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Promoting Creative Thinking Ability Using Contextual Learning Model in Technical Drawing Achievement

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Promoting Creative Thinking Ability Using Contextual Learning Model in Technical Drawing Achievement

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Abstract. The purpose of this study is to determine whether there is influence; the differences in the results between students that learn drawing techniques taught by the Contextual Innovative Model (CIM) and taught by Direct Instructional Model (DIM), the differences in achievement among students of technical drawing that have High Creative Thinking Ability (HCTA) with Low Creative Thinking Ability (LCTA), and the interaction between the learning model with the ability to think creatively to the achievement technical drawing. Quasi-experimental research method. Results of research appoint that: the achievement of students that learned technical drawing by using CIM is higher than the students that learned technical drawing by using DIM, the achievement of students of technical drawings HCTA is higher than the achievement of students who have technical drawing LCTA, and there are interactions between the use of learning models and creative thinking abilities in influencing student achievement technical drawing.

1. Introduction

Technical drawing means to express an idea or ideas engineers. Therefore, a technical drawing is often also referred to as technical language or languages for the technical experts. Read technical drawing is one of the vocational competence in SMK (Vocational High School) courses mechanical engineering skills that must be mastered by the student. Students of vocational graduates should have the competence expected by the industry or the business world. But in fact the student competence in understanding these subjects is still lack. Students do not understand the subject matter, misread images, wrong to make the image size and so on.

Drawing is the "engineering language". Therefore, it should be able to depict and describe the explanations precisely and objectively. Particulars images accurately and objectively. The information in the form of visual images, symbols, emblems and image standards. Such as information is of ideas, then abstract concepts are realized by the image [1].

SMK, particularly in the Department of Mechanical engineering, the learning process technical drawing is not optimal, because the dominant learning using conventional models. The use of technology and constructivist theories together is more effective and integrated learning devices and usage models designed learning that focuses on student [2]. The main task of the teacher is not only to acquaint the students with information but also to use the information in a proper way in the real world [3]. The innovation of education should have a high impact technical and complexity through technology that includes education by considering future goals [4].

Learning model has five characteristics, namely: the syntax, the social system, the principle of the reaction, and the impact of instructional support system and escort [5]. The learning model is a frame of mind to direct the teacher to design, implement, and guide so that the interaction of teaching and learning that is more focused. Learning is a process of thought, means that knowledge does not come from outside but is formed by individuals themselves in cognitive structure. Learning process be categorized into three types, namely teaching of thinking, teaching for thinking and teaching about thinking [6]. Teaching of thinking is more emphasis on the process of thinking while teaching for thinking emphasis on how the thought process that occurs when learning while teaching about thinking emphasis on how teaching methods can motivate what to think. Constructivist learning in the school setting is strongly supported by the technology, talent, facility, democratic environments, interactive learning, and experience the learning needs of the community of interest [7].

An innovative learning model of learning is by organizing the learning content and learning activities resulting in innovative activity in learning technical drawing. CTL innovative learning is learning, cooperative learning, mastery learning, problem based learning and project based learning. Contributing to integrate creative thinking with critical thinking are very supportive thinking and learning by engaging students thinking skills in learning strategies [8].

Creative thinking is one kind of thinking that directs gained insight are new, new approaches, new perspectives, or new ways of understanding things [9]. Creative thinking occurs triggered by tasks or challenging problems. Creative thinking as the process of obtaining an idea that emphasizes the aspects fluently, flexibility, originality and elaboration in thinking [10].

Creativity can also be seen from the process. Generating a creative product of any kind certainly preceded by the construction of creative ideas [11]. These creative ideas generated through thinking that involves cognitive activity. This process is referred to as creative thinking. A person's ability to think creatively can be improved by understanding the creative thinking process and the various factors that influence and through proper exercise. The factors influencing creative thinking is: contextual, cultural, school, social, economic, acculturation of parents have a significant pathway that leads to creative thinking indexes [12].

This study was formulated as follows: (1) whether there are differences in the results between students that learn drawing techniques taught by contextual Innovative Model (CIM) with Direct Instructional Model (DIM)?; (2) whether there are differences in achievement among students of technical drawings that have High Creative Thinking Skills (HCTA) with creative thinking ability is low (LCTA)?; and (3) whether there are interactions between the learning model with the ability to think creatively to learn the results of technical drawing?

2. Methods

The population in this study were taken from the two schools namely SMK Negeri 5 Medan and SMK Negeri Binaan Provinsi Sumatera Utara. The sampling technique study with cluster random sampling technique. Areas of study technology and technical expertise, courses mechanical technical expertise, competence machining technical expertise, the technical drawing subject, class XI, 3rd semester, and competency standards explain how to read the technical drawing, and the basic competence work piece image complete with size. This study uses a quasi-experimental research by conducting experiments in the classroom that is already available as they are, without making changes to classroom situations and learning schedule.

The technique of analysing the data is descriptive statistic and inferential techniques. In hypothesis testing, the statistic inferential technique which is two-way analysis of variance (2x2 factorial design) with significance level of 0,05 is used in the study. Before two-way analysis of variance (ANOVA) being carried out, an analysis requirement such as Lilifors test for Normality is determined. Fisher (F) and Barlette tests are also employed to try out the Homogeneity requirements in the study. Once the test on all analysis requirements has been done, the two-way ANOVA is possible to be applied. Furthermore, post hoc test is done if the results indicate that the two-way ANOVA is significant. If ANOVA two significant lines, then conducted a further test (post hoc test). Further trials will be

conducted with the Scheffe test 'because they sample of each cell is not the same (n not equal). Based on figure 1, explain about Contextual Innovative Learning Model (CILM) with constructivist approach.
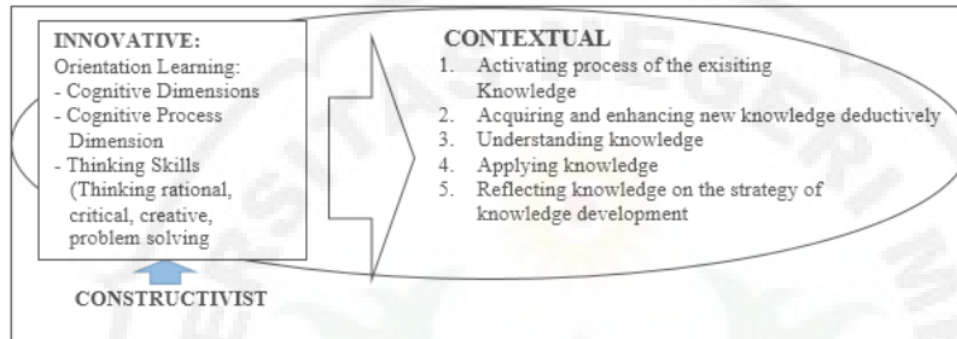

Figure 1. Contextual Innovative Learning Model (CILM) with constructivist approach.

3. Results and Discussion

3.1. Results
Hypothesis testing is done by using analysis of variance (ANOVA). For purposes of analysis of variance, the complete data are provided in table 1.

Table 1. The data of the students' technical drawing achievement.

| Creative Thinking Ability (B) | Learning Model (A) | | Total |
	Contextual Innovative (A_1)	Direct Instructional (A_2)	
High BK (B_1)	$n_{A1B1} = 19$ $\sum X = 565$ $\sum X^2 = 16875$ $\bar{X} = 29.73$	$n_{A2B1} = 15$ $\sum X = 422$ $\sum X^2 = 11950$ $\bar{X} = 28.13$	$n_t = 34$ $\sum X = 987$ $\sum X^2 = 28825$ $\bar{X}_t = 28.93$
Low BK (B_2)	$n_{A1B2} = 14$ $\sum X = 385$ $\sum X^2 = 10651$ $\bar{X} = 27.5$	$n_{A2B2} = 17$ $\sum X = 477$ $\sum X^2 = 13499$ $\bar{X} = 28.05$	$n_t = 31$ $\sum X = 862$ $\sum X^2 = 24150$ $\bar{X}_t = 27.77$
Total	$n_t = 33$ $\sum X = 950$ $\sum X^2 = 27526$ $\bar{X}_t = 28.61$	$n_t = 32$ $\sum X = 899$ $\sum X^2 = 25449$ $\bar{X}_t = 28.09$	$n_t = 65$ $\sum X = 1849$ $\sum X^2 = 52975$ $\bar{X}_t = 28.35$

The calculation results of ANOVA described in table 2 is the summary of 2x2 factorial analysis.

Table 2. The summary of 2x2 factorial analysis.

Variance Source	JK	dk	RJK	$F_{calculation}$	F_{table}	Explanation
Learning Model	90.95	1	90.95	4.48	3.96	Significant
Creative Thinking Ability	24.25	1	24.25	16.82	3.96	Significant
Interaction	262.86	1	262.86	48.61	3.96	Significant
Inter-group	48.20	3	16.06			
Intra-group	329.86	61	5.41			
Total	378.06	64				

The results of analysis of variance for both learning models indicate that $f_{cal.} = 4.485$ is greater than $f_{table(0.05)} = 3.96$ at a significant level $\alpha = 0.05$. Thus, the hypothesis which says that the students' technical drawing achievement using CIM is higher than DIM is true and verified.

The result of analysis of variance for both creative thinking abilities show that $f_{cal.} = 16,820$ is greater than $f_{table(0,05)} = 3.96$ at a significant level $\alpha = 0.05$, so that h_0 is rejected at significance level of $\alpha = 0.05$. Therefore, the hypothesis which says that the technical drawing achievement of HCTA students are higher than LCTA students is true and verified.

In the study, a mean difference test of the two proportions is necessary to be performed since the result of the third hypothesis testing indicates that there is an interaction between the learning models and the creative thinking abilities. Assessed from the effect and the interaction of the learning models and creative thinking abilities, it is noted that the average outcomes of the students' technical drawing learning using CIM are higher than DIM. The study also corroborates that creative thinking ability is one of the students' characteristics which needs to be optimised further, considering the fact that it has significant impact on technical drawing achievement.

3.2. Discussion

Results learn drawing techniques emphasis on cognitive and psychomotor abilities requires students to actively read pictures, and drawing techniques correctly according to ISO standards. Therefore CIM provides convenience for students' active and motivated towards learning can construct itself to evolve, so get learning results increased compared with DIM only gives examples in working on technical drawing without constructing their students to be more active. CIM learning on achievement can be improved because students are taught in the classroom providing a climate conducive to the development of reasoning power, the power of inquiry, and creativity of students. The factors that influence in drawing techniques are: inadequate facilities draw, the factors teacher, and the student background [13].

Contextual innovative learning makes the students have the capacity to think creatively and skilled in solving problems. Students are able to use this kind of reasoning is clear in the process of understanding something, and skilled in making choices, and making decisions, especially in understanding technical drawing, and able to read pictures, and drawing techniques correctly. In addition, learning CIM is also reflected in the results shown students communicative, and collaborative in articulating thoughts, and ideas clearly, and effectively through speech / oral, written, and pictures [14]. Learning technical drawing using the media power point better than with conventional learning, more effective and have higher benefits for students [15].

Innovative learning characterized encourage students to discover new ideas and encourages learner to make new things. Learning technical drawing given appropriate basic competence in the appointment of the material and the size of the projection image is in desperate need of work accuracy and precision of placement and use line drawings properly, so that required students were able to draw correctly. Practice drawing were repeatedly given to the students to provide a good skill ability, so that the drawing be good. Owners drawing tools are not enough to guarantee good performance of students in drawing technique, this should be dated into a fun learning to achieve student success [16].

The learning model should be able to construct the students to active learning. CIM requires students to engage mutually exchange ideas, collaborate, and communicate to achieve the desired learning, so expect pupils to develop communication skills in their technical drawing. Constructivist approach, teachers can engage students in learning activities, they can arrange instruction to meet the different learning levels, and styles, and they can extend the range of resources available for learning [2].

From observation, and discussion of researchers together with teachers in the assessment of learning strategies in the classroom innovative contextual, and DIM, for the treatment classes CIM teacher just give the problem, or problems are different to look for completion by students while in class treated DIM more teachers completing the problems presented in the example. This is evidenced by the length of time the presentation of the subject matter in the classroom DIM compared with a presentation of the material in the CIM class. Reviewed by CIM classes through the guidance of teachers, students find their own knowledge of the problems set by the teacher so that such knowledge will be more meaningful. This lead into the cause of high achievement technical drawing on CIM classes. It is quite reasonable for students who have HCTA will have the curiosity of the ways to find, or solve problems relating to technical drawings until they find the correct answer, the spirit of great learning in order to achievement, it means that the student is not easy influenced by things that are beyond the reach of logic. The ability of the technique to draw the students to the achievement obtained can be increased with the process of creative thinking of students at the stage expected, so with a mastery of the material that has been taught, students will be able to do well.

The study's findings indicate that there was an interaction between the learning strategies and creative thinking abilities on achievement technical drawing. Students who have HCTA has a higher achievement than students who have LCTA taught using CIM as well as with students who have LCTA has a higher achievement than students who have HCTA in class by DIM. This indicates the interaction between the uses of learning strategies with creative thinking skills to the achievement of students of technical drawing.

Students who have HCTA will be motivated to study harder, and be able to control themselves because they are always optimistic to be able to find out information on learning objectives technical drawing in their daily life, and improve achievement. While students who have LCTA may be worried that they are not able to follow the learning drawing techniques considered difficult by most students, considered a bogey in a series of subjects that occupied so will result in the achievement are achieved. DIM is a learning-oriented teacher who is linear, so it is more suitable for students who have LCTA, this is due to the students who have LCTA tend to passively wait for information from the teacher. Thus teachers have many opportunities to provide motivation, encouragement, and guidance so that students are more motivated, and driven in knowing, and understanding the application of technical drawing information in everyday life, and improve achievement, but if learning DIM is given to students who have HCTA will cause boredom and burnout. This is due to the learning process seem monotonous and lacking in variation in the presentation as well as learning about providing opportunities for students to actively and creatively.

4. Conclusions
It was concluded that: (1) The students learn drawing techniques that learned by using CIM get the higher achievement than the students that learned technical drawing by using DIM; (2) The student's achievement of technical drawing HCTA is higher in the study of technical drawing than the students who have the ability LCTA; and (3) There are interactions between the use of models of learning and creative thinking abilities in influencing student achievement technical drawings. The real gaps in teachers is the performance of students in learning, partly due to the shortage of qualified teachers and inadequate resources that will ultimately lead to poor achievement. Teachers continually develop the capacity, motivation, and effective coordination, and control the principals to teachers, teachers' morale, and commitment, is a major determinant of the quality of student achievement [17]. A strong partnership with the industry, making the increased quality of students in technical drawing, and useful

for the students, because it can identify the effectiveness of learning drawing techniques. Teachers will be able to evaluate the students, monitor, and improve their competence in learning technical drawing [18].

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