The Implementation of Plasticine Wax Media to Increase the Right-Aligned Lathe Chisel Geometry Understanding for the Students of Automotive Engineering Education During Covid-19 Pandemics

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ABSTRACT
The covid-19 pandemic has weakened various aspects of human life, including the field of education. One of the negative impacts of the pandemic can be seen in practical learning. Students should be skilled for practice but currently have to endure with online learning. The difficulty of delivering practical learning in online learning methods is a challenge for lecturers. The lecturer took the initiative to provide material for right-aligned lathe chisel geometry through the application of plasticine wax media. This research aims to determine the increase in students' understanding of the material of lathe chisel geometry in the group using plasticine wax media and the group using work drawing media. The method used in this research was a quasi-experiment method with a nonequivalent control group design as the research design. The population of this research was all automotive engineering students of class of 2020 at the Department of Mechanical Engineering, Semarang State University. The data analysis technique used was pre-test and post-test to determine the increase in students' understanding. The increase in students' understanding is expressed in the N-Gain score. Furthermore, the independent sample t-test was used to determine the difference in learning outcomes of the two groups. The results showed that the use of plasticine wax media was able to increase students' understanding of the right-aligned lathe chisel geometry material for automotive engineering students during the covid-19 pandemic in a fairly effective interpretation with a percentage of 57.34%. Meanwhile, the results of the research in the control class, namely the class that used work drawing media, showed a value in the less effective interpretation with a percentage of 42.22%. The conclusion of this research is that there is a significant difference between the application of plasticine wax media and work drawing media on the right-aligned lathe chisel geometry material. Plasticine wax media can be used as a solution to help improve students' understanding because this media is able to provide a real visual picture to automotive engineering students in right-aligned lathe chisel material.

Keywords: *Media, Plasticine Wax, Geometry, Lathe Chisel.*

1. INTRODUCTION

The Study Program of Automotive Engineering Education of Semarang State University implements the education both theoretically and practically. One of the subjects implemented in Study Program of Automotive Engineering Education is Machinery Practice. Literally, the machinery practice is a process to eliminate the unwanted material of a work object in the form made of shavings [1]. The machinery practice is a practical subject where the students are expected to have output in the form of competency in using the lathe machine. The competency in using the lathe machine includes the ability to recognize, operate, as well as produce the work item with lathe machine according to the existing procedure operational standard.

The parameter that needs to be prepared in the lathe machinery practice is lathe chisel. Therefore the skill to hone or prepare the chisel is one of the competency achievements in machinery practice. The lathe chisel is a cutting tool used to eliminate the work item material or cut in the lathe machine. The selection of lathe chisel is an important thing that must be prepared by the students

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at the time of practice. The success in cutting the metal depends on the correct cutting tool selection which is seen from the material and geometry selection. Many kinds of cutting tool materials are available in various types, performance ability, and price. The good lathe chisel selection will also be able to produce the good lathe work [1].

The lathe chisel has different specification and geometry depends on its intended use. In this research the writers emphasized on the right-aligned lathe chisel material. The right-aligned lathe chisel is lathe chisel used to slash the work object from the direction of the head off towards the gripping direction. The geometry of lathe chisel has respective function. Therefore the understanding of right-aligned lathe chisel geometry becomes an absolute thing that must be possessed by the students when executing the machinery practice especially the right-aligned lathe activity. The right-aligned lathe chisel has geometry size as shown in the figure below.

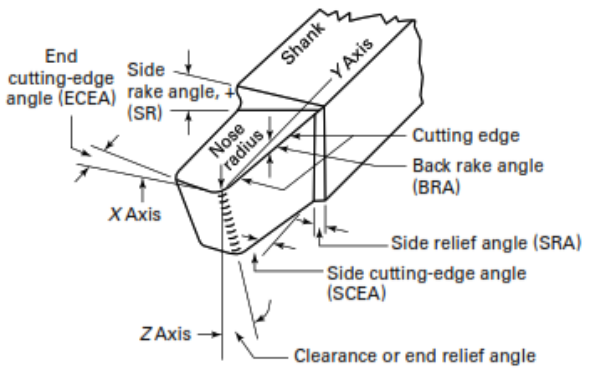

Figure 1 Oblique view of tool from cutting edge [1]

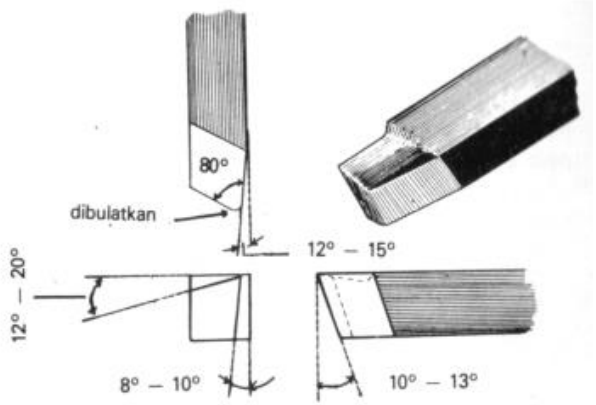

Figure 2 Right hand tool angle geometry [2]

The covid-19 pandemic has caused problems in human life, including the field of education. The learning activity is changed into online learning to reduce the spread of the covid-19 virus. It has a big impact in practical learning activity. The practical learning activity should have been able to bring the students to obtain the direct learning experience to the machine and other machinery components which become the purpose. However because of the pandemic the students are forced to perform the lecturer by online from home so that the direct practical learning experience has not been owned.

The machinery practice material currently is still conducted online. It includes the material to prepare the lathe chisel in the right-aligned lathe chisel geometry understanding in theory and practice. The students currently learn by using the text book and supporting tutorial video without followed by direct practice activity. It causes the students' understanding level to be less good, it is proven by the average of test result of lathe chisel geometry material understanding which is still low.

Many efforts to increase the online practical learning interest have been done by the lecturers to give the understanding to the students. However the practical learning experience cannot be replaced by online.

Involving students in hands-on inquiry is important for their understanding of science as a process and not just as a collection of facts [3]. Experiential learning, particularly when students have ownership of the process, can improve understanding and retention of scientific concepts. Exposing students to the entire scientific method can help build thought processes and facilitate learning skills such as data analysis, graphical presentation of outcomes, and interpretation of their result [4].

The use of learning media showed that the use of learning media can increase the students' learning outcome [5]. [6] Teaching and learning process using various constructive teaching media has significantly improved the science process skill among students. Therefore the writers initiated to implement the learning media which can be used to implement the practical learning even though only in the understanding of right-aligned lathe chisel geometry, not for the application.

The writers implemented the use of plasticine wax as the media with consideration that plasticine wax is a material that is easy to shape with simple tools such as cutter knife. Other than that, plasticine wax is easy to obtain with affordable price. [7] Plasticine is a nontoxic, nondrying modeling clay. [8] Plasticine can be selected material for modeling the practical learning of chisel geometry. [9] Modeling clay is a soft malleable material made from oils and waxes. It can be formed into shapes yet remains malleable and can retain imprints of attempted predation events (beak, mandible, teeth imprints). [10] Use plasticine modelling is a simple, economical, and effective method of delivering teaching in the workplace. By using the learning media that are easily available in the neighborhood it is expected that the students will be able to implement the concept of

lathe chisel geometry with plasticine wax media. Based on the background as mentioned above the researchers conducted the research against the improvement of students' understanding about lathe chisel geometry material in the group using the plasticine wax media with the group using the work drawing media.

2. METHODS AND PROCEDURES

The research method used is quasi experiment method. This method is chosen because the researchers used the group which has been formed naturally. The research design used is nonequivalent pre-test and post-test control group design. In this design, the experiment group and control group are selected without random assignment. In these two groups were conducted the pre-test and post-test but only the experiment group is given the treatment.

The population in this research is all students of Study program of Automotive Engineering Education of Semarang State University in the year of 2020 as amount as 89 students. The sampling technique used is purposive sampling. The sample in this research is all students following the Machinery Practice subject which consists of 44 students divided into Study Group A as control group and Study group B as experiment group.

The research approach used is quantitative approach. The data analysis technique used is Normalized gain (N-gain) test aimed to figure out the effectiveness of the use of plasticine wax media in this research. The gain score is the difference between post-test and pre-test scores. The N-gain test can be used when there is a significant difference between the post-test scores of control group and post-test score of experiment group through the independent t-test. The calculation of N-gain score used the equation below [4].

$$\text{N-gain} = \frac{post\ test\ score - pre\ test\ score}{ideal\ score - pre\ test\ score} \quad (1)$$

Where the ideal score is maximum score that can be obtained. The normalized gain category as showed in Table 1.

Table 1. Category of N-gain Effectiveness Interpretation

Percentage (%)	Interpretation
<40	Ineffective
40 – 55	Less Effective
56 – 75	Quite Effective
>76	Effective

The instrument in this research was the test about students' understanding in the right-aligned lathe chisel geometry material. The instrument was arranged and tested the validity and reliability and furthermore can be used to collect the research data.

The hypothesis of this research is there is a significant and effective difference from the plasticine wax media implementation in the right-aligned lathe chisel geometry material. The hypothesis testing was done using the independent sample t-test to figure out the difference of learning outcome of both groups.

3. RESULTS

3.1. Result

The N-gain test was conducted to acknowledge the magnitude of average increase of pre-test and post-test score from the experiment class and control class. Table 2 below shows the N-gain testing result in detail.

Table 2. N-gain Test Result of Experiment and control class.

N-gain score	Class		Statistic
	Experiment	Mean	.5734
	Control	Mean	.4222

The N-gain testing result showed that the magnitude of plasticine wax media implementation percentage is 57.34%. Based on the table of effective interpretation category it can be acknowledged that 57.34% is in quite effective category. While the implementation of work drawing media showed the result as 42.22%. Based on the table of effective interpretation category it can be acknowledged that 42.22% is in less effective category.

The hypothesis test result showed that there is a significant difference of students' learning outcome increase from experiment group.

Table 3. Result of independent sample t-test

Independent Samples Test				
		t-test for Equality of Means		
		t	df	Sig. (2-tailed)
N-gain persen	Equal variances assumed	2.046	40	0.047
	Equal variances not assumed	1.982	31.748	0.056

The result of independent sample t-test showed that the value of Sig. (2-tailed) is 0.047 < 0.05, then can be concluded that there is a significant difference from the knowledge average between the experiment group and control group so that there is a significant knowledge difference in the implementation of plasticine wax media in right-aligned lathe chisel geometry material.

3.2. Discussion

The pre-test and post-test scores were obtained after the research was conducted to the experiment group which is the group sued the plasticine wax media. The comparison result of pre-test and post-test scores showed that the students' score indicated the improvement. The N-gain score test furthermore was conducted to acknowledge the magnitude of learning outcome increase of the students. The N-gain score test calculation showed that the N-gain score average value for experiment class was 57.34% which was included to the quite effective category.

The comparison result of pre-test and post-test in the control class which used the work drawing showed that the students' score showed the improvement. The N-gain score test furthermore was conducted to figure out the magnitude of learning outcome of the students. The N-gain score calculation for control class was 42.22% which was included to the less effective category.

The implementation of both media has similarity and difference. Both media can improve the students' learning outcome. The difference of both medias implementation is in N-gain score where the implementation of plasticine wax media had quite effective criteria and the implementation of work drawing media had less effective criteria.

The result of normality and homogeneity tests of the experiment group in this research showed normal and homogeneous results. To be able to acknowledge the difference of students' learning outcome improvement, then the testing was conducted to the existence of students' learning outcome improvement difference in the right-aligned lathe chisel geometry material in the experiment class which used plasticine wax media. The result of t-test showed that there was difference of students' learning outcome increase in the right-aligned lathe chisel geometry material.

The goal of this experiment is to introduce students to the scientific method using hands-on experiential learning. Students will follow the scientific process, beginning with asking questions through making conclusions and considering future research. Plasticine wax media can increase the students' learning outcome in the competency of right-aligned lathe chisel geometry. The figure below shows the results of the practice of using plasticine wax.

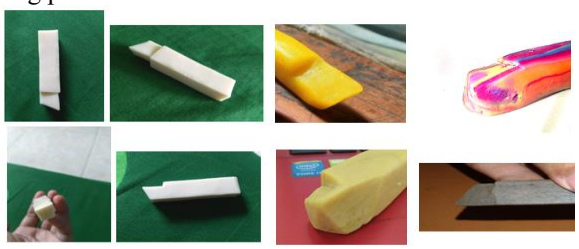

Figure 3 Results of the practice of right aligned lathe chisel by students.

The use of plasticine wax media as model in the learning gives the experience to the students because the use of plasticine wax is able to demonstrate students' learning material so that can give stimulus because the students can represent the original shape of the ongoing learning material [11]. They learn experimental technique, build and field skills [7]. Other research shows that plasticine media can improve skill of students on the molecule shapes [12]. The use of plasticine wax is also able to give real illustration about right-aligned lathe chisel geometry for the students' of automotive engineering education. It present a simple experimental technique using plasticine model of right-aligned as a resource for illustrating these core scientific activities. It is different from the control class which only implemented the work drawing media. The students' understanding with plasticine wax media is getting embedded when they are able to shape the plasticine wax according to the size of real right-aligned lathe chisel geometry.

4. CONCLUSION

The implementation of plasticine wax media is quite effective to increase the automotive engineering education students' understanding in the right-aligned lathe chisel geometry material during the covid-19 pandemic with percentage as 57.34%. The implementation of work drawing media showed less effective value to increase the automotive engineering education students' understanding in the right-aligned lathe chisel geometry material during the covid-19 pandemic with percentage as 42.22%. The result of this research can be concluded that there is a significant difference from the knowledge average between the experiment group and control group so that there is a significant knowledge difference in the implementation of plasticine wax media in right-aligned lathe chisel geometry material. Through this experiment, participating students gained a thorough understanding of the scientific process. Lecturers can easily integrate this lesson into their practical classes and build upon students' inquiry skills.

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