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IMPROVING MATHEMATICAL PROBLEM-SOLVING ABILITY AND SELF-CONFIDENCE OF HIGH SCHOOL STUDENTS THROUGH CONTEXTUAL LEARNING MODEL

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Abstract

The purposes of this study are: (1) to know if students' mathematical problem-solving ability taught by contextual learning model is higher than students taught by expository learning, (2) to know if students' self-confidence taught by contextual learning model is higher than students taught by expository learning, (3) to know if there is interaction between learning model and students' early mathematical ability to improve students' mathematical problem-solving ability, (4) to know if there is interaction between learning model and students' early mathematical to improve students' self-confidence. This study is a quasi-experimental research. The population in this study consists of 180 students in grade VIII SMP Muhammadiyah 11 Pangkalan Brandan. Two classes (60 students) are taken as sample. Data were analyzed by two way Anova. The results of this study indicate that (1) students' capability of solving mathematical problems taught with contextual learning model is higher than students taught by expository, (2) students' self-confidence taught by contextual learning model is higher than students taught by expository, (3) there is interaction between learning model and students' early mathematical ability to improve students' mathematical problem-solving ability, (4) there is interaction between learning model and students' early mathematical to improve students' self-confidence.

Keywords: Contextual Learning Model, Mathematical Problem-Solving, Self-Confidence

Abstrak

Tujuan penelitian ini adalah: (1) Mengetahui peningkatan kemampuan pemecahan masalah matematis siswa yang diajar dengan model pembelajaran kontekstual lebih tinggi dari siswa yang diajar dengan pembelajaran ekspositori, (2) Mengetahui peningkatan *self confidence* siswa yang diajar dengan model pembelajaran kontekstual lebih tinggi dari siswa yang diajar dengan pembelajaran ekspositori, (3) Mengetahui terdapat interaksi antara model pembelajaran dengan kemampuan awal matematika siswa terhadap peningkatan kemampuan pemecahan masalah matematis siswa, (4) Mengetahui terdapat interaksi antara model pembelajaran dengan kemampuan awal matematika siswa terhadap peningkatan *self confidence* siswa. Penelitian ini merupakan penelitian kuasi eksperimen. Populasi dalam penelitian ini terdiri dari seluruh siswa kelas VIII SMP Muhammadiyah-11 Pangkalan Berandan yang berjumlah 186 siswa, dengan mengambil sampel dua kelas berjumlah 60 siswa. Analisis data dilakukan dengan Anava dua jalur. Hasil penelitian ini menunjukkan bahwa (1) Peningkatan kemampuan pemecahan masalah matematis siswa yang diajar dengan model pembelajaran kontekstual lebih tinggi dari siswa yang diajar dengan pembelajaran ekspositori, (2) Peningkatan *self confidence* siswa yang diajar dengan model pembelajaran kontekstual lebih tinggi dari siswa yang diajar dengan pembelajaran ekspositori, (3) Terdapat interaksi antara model pembelajaran dengan kemampuan awal matematika siswa terhadap peningkatan kemampuan pemecahan masalah matematis siswa, (4) Terdapat interaksi antara model pembelajaran dengan kemampuan awal matematika siswa terhadap peningkatan *self confidence* siswa.

Kata Kunci: Model Pembelajaran Kontekstual, Pemecahan Masalah Matematis, *Self-Confidence*

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Education provides the possibility for students to obtain a "chance", "hope", and knowledge in order to live better. The magnitude of opportunity and hope is very dependent on the quality of education pursued.

Education can also be a force for change so that a condition for the better (Prahmana, 2010). Quality education must engage students to actively learn and directs the formation of values needed by students in taking life.

Simmers (2011) says that mathematics is often experienced as difficult. Mathematics is one of the very important auxiliary science in everyday life as well as in supporting the advancement of science and technology (Case, 1992; Gooding, 2009: Seifi, et al, 2012). Coockroft (Abdurrahman, 2009: 253) suggests several reasons why mathematics should be taught to students, such as: (1) is always used in all facets of life; (2) all fields of study require appropriate math skills; (3) is a powerful means of communication, clear and concise; (4) can be used to present information in a variety of ways; (5) improve the ability to think logically, accuracy and spatial awareness; (6) to give satisfaction to the efforts to solve challenging problems.Mathematical problem-solving ability is a major part of the learning objectives to be achieved in mathematics. NCTM (Pehkonen et al, 2013) suggests thatthe problem-solving is defined as a teaching method that can improve the quality of teaching mathematics in schools.

The importance of solving the problem is also expressed by Beigie (2008) which says that through problem-solving, students can learn about deepening their understanding of mathematical concepts by working through the issues carefully selected which use the application of mathematics to real problems. The development of mathematical problem solving ability can equip students to think logical, analytical, systematic, critical, and creative. Some indicators of mathematical problem-solving ability by NCTM (in Widjajanti and Wahyudin, 2011: 402; Novita, Zulkardi, & Hartono, 2012) are as follows: (1) identify the elements that are known, were asked, and the adequacy of the required elements; (2) formulate a mathematical problem or to develop a mathematical model; (3) implement strategies to solve the problem (and the kind of new problems) inside or outside of mathematics; (4) explain or interpret the results according the problem of origin; (5) using mathematical significantly.Besides the amount of research in the cognitive aspects in recent years began to affective aspects studied, among others, self-confidence (confidence) that are expected to increase students' mathematical problem-solving ability.

According McPheat (2010) concluded that confidence can proceed on the belief that a person has the ability to succeed in a task, based on the presence or not they have been able to do that task earlier. Someone with confidence to have confidence that they will be able to recover, reduce negative attitudes, and experience a positive attitude. Meanwhile, according to Lautser (in Hendriana, 2012: 93), there are several characteristics to assess the confidence of individuals, such as: believe in their own abilities, to act independently in making decisions, have a positive self-concept, and the courage to express opinions.

Based on the observation that researchers do at SMP Muhammadiyah 11 Pangkalan Brandan obtained information that mathematics learning in school do not yet fully developed a high level of mathematical ability of students such as mathematical problem-solving ability.Learning mathematics is usually done in schools is limited on purpose to improve the ability of cognitive, affective, and psychomotor students without regard to other aspects, the aspects of mathematics are interrelated. In fact, if the teacher can connect mathematical ideas to the students, the students' understanding will be deeper and last longer. One cause of

low ability students' mathematical problem-solving factor lies in learning models. The use of expository teaching model that has been used is more focused on the activity of teachers and students less given the opportunity to develop the skills and knowledge gained only limited to what he learned that thinking skills are not developing optimally, including mathematical connection capabilities.

Expository learning model emphasizes the process of delivering verbal material. In this learning material is delivered directly by the teacher. The subject matter seemed to have been so. Therefore expository learning model emphasizes the process narrate. When researchers observed in SMP Muhammadiyah 11 Pangkalan Brandan, investigators interviewed several students about the learning of mathematics at the school. Students in these schools are likely to see his answers were considered to be good at math than their more trusting with their answers, even to reveal their own answers to the class they did not dare when their answers are correct. Students tend to be embarrassed to come forward class. Students also think math is boring and frightening lesson. While the teachers do not give students the opportunity to construct mathematical knowledge which will belong to the students. Lack of motivation of teachers also can cause a student to be confident. It can be concluded that there is still a lack of self-confidence of students in the school, especially in math.This is in line with researchers test given to students of class VIII-1 at the school. Questions were taken from about solving problems that include indicators of problem-solving. Many students still make mistakes such as not understand the concept and are not able to solve the problem in question. One question that researchers are given to measure students' mathematical problem-solving ability when conducting preliminary studies in class VIII SMP Muhammadiyah 11 Pangkalan Brandan is as follows in Picture 1.

At points dolphins use a circle made of rattan. Calculate the diameter of the ring with, if the circumference of 5.04 m!

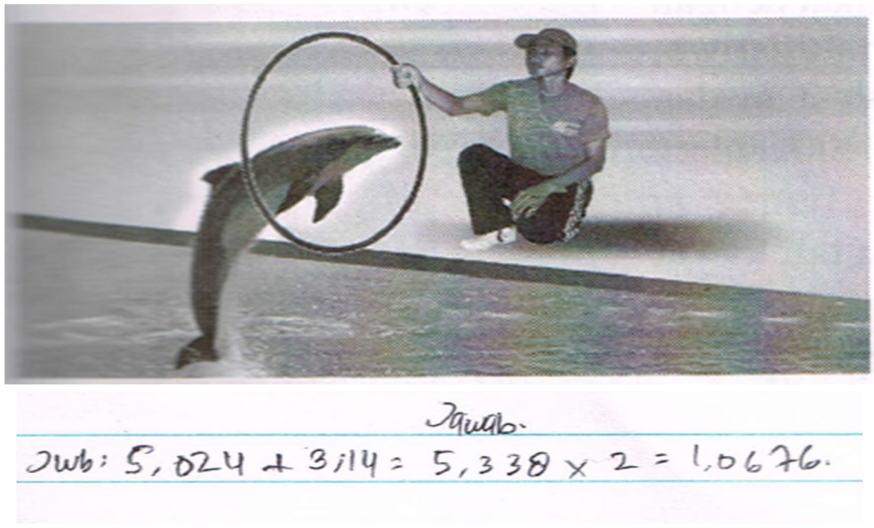

Figure 1. One of student's answer

From one of the students' answers on the material circle above it seems clear that the answer the student has not meet the indicators of mathematical problem-solving. The student has not been able to

identify the elements that are known, were asked, and formulate a mathematical problem or to develop a mathematical model.

Based on the results of the study researchers can tell that the weakness of students are on indicators that are in the problem-solving abilities indicators to identify the elements that are known, asked, formulate mathematical problem or to develop mathematical models and the lack of confidence of students in convey the answers. Therefore, the researchers concluded that the mathematical problem-solving ability and self confidence eighth grade students at SMP Muhammadiyah 11 Pangkalan Brandan is still relatively low.

From the above issues can be concluded that the way of learning mathematics should be updated in order to improve students' mathematical problem-solving become better and raises the confidence of students in solving mathematical problems, it is necessary to improve the model. Based on research Cobb & Bowers (1999); Kumar &Voldrich (1994) stated that based on the contextual learning cognition research has found that the process of constructivists such as critical thinking, inquiry learning, and problem-solving should be situated in the context of physical, intellectual, social and relevant (Glynn, 2004). Contextual learning can be regarded as a learning approach that recognizes and shows the natural conditions of knowledge. Through relationships inside and outside the classroom, a contextual learning approach makes the experience more relevant and meaningful to students build knowledge that they will apply in lifelong learning. Contextual learning presents a concept linking the material that students are studying in the context of the material used, and the relationship of how one learns or how students learn.

Johnson (2007) reveals the eight components in contextual learning, namely: (1) Make meaningful linkages; (2) Independent Learning; (3) Doing meaningful work; (4) In collaboration; (5) Thinking critically and creatively; (6) Helping people to grow and develop; (7) Achieving a high standard; (8) Using authentic assessment. Learning theories that form the basis of contextual learning model (Sariningsih, 2014: 158) are Piaget's theory, Constructivism theory, and Bruner Theory.

Piaget argues that there are two processes that occur in a child's cognitive development and growth, namely: (1) the assimilation process, in this process to adjust or fit new information with what he knew to amend it as necessary; (2) the process of accomodation, namely child compose and rebuild or change what is already known in advance so that the new information can be customized to better. On the implementation of contextual learning, learning theory of Piaget become an important part to understand. Because with Piaget's theory is understood, then the teacher needs to consider the cognitive development of students, because of the mindset of the child will be different with the mindset of adults.

Constructivist theory becomes the main foundation of contextual learning. This is because in contextual learning, students actively construct their own knowledge. In constructivism, knowledge is not set of facts, concepts or rules that are ready to take and remember. But must construct knowledge and give meaning through real experience. Constructivist theory is an important part that must be

understood in a contextual learning, because in contextual learning students actively construct their own understanding rather than as a process in which ideas are transferred to the student teacher.

Contextual learning, Bruner's theory is a theory that is important. This is because the experience of the child will try to adjust or reorganize the structures of ideas in order to achieve a balance in his mind. This is in line with the essence of contextual learning, the students participate actively discover and transform complex information into other situations.

Besides learning model, there are other factors that may contribute to the development of mathematical problem-solving ability and self confidence of students are early mathematical ability of students. Learning is implemented is successful if the students' initial ability of low becomes high after learning implemented. Preliminary knowledge will have an impact on the process of acquiring adequate learning so as to make learning more meaningful by providing opportunities for students to select facts.

Early mathematical ability of students is also important for the development of mathematical problem-solving ability and self-confidence, this is due to early mathematical ability is a student achievement obtained in the previous material. Each student has a different initial ability. It is necessary to get the teacher's attention before implementing the learning, because learning process to some extent will be influenced by prior knowledge possessed by students. The ability of these students can be classified into three categories: the ability of high, medium and low. This is similar to Sanjaya (2008: 54) that states can not be denied that every student has different abilities that can be grouped on a high ability students, medium and low. Gafur (1989: 57) argues that "initial ability of students is the knowledge base of the students before learning takes place". To determine the characteristics and capabilities of early math student, a technique that can be done that (1) Using the records or documents such as report cards; (2) Using a pre-requisite test and the initial test; (3) Conducting individual communication; (4)Delivering questionnaires.

METHOD

This research is a quantitative research model of quasi experimental design with pretest-posttest control group (pretest posttest control group design). Research conducted at SMP Muhammadiyah 11 Pangkalan Brandan, North Sumatra Langkat in the second semester of the Academic Year 2015/2016. The study population was all students of SMP Muhammadiyah 11 Pangkalan Brandan Langkat.. Samples were students of class VIII-1 and VIII-2 with probability sampling techniques. VIII-1 as the experimental class and class VIII-2 as a controled class.

Data collection techniques in this study using the test instrument mathematical problem-solving ability and scale of self-confidence. Data obtained through tests are used to see an increase in the ability of mathematical problem-solving ability and scale of self-confidence of students and look at the interaction between the learning ability of the students beginning to increase the ability of reasoning and mathematical connections.

RESULTS AND DISCUSSION

Description of Early Mathematics Ability Students

Initial ability of students seen from the average value of general tests of mathematics (report cards) students T.A odd semester 2015/2016. Initial ability of students are categorized into high, medium and low.

Table1. Distribution of Research Sample

Sample Research Group	Students's Initial Ability		
	High	Medium	Low
Experimental Class	6	19	5
Controled Class	6	16	8

Based on Table 1 note that the experimental class (Contextual learning model), students with high initial capability No 6, the initial capability was there were 19 people, and there are five people low ability. For the class of the control (model expository) is known to have 6 students have a high initial capability, 16-skilled, and 8 low ability.

Factors Student Mathematical Problem-Solving Ability Improved Mathematical Problem-Solving

To see an increase in mathematical problem-solving ability between the experimental class students (using contextual learning model) with a control class (using the model of expository) then used the calculation of the normalized gain in both classes. Gain normalized (N-gain) is obtained from the difference between pretest posttest scores divided by the difference in maximum score (ideal) with good pretest scores in the experimental class and in the control class.

Table 2. Description of Increasement Mathematical Problem-Solving Ability based on Learning with Initial Ability

CATEGORY KAM	Class					
	EXPERIMENTAL			CONTROLED		
	Mean	SD	N	Mean	SD	N
High	0.849	0.067	6	0.596	0.078	6
Medium	0.683	0.111	19	0.525	0.131	16
Low	0.461	0.086	5	0.523	0.129	8

In general, the mean N-gain for the experimental class is higher than the average gain better control class for capable students beginning high, medium, or low. This means that students who are taught by contextual learning model has increased mathematical problem-solving abilitythan students taught by expository learning model. To test whether the mean difference significant difference test is carried out using Anova two paths as contained in Table 2.

Table 3. AnavaTest Two Line Data N-Gain Mathematical Problem Solving-Ability

Varians Resources	JK	db	RJK	F_0	F_{tabel} $\alpha = 0,05$
Learning	0,296	1	0,296	23,588	4,020
KAM	0,311	2	0,156	12,400	3,168
Interaksi Pemb*KAM	0,125	2	0,0062	4,972	3,168
In	0,678	54	0,013		
Total	1,411	59			

Based on Table 3 shows that the learning factor obtained calculated F value of 23.588 and F table 4.020. Because the value of F count is greater than the value of F table then Ho and H1 accepted. Thus it is known that the increase in mathematical problem-solving ability of students who obtain contextual learning model is higher than the mathematical problem-solving ability of students who received expository learning model.

Learning and human interaction to increasing the capacity in Mathematical Problem-Solving

Test the interaction between the learning factor and factor KAM done using Anova two lines (summarized in Table 2). Test results on the F count shows that there are significant combined effect between the factors of learning with KAM to increase students' mathematical problem-solving ability, as can be seen in Figure 2.

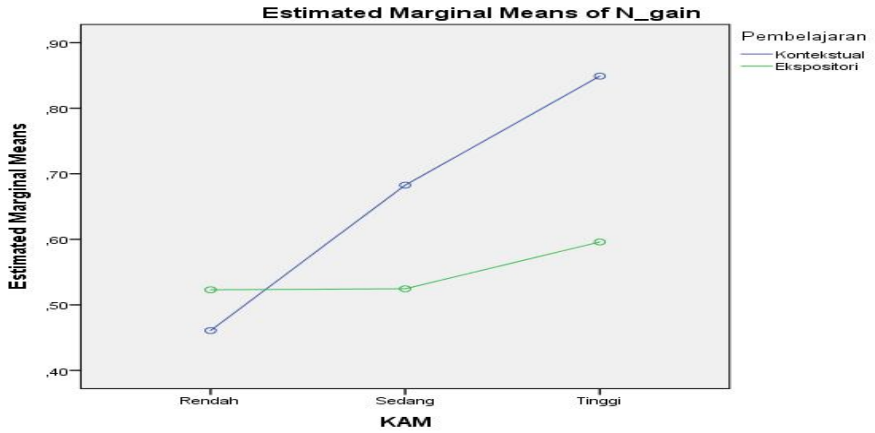

Figure 2. Interaction between Learning with KAM to the Increasement of Problem-Solving Ability Increasement.

Self Confidence Factor Increasing Self Confidence

When viewed under the criteria of the initial capabilities of students, the self-confidence based on the class description (experimental and control) and the initial capabilities (high, medium, and low) are summarized in Table 4.

Table 4. Description Scale Self Confidence Based on Initial Learning Ability

Category KAM	CLASS					
	EXPERIMENT			CONTROL		
	Mean	SD	N	Mean	SD	N
High	0.570	0.168	6	0.271	0.283	6
Medium	0.264	0.124	19	0.233	0.128	16
Low	0.174	0.139	5	0.178	0.091	8

In general, the mean N-gain for the experimental class is higher than the average gain better control class for capable students beginning high, medium, or low. This means that students who are taught by contextual learning model to increase self confidence than students taught by expository learning model. To test whether the mean difference significant difference test is carried out using Anova two paths.

Table 5. Anava TestTwo line Data Gain Self Confidence Scale

Varians Resources	**JK**	**db**	**RJK**	**F_0**	**F_{tabel}** $\alpha = 0,05$
Learning	0,107	1	0,107	4,864	4,020
KAM	0,401	2	0,201	9,090	3,168
Interaction Pemb*KAM	0,169	2	0,086	3,864	3,168
In	1,200	54	0,022		
Total	1,877	59			

Based on Table 5 shown that the learning factor obtained calculated F value of 4.864 and 4.020 table F value. Because the value of F count is greater than the value of F table then H_0 and H_1 accepted. Thus it is known that an increase in self-confidence of students who obtain contextual learning model is higher than the self-confidence of students who received expository learning model.

Interaction Learning with KAM to the Self Confidence Increased

Test the interaction between the learning factors by a factor of KAM done using Anova two lines (summarized in Table 5). Test results on the level of alpha of 0.05 indicates that there is significant influence of a combination of factors of learning with KAM to increase students' self-confidence, as can be seen in Figure 3.

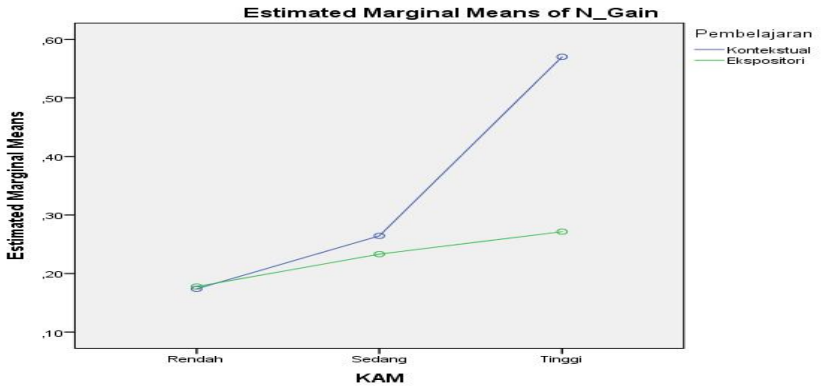

Figure 3. Interaction between learning with KAM to Students' Self Confidence Increased

Overall, there are some of thefindings related to the increase in mathematical problem-solving ability and self confidence of students through contextual learning model including: Most of the students have not been able to understand it well all the problems posed particularly concerns about the ability of reasoning. Students are not familiar with the nature of learning to construct their own knowledge (student centered). The knowledge and skills of students still inadequate.

CONCLUSION

Improvement of mathematical problem-solving ability of students taught by contextual learning model is higher than students taught by expository learning model. Increased self-confidence of students who are taught by the model of contextual learning is higher than students taught by expository learning model.There is an interaction between the learning early math abilities (KAM) students to the increase in mathematical problem-solving ability. There is interaction between the learning early math abilities (KAM) students to increase self confidence.

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