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Vocational High School Students' Interest in Mathematics by Implementing Contextual Teaching and Learning

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Abstract. The research aimed to improve students' interest in mathematics by implementing Contextual Teaching and Learning (CTL) approach. This research was an action research which developed by Kemmis and Mc Taggart. There are four phases of this research: 1) Planning; 2) Action; 3) Observing; and 4) Reflecting. The subject is class XI Computer and Network Engineering (TKJ) in Vocational High School (SMK) Muhammadiyah 2 Ngawi. The instruments which used to collecting data are questionnaire for students' interest in mathematics and observation sheet using CTL stages. Students' interest in this research consists of five categories. The results of this study: 1) Cycle I showed that 3% students in extemely high category, 38% students in high category, 49% students in moderate category, and 5% students in low category; 2) Cycle II showed that 22% students in extremely high category, 54% students in high category, 35% students in moderate category, and 3% students in low category. Students' interest in mathematics was increase in the end of Cycle II. The findings of this study imply that CTL can be used as an alternative learning approach to improve vocational high school students' interest in mathematics.

INTRODUCTION

Learning mathematics does not only need cognitive skills. Affective domain is also a criticalsuccess factor in learning mathematics. One of the students'affective domains requiring the teacher's attention is the interest to learn, because if the students have nolearning interests, they will have difficulties intheir study or activities. The opinions "interests are preferences for specific types of activities when a person is not under external pressure" [1] and "… interests as preferences for particular work activities" [2], these two opinions can be interpreted that interest is a choice of more preferable activity when a person is separated from the outside pressure. It means that if a person holds interest towards an object of activity, he or she will do these activities with pleasure, without feeling any compulsion. Furthermore, the absence or presence of interest is one of interest factors, as expressed by Gable [2] "interest can be describes with regard to their target, direction and intencity. The targets of interest are activities, the direction can be describes as interested or disinterested and intencity can be labeled as high or low".

Collette and Chiappetta [3] point out that "interest is defined as curiosity or fascination for an idea or even that engages attention". It is in line with Scraw and Lehman proposing that "interest refers to the liking and willful engagement in an activity" [4]. Thereafter, one's extra attention to things/ activities can indicate the level of his /her interests. It is like the opinion of Dai and Sternberg [5] that "interest refers to focused attention, engagement, or both with the affordance of particular content and it is this content that can be said to suggest possibilities for

activity". The researchers agree with these three; because if someone has interests, they tend to give more attention and actively involved in a particular thing for answering their curiosity.

Elliot, et al. [6] point out that "interest is similar and related to curiosity. Interest is an enduring characteristic expressed by a relationship between a person and particular activity or object." Nunnaly and Berstein [2] defining that "interests as preferences for particular work activities". And Silvia [7] has opinion that "interest is the feeling of being engaged, caught-up, fascinated, curious. There is a feeling of wanting to investigate, become involved, or extend or expand the self by incorporating new information and having new experiences with the person or object that has stimulated the interest". From the opinions, students whose has curiosity in activities or idea they can be labeled as low or high interest.

Tabel 1. Preliminary Data

Interval	Preliminary	Category
$100.8<x$	0%	Extremely High
$81.6<x \leq 100.8$	29,73%	High
$62.4<x \leq 81.6$	59,46%	Moderate
$43.2<x \leq 62.4$	10,81%	Low
$x<43.2$	0%	Extremely Low

Based on preliminary data taken from 37 students, it is known that the students'interest in learning mathematics at Class XI Computer and Networ Engineering (TKJ) in SMK Muhammadiyah 2 Ngawi, falls in the moderate category at 59.46% (22 students), 10.81% (4 students) have a low interest in learning mathematics and the average interest in learning mathematics is 73.12. Therefore, Class XI TKJ still falls into moderate and low categories, and it needs improvements. Based on questionnaire data, there are several items becoming the focus on the causes of low interest in learning mathematics, one of which is low curiosity of the students; although curiosity with something can drive someone try to do activity for satisfying their curiosity. If the students'curiosity with mathematics is low, it will make them reluctant and lazy to study mathematics and/or solve mathematics problems themselves. Thereby, they prefer to copy their friend's work.

In addition, the students are afraid of their teachers and they are even reluctant to express their opinion as there are many teachers who start the learning by giving abstract illustration of the materials. The data are also supported by French's pointing out that "one of the great mistakes in the teaching of mathematics, and one to which we are always liable, is that of presenting abstractions familiar to ourselves to minds unprepared for them" [8]. In other words, the teachers assume the students who are about to study mathematics have mastered equal mathematical abilities and ideas as them. It may result in several possibilities: the students become afraid of the mathematics subject or the teacher, and the students become lazy to convey the idea for fear of being wrong. Students' curiosity and fear of the teacher and mathematics, anotherthing found in the data is that the students deem mathematics has no contribution to the materials in vocational study, making mathematics inapplicable to solve the problems in vocational training. It has led vocational school students choose to focus on vocational materials rather than learning mathematics. Another factor as the cause of lack of interest in learning mathematics among vocational school students is unfocused discussions. It is resulted fromless effective learning scenarios designed by the teacher. NCTM [9] mentions that "effective mathematics teaching required understanding what students know and need to learn and then challenging and supporting them to learn it well". Thereby, the teacher is advised to make mathematics learning more challenging. The learning scenario is commonly called Lesson Plan. Prior to implementing the learning in the classroom, the teacher should design proper scenario, so that the learning process in the classroom can achieve the learning objectives. Besides, the students should be provided with an activity that willeventually help them to recall the materials taught and can be usedin solving problems in vocational training. Based on the description above, the required solution to improve the students' interest according to the diagnosis obtained is by applying the Contextual Teaching and Learning (CTL) approach. The need of student to connect their mathematics context to their daily lives is important.

Bern and Erickson [10] said that "Contextual teaching and learning is a conception of teaching and learning that helps teachers relate subject matter content to real world situations; and motivates students to make connections between knowledge and its applications to their lives as family members, citizens, and workers; and engage in the hard work that learning requires". But Carraber and Schiermann [11] underlined that "contextual problems do not directly make mathematics easier and motivating for students". Widjaya said that "contextual problems can bring students to have different kearning experience which will affect their interpretations of the context". So, researcher made a conclusion that contextual problem which given in good CTL approach can give

student experience to construct their own knowledge. Johnson said that "contextual teaching and learning enables students to connect the content of academic subject with the immediate context of their daily lives to discover meaning" [11]. CTL help students to connecting academic studies with their context in their real-life situations. From this connection, student can learn the meaning in mathematics context. Johnson also said that "when students formulate projects or identify interesting problems, when they make choices and accept responsibility, search out information and reach conclusions, when they actively choose, order organize, touch, plan investigate, question, and make decisions to reach objectives, they connect academic content to the context of life's situations, and in this way to discover meaning. Teaching should let students grasp the personal significance of the lessons they are studying. CTL invites students to make connections that reveal meaning. CTL has the potential to increased interest all students in learning" [12].

The CTL approach used in this research referred to the opinion of Crawford [143: there are five stages of learning activities. The five stages of learning in question are: 1) *Relating*; at this stage, the teacher helps the student to connect the knowledge previously learned with the knowledge that will be learned, certainly by connecting it to the real environment; 2) *Experiencing*; the students are provided withdirect experiences and doing the learning while exploring, discovering and inventing; 3) *Applying*; the students know that they are directed to apply the concepts learned in real life and on varying conditions; 4) *Cooperating*, the students are directed to exchange ideas, ask and answer questions, communicate with teachers, students and other learning resources to solve the problems; 5) *Transferring*, in this activity, the students use background knowledge to understand the knowledge to be obtained. Based on Crawford, when students try to do every stage of CTL, they also can understand how to apply mathematics context to real life. Makari [14] has opinion that "the use of CTL in teaching mathematics has the potential to change various aspects of student learning such as interest in mathematics, critical reflection and active participation". Based on these opinions, researcher make a conclusion that CTL can applied in learning mathematics for increased interest in learning mathematics.

EXPERIMENTAL

The research - which was conducted in October-November 2016 at SMK Muhammadiyah 2 Ngawi with Class XI TKJ of SMK Muhammadiyah 2 Ngawi as the test subject – was Classroom Action Research (CAR), consisting of four stages, namely planning, action, observing and reflecting. The model used in this CAR was the model developed by Kemmis & McTaggart or commonly referred to as cycle-forming spiral model [15]. The initial action was to retrieve data on the interest in learning mathematics, prior to the treatment which was aimed to measure the initial condition of the students' interest. Afterwards, the questionnaires were given back, after the treatment was done to determine wether or not the students' interest in learning had reached the target. The questionnaires were comprised of several statements drafted based on indicators of interests that were previously prepared. The questionnaires used in this research were inventory type, consisting of five responses: 5 points were given for *always* (SL) option; 4 points for *frequently* (SR) option; 3 points for *sometimes* (K) option; 2 points for *rare* (JR) option; and 1 point for *never* (TP) option.

Furthermore, to determine the enforceability of CTL, the researcher used observation sheets for enforceability study, consisting of two parts: observation of the learning enforceability by the teacher, and observation of the learning enforceability by the students. Observation oflearning enforceability consisted of two parts, i.e. teacher's activity enforceability, and the students' activity enforceability. The part of teacher's enforceability was used to collect data during the learning activities conducted by teachers using ongoing CTL approach; whilst the students' learning enforceability was used to collect the data related the students' activity in the learning using CLT approach. Observation sheets for learning enforceability were based on the characteristics and steps contained in CTL approach. These observation sheets for learning enforceability have two assessment scales, "yes" or "no". The option "yes" was used if the teacher and students undertook the activities listed on observation sheets, while the option "no" was used if the teacher was yet to perform the activities listed on observation sheets.

This research was conducted in two cycles and each Cycle went by five stages: 1) planning; 2) action; 3) observation; 4) reflection. The research scenario on Cycle I: 1) planning stage for observation on research site and subject, consultation with the other teacher, assessment for learning resources, preparation for lesson plans, and learning interest questionnaires; 2) the research actions conducted by the teacher, referring to the lesson plan prepared at the planning stage; 3) this observation was to observe learning process enforceability, done by the teacher and students, starting from the preliminary activities, core activities, up to closing activities; and 4) reflection was used to analyze the weaknesses and obstacles occurred during the action, to analyze the factors

causing the emergence of weaknesses and obstacles, find alternative solutions for actions, and determine whether or not the previously established targets had been achieved well. If the target had not been reached, the reflection result on Cycle I was used as a reference for planning the action in Cycle II. Upon the reflection of Cycle I, the research was continued Cycle II using the same procedure while considering the reflection results of Cycle I.

Tabel 2. Actuale Score‘sConversion

Interval	Category
$x > \bar{X}_i + 1{,}8\ Sbi$	Extremely High
$\bar{X}_i + 0{,}6\ Sbi < x \leq \bar{X}_i + 1{,}8\ Sbi$	High
$\bar{X}_i - 0{,}6\ Sbi < x \leq \bar{X}_i + 0{,}6\ Sbi$	Moderate
$\bar{X}_i - 1{,}8\ Sbi < x \leq \bar{X}_i - 0{,}6\ Sbi$	Low
$x \leq \bar{X}_i - 1{,}8\ Sbi$	Extremely Low

The instrument employed in this research was questionnairesfor interestsin learning. The data obtained from the questionnaires was analyzed using interval as adapted from Widoyoko [16], where the statements on the interest questionnaireswas made 24 by the researchers. The conversion of quantitative data into qualitative data is shown in Table 2. The interests for learning mathematics in this research is indicated when it reaches a minimum of 46% (a minimum of 17 students) in high learning interest category, and a minimum of 22% (a minimum of 8 students) in extremely high category out of the students in total.

RESULTS AND DISCUSSION

Based on the data in Table 1, the interest in learning mathematics ofthe students of Class XI TKJ shows moderate category. Therefore, the researchers sought to improve the interest of Class XI TKJ students by implementing the learning which connects the materials with their surrounding environment. The data obtained from Cycle I and Cycle II is as follows.

Tabel 3. Interest in Mathematics Data

Interval	Preliminary	Cycle I	Cycle II	Category
$100.8<x$	0%	3%	8%	Extremely High
$81.6<x \leq 100.8$	29,73%	38%	54%	High
$62.4<x \leq 81.6$	59,46%	49%	35%	Moderate
$43.2<x \leq 62.4$	10,81%	5%	3%	Low
$x<43.2$	0%	0%	0%	Extremely Low

From Table 3, from Cycle I we know that one student (3%) falls inextremely high category, 14 students (38%) fall in high category, 18 students (49%) fall in the moderate category, and 2 students (5%) fall in low category. The result show us 20 students stand at moderate and low category maybe it is caused by many teacher and student activities yet. The average score of students' interest in learning mathematics is 81.70, which is included in a high category. It signifies that the students' interest in learning mathematics has improved. So, researcher takes a note for Cycle II. As for questionnaire in Cycle II, it shows that the average score of the students' interest in learning mathematics is 83.92, which is included in the high category. In description, 8 students (22%) fall inextremely high category, 20 students (54%) fall in the high category, 13 students (35%) fall in the moderate category, and one student (3%) falls in low category. This research ended in Cycle II, as the interest in learning mathematics had reached success indicator previously established by the researchers.

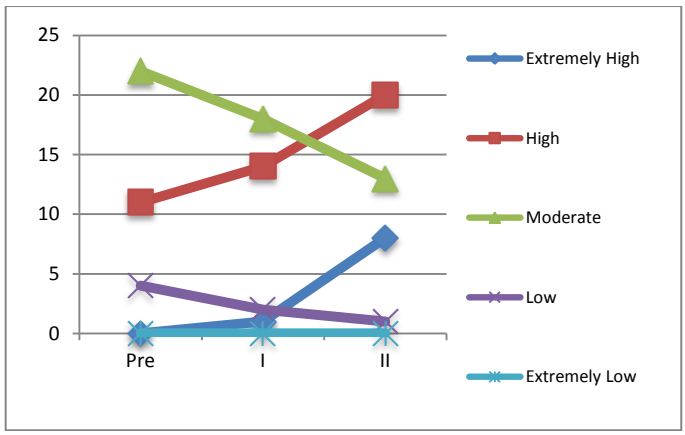

Figure 1. Increased interest in learning mathematics

Figure 1 (chart of interest in overall) demonstrates the questionnaire results of students' interest in mathematics from preliminary till Cycles II. From the figure 1 we know that there is no students falls inextremely high category in before applied CTL. After applied CTL in Cycle I, there is 3 students fall inextremely high category and still stand for Cycle II. The figure also showed to us, that 11 students fall in high category in preliminary. It has been increased after apllied CTL, the figue show us that Cycle I there is 14 students fall in high category and 20 students falls in high category. It indicates that the students' interest in learning mathematics has improved.

This Classroom Action Research generates results that mathematics learning using the applied CTL is liable to improve the interest in learning mathematics of the students at SMK Muhammadiyah 2 Ngawi. It is in line with the research undertaken by Dafid Slamet Setyana and Jailani, with their research experiment which concludes that there is a good interest in learning mathematics after receiving CTL learning [17]. We can point that Makari [14] statement that CTL can improve various aspect include interest in learningmathematics. From this research, several matters are known to have caused improvement in the students' interest in learning mathematics using CTL approach: a) the learning using CTL can connect the materials with the real world. The students can find the connection between the materials and their surrounding condition, making them become more interested, since what they learn has connection with their surrounding environment; b) the learning actions in the classroom are aimed to make the students actively partake in each learning activity, enabling them to satisfy their curiosity. Nevertheless, there are still numerous matters that should be considered to optimize the implementation of CTL in improving the students' interest, including: 1) propermaterial selection; 2) real examples to give must exist around the students; and 3) the teacher's discussion process must approach group discussion, allowing the students to collaborate and share learning experiences.

CONCLUSION

Based on the results and discussions, it can be concluded that the learning using CTL method can improve interest in learning mathematics after the students are provided with two-cycle actions. In addition, there are things that should be considered in implementing the learning using CTL approach: the teacher should learn and understand learning syntax properly to adjust to the materialsbeing learned.

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