Effect of contextual approach to improve competence of engineering design and manufacturing in vocational high school 2 Depok Sleman

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Abstract. The aim of this research was designed to determine the effect of contextual approaches on Manufacturing and Drawing Engineering competencies in class XII students of the Metal Fabrication and Manufacturing Engineering Vocational Engineering 2 Depok Sleman and improving the competency of the Manufacturing Image Engineering course by using the contextual approach of the XII grade students of the Metal Fabrication and Manufacturing Engineering expertise program at Vocational High School 2 Depok. This research is classroom action research. Data had collected in August 2019. Subjects were 29 students in class XII TFLM A. Data collection techniques used were observation, competency assessment, and documentation. The assessment technique applied in the study uses an evaluation based on the results of the student job sheet assignments. The results of this classroom action research are applying a contextual approach to improve student learning outcomes. The increase that can occur could be seen from the results of the 1st and 2nd cycle research. Increased value of cycle one by 3.4%. In the second cycle was 5.8%.

1. Introduction
Technological advances in the modern era have influenced human life, starting from working, socializing, learning, and teaching. The impact of technological advances that affect learning and teaching changes needs to be pursued and balanced by education providers, especially in vocational high school as secondary education that has unique objectives [1]. According to Law no. 20 of 2003, a detailed description that vocational education is secondary education that prepares students, especially to work in specific fields. Vocational education as an educational institution that aims to prepare its graduates to enter the world of work has a strategic role in training human resources, especially middle-level workers [2].

One of the fields of work that has changed a lot and has shifted from technology to computer technology is the manufacturing industry. In the manufacturing industry's product design process, most enterprises have used the help of CAD devices. Therefore, the ability to operate CAD software is needed by the manufacturing industry [3].

The high standard of competence needed by the industry requires vocational high school to be able to produce graduates with the competencies needed by the industry today. Efforts to meet the workforce's needs must produce graduates with the competencies needed in today's industry. To meet the needs of the industrial workforce, especially in Image and Manufacturing Engineering (TGM)
competencies, the government has prepared a curriculum that aims to prepare students to have skills and be competent in manufacturing drawing techniques by presenting TGM training at vocational high school. Making this curriculum aims to equip every student to be skilled in the CAD field to be absorbed in the industrial world [4].

But in reality, at Vocational High School 2 Depok Sleman, especially in the Metal Fabrication Engineering and manufacturing department, there are still many problems. The results of preliminary observations made during the period 19-26 July, the criteria obtained were that at Vocational High School Depok Class XII, TFLM showed that students' TGM competency still did not meet the Minimum Completeness standard, of 29 students the passing rate was only 23.3%. The low competency of TGM is caused by: 1. A low understanding of the concept of 3-dimensional drawing, this is evidenced by the daily assignments given. 2. no teaching aids that support the learning process. 3. The learning process is dictating so that students are bored in learning.

Research conducted by Dionysius D Noviantoro [5] shows that student activity increases using the CTL method in the Engineering Image Reading subject at Vocational High School Piri 1 Yogyakarta. It can be seen from the proportion of student activity in the first cycle of 60.87% (enough), increasing to 76.09% (right) in the second cycle and increasing to 86.41% (very good) in the third cycle. The results also showed an increase in learning achievement, as seen from the average test scores. The test score of 56.52 in the first cycle increased to 63.04 in the second cycle and raised in the third cycle to 73.04.

Based on the conditions described, it is necessary to have an effort that aims to overcome the above problems by applying appropriate learning methods in the learning process to improve CAD competencies. There are many learning methods available, but the most suitable alternative is using the Contextual Teaching Learning (CTL) method in solving the above problems. The CTL method is an educational process that aims to help students see the meaning in the academic material they make by connecting the academic subjects they create with the context in their daily lives [6].

2. Method
This research uses a descriptive qualitative method. This research is a classroom action research that aims to determine whether the learning process is running well or not in terms of increasing students' competence. In this case, rising students' competence by testing the questions so that the value rises on the testing. The Classroom Action Research (PTK) by Suharsimi Arikunto model is planned to be implemented in two cycles. Each cycle consists of 4 stages, namely, planning, action, observation, and reflection [7].

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Time used This classroom action research was conducted from August to September 2019 at Vocational High School 2 Depok, which is located in Mrica Village, Depok District, Sleman Regency, Yogyakarta Special Region Province. The research subjects were 29 students of Vocational High School 2 Depok, Metal Fabrication and Manufacturing Engineering Department.

This research procedure was carried out in 2 cycles. Each cycle consists of 4 stages of action, namely, Planning, Implementation, Observation, and Reflection. Each stage carried out in process 1 becomes a reference in taking activities that will be carried out in cycle 2, namely in the form of steps in making improvements that will support the learning process in the future.

Data collection in this study used three ways, including observation, tests, and documentation. Observation is defined as the process of collecting data where the researcher observes the research situation. Observations are made to identify and record the symptoms that occur in students. The test is used to determine the effect of the CTL approach on improving students’ abilities. Documentation is used to strengthen data obtained from research.
The data analysis technique in this study used a qualitative descriptive analysis. The qualitative descriptive analysis calculates the average (mean), median, mode, and standard deviation (SD), highest value, lowest value, and percentage. The mean or mean is an explanation technique based on the average cost of the group [8].

3. Result and Discussion

In cycle 1 (action 1), the result of the class average competency score has reached the specified competency standard, namely 75. The average class score in cycle 1 (action 1) is 79.4. However, there are 6 out of 29 students who have not been able to achieve the standard competency score. The problems that occur in cycle 1 (action 1) are caused because students are not careful in making sketch relations so that they affect other assessment instruments. The distribution of the average competency score in cycle 1 (action 1) can be seen in figure 1.

![Figure 1. Cycle 1 Competency Score (Action 1)](image1.png)

In cycle 1 (action 2), the result of the class average's competency score has reached the Minimum Completion Criteria (KKM), namely 76.6. The number of students who passed was 18 people or 63.06%, while the students who had not reached the KKM were 11 people or 39.98% of the 29 students. The causes of low-class graduation are the material being taught that is still foreign to students, so it is necessary to improve cycle II (action 2). The distribution of the average competency value in cycle 1 (action 2) can be seen in figure 2.

![Figure 2. Cycle 1 Competency Score (Action 2)](image2.png)

In cycle II (action 1) there was an increase in the average class score of 82.24 or 3.4% from cycle I (action 1), and the number of students who reached the KKM score increased to 25 students from 29 people. The average class value increase was caused by the improvements made in the reflection process in cycle I (action 1). The distribution of the average competency value in cycle II (action 1) can be seen in figure 3.
In cycle II (action 2) the results of the class average competency score above have increased from the previous cycle. This happens because students are no longer confused about arranging e-tickets, making main views, assistive views and tolerance. The average class score is 81.4. The number of competent students was 26 students or 89.6%, while the number of participants below the KKM standard was 3 or 10.34%. The distribution of the average competency value in cycle II (action 2) can be seen in figure 4.

4. Conclusion
There is an increase in the cycle with the implementation of the CTL approach. The increase occurred in the average cycle II (action 1) and cycle II (action 2). In cycle II (action 1) there was an increase of 3.4% with the number of passing students remaining static at 86.2% or 26 students out of 29 total numbers. In cycle II (action 2) there was a significant average increase of 5.8% and the number of passing students increased to 26 students, initially only 18 out of 29 in one class.

The results show that the Contextual approach to the CAD system manufacturing drawing engineering training course can improve because learning is based on problems that exist in everyday life. The real question is then poured into a task so that it can invite students to find the meaning and meaning of learning itself. On the other hand, it affects students' interest and enthusiasm in solving the problems that exist in the assignment.

In the Manufacturing Image Engineering course's learning process, the time given should be added to convey all learning material correctly. CAD drawing assignments given to students should be related to machine components that are easy to find so that the goals and intent of learning are more conveyed.

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