by the SMK so that graduates can survive in increasingly fierce competition. Therefore the problems in Vocational High Schools must be overcome properly.

Vocational high school (SMK) is institute of education which has responsibility to make better graduate who has the skill and special ability to get job career. The education of vocational will be efficient when the method use to teach the students appropriate with the students' characteristic. That's why the goal of learning process is from the result of students' learning (Prosser & Quigley, 1950) and (Anggraini, 2016).

Based on the reality of job career, students of SMK are very minim to get better job career, and also very seldom to see the graduate from SMK has better skill in the job career. In other hand they also have problem about skill to have interaction using technology. In the other hand, we also can see that students' competence is still bad because there are many people who have finished their study, and they are not working based on the program in vocational high school.

The other reality is about jobless. There are still many people who are from SMK has no jobs. It means that jobless from SMK is big enough. In other case, the result of research shows that there is comparison between competence result from school and the competence needed by industry. The first is from knowledge and skill aspect. SMK gives preparation for the students in the number of 7,92, and for employer is 7,22, but most of the industry think that the point of employer is 7,47, and industry need those aspect in 8,11 point.

Based on the competence needed from industry, thus required appropriate learning model for students of SMK. This aimed to make the graduates of SMK had ability in adapting the environment of industrial quickly. One of the subjects in SMK that could be utilized in industrial is engineering mechanics. Nurdiansyah (2016) stated that the ability in solving the problem and learning result of SMK students on engineering mechanics subject is relatively low. It occured due to the learning model applied in class was still using conventional model. The following were the development studies about learning model applied on engineering mechanics subjects.

Jigsaw type cooperative learning models
for improving the learning result in
engineering mechanics subjects on
program of building drawing engineering
(Saefulloh, 2016)

Jigsaw type cooperative learning model
for improving the activities and learning
result in engineering mechanics subjects
on program of mechanics engineering
(Nurdiansyah, 2016)
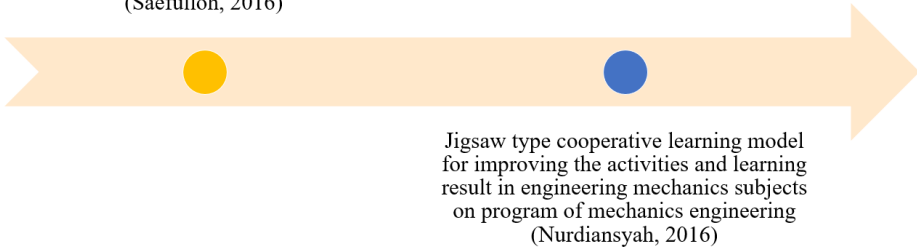
Figure 2.

Previous Research

Figure 2 shows that the type of cooperative learning model "jigsaw" had been used to improve learning result in subjects of engineering mechanics on program of building drawing engineering and program of mechanical engineering. The problem of this study was the learning result that had not been yet optimal, this could be known from students' ability in solving problem in different difficulty level which included in low category. It could be serious problem because students could not understand the concept of engineering mechanics. Thus, students' ability in adapting on engineering mechanics become low or in other words, students' ability in adapting on industrial environment was also low, because they did not used to solve problem with different difficulty level. Then, students were not able to meet the competence that needed by industry.

Therefore SMK needed special strategy to be implemented during learning process of engineering mechanics. The effort to optimize learning result and ability in solving problem with different difficulty level was by applying learning cycle model. This learning model was the most successful learning model in science subjects (Escalada, Rebello & Zollman, 2004); (Maier & Marek, 2005); (Mohammadjani, 2015) and (Ahmad, 2010). Brown & Abell (2007) stated that learning cycle model helped students in understanding the scientific ideas, improving the scientific reasoning and increasing the activity in the classroom.

The basic different between learning cycle and conventional learning is in the phase of exploration and explanation. In that phase, teacher will be more active for asking than giving information (Smith, 2001) and (Paolini, 2015). This is why learning cycle is better than conventional learning (Monica, 2013) and (Mobark, 2014). The activity model learning cycle will center to the students, and students will reach the competence by having more active (Olaoluwa, 2015).

Problem of Research

Based on the introduction above, the researcher focused on the problem in order to understand the difference of learning result of engineering mechanics learning by using conventional learning and learning cycle models in vocational high school.

The following were problems of research which were formulated throughout this study:

➢ Understanding the learning result of engineering mechanics subjects using conventional learning in vocational high school
➢ Understanding learning result of engineering mechanics subjects using learning cycle in vocational high school
➢ Analyzing the differences learning result of engineering mechanics subjects that using conventional learning and learning cycle models in vocational high school.

Method

Research Design

This study used a comparative research method using inferential statistical techniques with a quantitative approach.
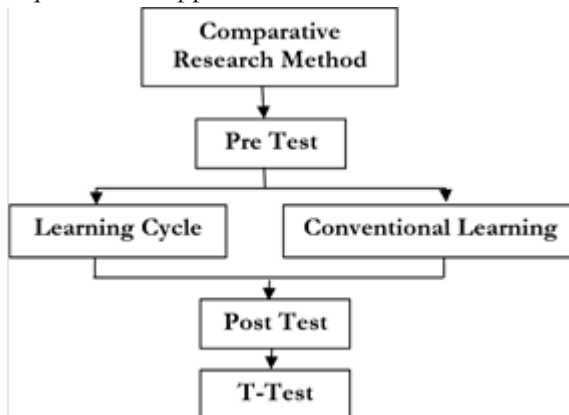
Figure 3.
Framework of the Research

Participants

The sample of this research was simple random sampling. Subject of this study was grade of XI vocational high school (SMKN 11 Malang) in the program of mechanics engineering, which consists of 68 students. They are divided into 2 classes (classes with 33 students used the learning cycle, while classes with 35 students used conventional learning).

Instrument and Data Collection

The instrument used in this study is the learning score result from the test of mechanics engineering. The type of instrument used is mechanics engineering competence. The assessment technique is based on the level of difficulty in each item. The items used have passed the validity and reliability test. The following is a pre-test and post-test research design to obtain data.

Table 1.

*Research Design Pre Test – Post Test*

Class	Test	Learning model	Test
XI Mechanical Engineering 1	Pre Test	Learning Cycle	Post Test
XI Mechanical Engineering 2	Pre Test	Conventional	Post Test

Data Analysis

In this research, the data analysis technique used was t test. T test aims to make a comparison of the given learning model (learning cycle and conventional). Thus, it can be seen which class is effective in developing the result of the student's learning process.

Results and Discussion
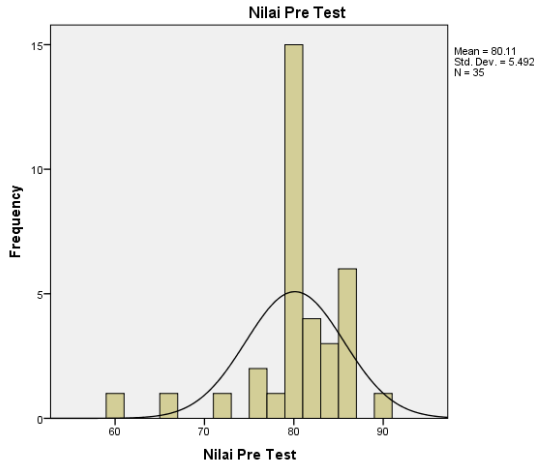
The process of this study includes (1) data description, (2) test of analysis and (3) testing hypothesis. The descriptive analysis of the first skill (Pre-Test) includes mean, and standard deviation which can be seen in the Figure 4 and Figure 5 and the data result of controlling classroom and experiment provided in Table 5.
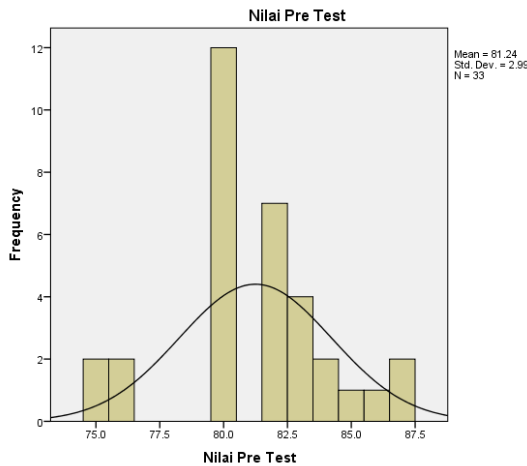
Figure 4.

Histogram of Pre Test of Learning Cycle

Figure 5.
Histogram of Pre Test of Conventional

The following is the validity test result.

Table 2.
Results of Validity Test

No	Nomor *Item*	*Pearson Correlation*	Significance	Information
1	Item 1	0,524	0,003	Valid
2	Item 2	0,580	0,001	Valid
3	Item 3	0,521	0,003	Valid
4	Item 4	0,603	0,000	Valid
5	Item 5	0,677	0,000	Valid
6	Item 6	0,647	0,000	Valid
7	Item 7	0,561	0,001	Valid
8	Item 8	0,527	0,003	Valid
9	Item 9	0,556	0,001	Valid
10	Item 10	0,425	0,019	Valid
11	Item 11	0,539	0,002	Valid
12	Item 12	0,781	0,000	Valid
13	Item 13	0,563	0,001	Valid
14	Item 14	0,223	0,237	Invalid

The following is the reliability test result.

Table 3.

Results of Reliability Test

Cronbach's Alpha	N of items
0,806	14

The following is the normality test result.

Table 4.

Results of Normality Test

| Correlations		Post Test	Pre Test
Post Test	Pearson Correlation	1	.540**
	Sig. (2-tailed)		.000
	N	68	68
Pre Test	Pearson Correlation	.540**	1
	Sig. (2-tailed)	.000	
	N	68	68
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 5.

T-Test Basic Skill Classroom in the Conventional Class and Learning Cycle

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
										Lower	Upper
Pre Test Score	Equal varian assumed	1,245	,269	1,043	66	,301	1,128	1,082		-1,031	3,288
	Equal varian assumed			1,060	53,154	,294	1,128	1,064		-1,006	3,263

Based on the result of t-test in the Table 5, the score is t = 1,043 and sig.= 0,301, so Ho is accepted, and it can be concluded that there is no difference in the result of pre-test between experiment and control class. After testing the learning result in pre-test, it was continued testing for post-test provided in Figure 6 and Figure 7, and to know the data description of post-test result. It has been provided in Table 6.
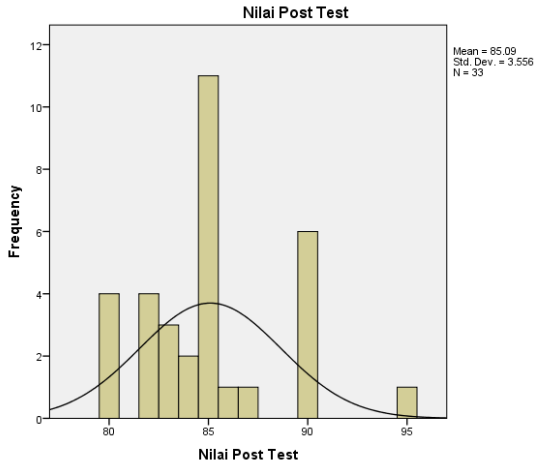
Figure 6.
Histogram of Post Test of Learning Cycle
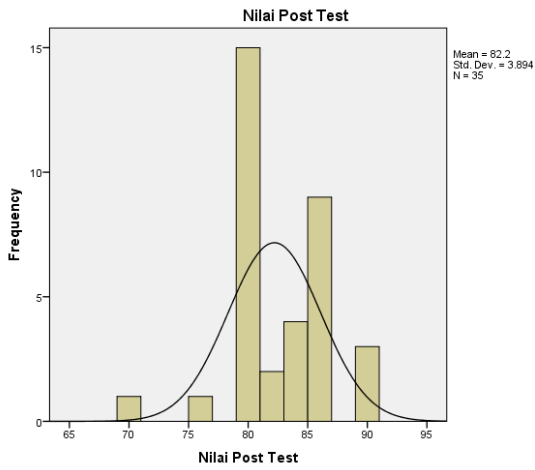
Figure 7.
Histogram of Post Test of Conventional

Table 6.

The Result of t-Test Post-Test Conventional Class and Learning Cycle

		Levene's Test for Equality of Variances		T-test for Equality of Means						95% Confidence Interval of the Difference	
		F	**Sig.**	**t**	**D f**	**Sig. (2-tailed)**	**Mean Differ ence**	**Std. Error Differ ence**		**Lower**	**Upper**
Post Test Scor e	Equal variance s assumed	,459	,501	3,19 1	66	,002	2,891	,906		1,082	4,700
	Equal variances not assumed			3,19 9	65,937	,002	2,891	,904		1,087	4,695

Independent Samples Test

Based Table 6, it can be seen that the result of t-test = 3,191 and sig.= 0,002, so it can be stated that Ho is rejected, and there is different learning result in the class of experiment and class control. It can be concluded that learning cycle is more effective than conventional learning.

Based on the data analysis, it can be concluded that there is no the difference before giving stimulus, so both of the groups has the same skill. This case can be happened because of conventional learning. This learning is a general learning style to make the students have no responsibility to the lessons (Li, 2016). In other hand, that style does not invite the students to think creatively (Weltman, 2010) and (Yore, 2001). Teacher is also often more active in the classroom than the students, and students in this style is only an object of education. Teacher center in the teaching method assume that all the students have the same ability (Lord, 1999) and (Khalid, 2012). The students are passive learners in the classroom, and teacher hold the role in teaching learning process (McCarthy, 2000).

The differences in student learning outcomes occur when given different treatment that is using conventional learning (control class) and Learning Cycle model (experimental class). The cooperative and innovative learning model is the conceptual framework used as a guide in doing the learning process (Joyce, 1992). Cooperative learning involves teachers and students together to actively cooperate (Johnson, 1986) and (Wael, 2014).

Based on the result of learning process in vocational learning model requires a strategic and innovative learning cycle which uses a model that is more effective in improving student learning outcomes (Maudu, 2012) and (Akinwumi, 2015). This is because learning cycle is able to provide effectiveness in the process of students' understanding of a concept of learning. This learning style also gives lessons to the

teachers to be able to activate students in learning activities (Hanuscin & Lee, 2010), and were able to improve student learning outcomes (Hasret, 2006). Learning Cycle is a series of stages and activity. There are 3-7 phased, and they are organized so that students can master the competencies that must be achieved in learning with the active role (Lorsbach, 2002). Learning cycle consists of three phases, namely exploration, invention and expansion and applied to the subjects of mechanical engineering (Abraham, 1986).

Engineering Mechanics is an adaptive program of vocational school, and that program contains key important concepts that are competencies that support the work as a teacher (Gagne, 1992) and (Ofsted, 2010). The achievement of the vocational education system is in order to get high quality and, the quality of teaching is a key factor in improving learning outcomes (Barber, 2008) and (Paolini, 2015). To develop a teaching model in the context of trade, it is necessary to compare the teaching model with the similarities and differences between the models that could serve as a guide for teachers to adapt the model appropriate teaching (Ji-ping, 1995) and (Ahmad, 2010). Thus, the learning outcomes of vocational Automotive is the acquisition of learning characterized by the mastery of students towards the teaching aims of machining vocational (Watson, 2002) and (Mahe, 2014).

Conclusion

Based on the discussion of the results study, it can be concluded that learning of engineering mechanics subjects in vocational high school (SMK) using Learning Cycle model is more effective than using conventional learning model. Learning cycle learning cycle helps students understand scientific ideas, improves scientific reasoning, increases activity in the classroom (Brown & Abell, 2007). Students who experience learning with learning models developed based on learning cycle will get better learning outcomes than students from the class that apply the conventional learning model. Learning Cycle model will be effective to develop scientific abilities, exploring material, finding concepts and applying these concepts students to other problems so that learning results increase.

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