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Application of *Cluth* Educational Teaching Aid As an Effort to Improve Metacognitive Knowledge

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***Abstract* - Thinking and knowledge developments on HOT's level are the teaching objective inchasis subject, one of them is in diaphragm-type coupling competence. The objective of this research is to measure the result of teaching using cluth educational teaching aid with unmodified media. Research design is experimental with pretest-posttest control group design. Research population is the entire grade XII students of light vehicle engineering competence class from SMK PGRI 1, Serang. The population number is 84. This research use cluster random sampling with TKR1 class of grade XI as control class and TKR2 class of grade XI as experiment class. The analysis result is the experiment class average score is 43,26 (pretest) and 75,9 (posttest) while for control class the result is 46,88 (pretest) and 66,58 (postest). Based on this result, it can be concluded that teaching with cluth educational teaching aid can improve students' metacognitive understanding learning result and also can stimulate the vision, hearing and tactile senses.**

Index Terms – Cluth, metacognitive

I. INTRODUCTION

Education objectives are translated into teaching objectives that consist of knowledge, skill, and attitude. Competence can be achieved through learning process and evaluation process. The achieved result indicates competence level of a particular learning process. Competence is the objective and also result [5] of professional performance [6],[23].

Competence in learning process three major important components, namely*internal condition of learning, the learner's internal states and cognitive processes, and the outcomes of learning* [9]. That concept became the basic for Bloom's development that divided "*learning domain*" (Bloom, 1956) into three classifications or aspects, namely: (1) *cognitive aspect*; (2) *affective aspect*; and (3) *psychomotor aspect*. Then those classification was well known as learning objectives to classify the form in learning level [3] or identified as special thinking framework [1]. Nowadays, it is applied in numerous level of education, as a statement that said [21] *Bloom's Taxonomy is a classification of learning objectives within education that educators set for students*.

Cognitive aspect of learning level is divided into six levels which are grouped into two parts. First three levels are *lower order thinking skill* (LOT'S) that are, memorizing, uderstanding and applying. The next three levels are*higher order thinking skill* (HOT'S) that are analyzing, evaluating and creating [19][20]. LOT'S and HOT'S have been revised by Bloom, so application in education especially the curriculum needs to be revised as well [26].

In the application, cognitive competence is divided into two dimensions, that are cognitive process dimension which is in the form of levels, and knowledge dimension which consists of facts, concepts, procedure and metacognitive. Those two dimensions are interconnected and on vocational level are separated in their own levels. Implementation on vocational levels is not as easy as the concept (a) the number of teachers involved in the development of the instrument doesn't differentiate between those two dimensions and only focus on cognitive process dimension, (b) result of cognitive process dimension doesn't reach to HOTS level – based on observation in SK PGRI 1, Serang. Problems in those particular learnings are affected by several factors, among others the teachers, supporting facilities and infrastructures and the students.

Improvement effeort implemented in this research is by implementing new strategy in learning process. It is by using coupling educational teaching aid before metacognitive or HOTS. The property of that teaching aid is to help make it easier to deliver messages, next the teaching aid is replaced by unintervened real media in order to be declared as mastering metacognitive cognitive competence or the ability for higher level of thinking.

II. CLUTH EDUCATIONAL TEACHING AID

Educational teaching aid is an auxiliary media utilized in the learning process to stimulate and improve students' competence [24]. Educational teaching aid is used to deliver messages, [27] in communication and interaction, [2] that describe work mechanism of a particular object, [11] with the objectives to stimulate students' thoughts, feelings, interest and attention. The shape of teaching aid, generally, is similar with the original one but with more flexibility and simpler. It is designed with several considerations, such as difficulties in understanding a concept if it is explained through the original shape or condition. Other than that, there are also conditions that are difficult to observe so real media are needed as teaching aid.

Development of teaching aid auxiliary media for education purpose should follow certain criteria, that are consideraing teachers' condition, simple, clear and with the correct and unambiguous shape [25]. Beside those, education tool should be durable, in interesting shape and color, simple, easy to manage, in suitable size, can explain the concept of abstract thoughts and can bring benefits. To be cathegorized as worthy

to be used, it should be rational, scientific, economical, practical and functional. A medium which can fulfil all above requirements can be used as auxiliary medium, if not, that media may not help achieve the learning objectives.

Coupling educational teaching aid in this research is for diaphragm type coupling, and it is often found at vocational schools.Development of this teaching aid started from teachers' input that the actual condition is very difficult to understand and also it is hard to measure the knowledge dimension. Meanwhile, understanding the concept through visual auxiliary media is difficult in practice. So coupling teaching aid with cutting to show moving mechanism parts is developed so working components of coupling can be observed directly. This will help to memorize extensively and intensively, [13] and also improve critical thoughts and problem solving [17].

In the learning process, using the coupling educational teaching aid is only for the concept understanding, factual and procedural level. For metacognitive stage, this media is put aside and replaced with actual condition, the aim is to achieve levels of analysis, evaluation and even creation.

III. METACOGNITION KNOWLEDGE DIMENSION

*Metacognition*is defined as thinking about thinking, Kuhn, 2000 andMurti, 2011. That statement can be interpreted as conscious and organized act from cognitive process and product. Metacognitive knowledge refer to someone's deep understanding and awareness about process and product, while metacognitive process refer to someone's ability to monitor and regulate his/her cognition activities during problem solving. Misailidi, 2010 has different view where metacognitive experience is different from metacognitive process [7]. Generally it can concluded that metacognitive is knowledge or activity that regulates cognition.

Metacognitive monitoring and Metacognitive control are affected by the task to be done and the level of that task, [14] also they are affected by how often training is conducted, [12]. In learning process, students required to be more responsible and aware about themselves and about their studies, [28]. Components built metacognitive knowledge is general cognition and knowledge about oneself. Knowledge about cognition tasks includes contextual and conditional knowledge, [10]. Knowledge about various cognitive tasks is difficult and requires cognitive system and cognitive strategies, [7]. Meanwhile conditional knowledge must know when and why using those strategies Paris. So metacognitive knowledge has close relation with various cognitive strategies, cognitive tasks and self-knowledge.

Metacognitive knowledge is divided into three parts:

1) Strategic knowledge, covering knowledge abaout general strategies for learning, thinking, and problem soving.
2) Knowledge about cognitive task, including also knowledge regarding context and suitable condition, also covering knowledge about cognitive operation type that is required to execute particular task, and which cognitive strategies to be used in a certain situation and condition specifically.
3) Knowledge about one self, covers knowledge about self weaknesses and advantages in learning. In this metacgnitive level students are expected to know their own strengths and weaknesses and also know how to overcome those weaknesses as well.

The relation between *cognitive process dimension* and *knowledge dimension* related with students' thinking development are clearly explained in the table 1 below:

TABLE 1.
RELATION BETWEEN *COGNITIVE PROCESS DIMENSION* AND *KNOWLEDGE DIMENSION*

Thinking Development	Knowledge Form	Remarks
Rimember (C1) Understanding (C2) Apply (C3)	Factual Conceptual Procedural	*Lower Order Thinking Skills (LOT'S)*
Analyze (C4), Evaluate (C5), and Create (C6)	Metacognitive	*Higher Order Thinking Skills (HOT'S)*

IV. METACOGNITION KNOWLEDGE DIMENSION

This research is in the form of quasi experiment with *non randomized control group pretest-posttest design*. The objective is to observe the impact of administering a treatment to a particular object. Subject placement in the group is not random, but choosing the group is done randomly.Research subject population are students of SMK PGRI 1 Serang city, Bantenon Light Vehicle Engineering Skill Department (KeahlianTeknikKendaraanRingan = TKR). There are 84students in 2 classes. Research sample is class XI TKR 1 as experiment class and XI TKR II as control class. This research will compare two variables, $X_1$and X_2. X_1variable is students' learning result in metacognitive before the utilization of *cluth*teaching aid, measured with the result of pretest, while X_2variable is students' learning result in metacognitive after the utilization of *cluth* teaching aid, measured with the result of posttest.

Data collection is conducted with test method using test sheet to measure achievement in metacognitive mastering. Data analysis are data analsis pre requirement test with normality and data homogeneity test, and then data analsis test with validity and reliability test, and finally hypothesis test with t-test.

V. RESULT AND DISCUSSION

Class XI TKR 1 as control class has 40 students, while the XI TKR 2 as experiment class has 44 students. The pretest and posttest result of each class are presented in the table below:

TABLE 2
PRETEST AND POSTTEST RESULT FOR EXPERIMENT GROUP AND CONTROL GROUP

Scores Data	Pre test		Pos test	
	Experiment Group	Control Group	Experiment Group	Control Group
Means	43,26	46,88	75,91	66,58
Minimum	32	32	53	53
Maximum	63	68	95	84
Interval	31	36	42	31

The table above indicates that pretest score average for experiment class was 43,26while the control class was 46,88. Different data came for the result of posttest, the average score for experiment class was 75,91and for the control class was 66,58, with minimum passing grade is 75.00. This posttest result indicated that the average score for control class was still below minimum passing grade, while the opposite was demonstrated by experiment class. From the calculation, we found that $t_{count}$was -1,911 and $t_{table}$was 1,680 , so based on that it can be said that $t_{count}$is within the area of H_0 acceptance.So a conclusion was made that there was a similarity of pretest result between experiment class and control class.Posttest score calculation gave us $t_{count}$of 5,24that is much higher than t_{table}1,68, which showed that t_{count} is in the area of of H_0 rejection. So the conclusion was that there was no similarity for the posttest result of experiment class and control class.

Normality test calculatiom result for the experiment class gave us the result of $X2_{count}$= 3,77and for the control class the result of $X2_{count}$=10,57 , while the $X2_{table}$is 11,07. The significance level chosen for this research was 5% with dk 5. This indicated that $X2_{count}$was within the area of H_0 acceptanceso the data for this research have normal distribution. Variance calculation for control class resulted in variance = 46,97while for experiment class the variance was 83,18. From the two calculation, we found F_{count} = 1,77. Looking up at F distribution table with significance 5% and numerator dk (42) and denominator dk (39) we found F_{table}1,93. So the conclusion was F_{count}< $F_{table}$and $H_0$was accepted. This meant that those two classes are homogenous and group variances are not significantly different.

Based on the initial normally distributed data analysis that resulted in F_{count}< F_{table}, it could be stated that those two classes started from homogenous condition. After that those two classes received different treatment, where the experiment class used cluth educational teaching aid and the control class used unmodified teaching aid. Afterwards, both classes would take posttest to evaluate the end result, and the we would do normality test, homogenity test and hypothesis test. Results showed that both classes were normally distributed and homogenous.

Final result of hypothesis test showed t_{count}> t_{table}so H_0 was rejected and H_a was accepted. This meant that the average posttest result for experiment class was better than the result from control class. So it could be stated that teaching with educational teaching aid will give better result than teaching with unmodified general media. The average posttest result for experiment class was 75,91and for control class was 66,58. This indicated that experiment class showed higher improvement between pretest and posttest. Experiment class scored 32,65 points difference while control class was 19,7. The percentage of learning result improvement for both class was 12,95.

Teaching with cluth educational teaching aid in the experiment class also produced several findings related with students learning activity, that are teaching material became applicative, clearer and more real, this would help mastering the metacognition for students. Educational teaching aid stimulates and responds various senses including, vision, hearing, and tactile. Educational teaching aid with color identification for various components will improve the understanding about operational system of cluth that can be directly observed. This is the advantage compared with other media. Improved understanding will surely improve the performance of students.

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Learning result using educational teaching aid cluth improved as much as 32,65 points while the result which did not use educational media improved only 19,7 points.Improvement in learning result for competence in chasis maintenance for light vehicle using aducational teaching aid media cluth was better that learning result without modified teaching aid media, the improvement was as much as 12,95.

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