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STUDENTS' ABILITIES TO SOLVE MATHEMATICAL PROBLEMS ACCORDING TO ACCREDITATION LEVELS

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Abstract

Problem solving is important for mathematical learning because it enables students to enhance high thinking skills and positive attitudes. This research aimed at describing and comparing the abilities of junior high school students in grade VIII from one of the regencies/cities in Central Kalimantan (Indonesia) in solving mathematical problems based on schools' accreditations (A, B, C, and unaccredited), and schools' status (public and private). The researcher gave three mathematical problems to the students from 20 samples of schools. The schools were randomly selected from the population consisting of 62 junior high schools. Each student's solution was scored using a holistic rubric. The scores were summarized using some statistics represented in tables and graphics and were analyzed using a Kruskal-Wallis nonparametric test because the data were not normally distributed. The finding indicated that the average scores of the public and private schools' students were 4.71 and 3.49 (scale 0-12), respectively. Based on the percentages, namely 1.91% and 39.66%, the students were classified as good and naive problem solvers, respectively. Further test revealed that the students from the A-accredited public schools significantly achieved the highest score for problem solving skills. Meanwhile, the students in the A-accredited and the unaccredited private schools did not show a significant difference in the skills. Similar result was also found in the public schools which were accredited B and C, and unaccredited.

Keywords: Accreditation levels; good problem solvers; mathematical problems; naive problem solvers; problem solving

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INTRODUCTION

Students can achieve five dimensions of learning by trying to solve mathematical problems in the class. The dimensions consist of developing positive attitudes in learning, acquiring and integrating knowledge, extending and refining knowledge, using knowledge meaningfully, and developing productive thinking habits. The success of learning can be measured through the achievement of the dimensions (Marzano, Pickering, & McTighe, 1993).

Students will be able to solve mathematical problems if they have an appropriate scheme for problem solving. The scheme is constructed from meaningful knowledge of relevant concepts, previous experiences in solving problems, understanding of the problems being solved, and knowledge of problem-solving approaches or strategies (Mairing, Budayasa, & Juniati, 2011, 2012). Knowledge of a concept will be meaningful if it is elaborated with other concepts and its applications in everyday situations (Skemp, 1982; Solso, 1995; Sternberg & Sternberg, 2012). Students can perform the elaboration by learning to solve mathematical problems (Ontario Ministry of Education, 2006; Van De Walle, Karp, & Bay-Williams, 2010). The elaboration also extends and refines the students' knowledge. In addition, the use of meaningful knowledge to solve problems is considered as meaningful tasks (Marzano et al., 1993). Therefore, students who are able to solve problems have achieved the second, third, and fourth dimensions of learning.

Furthermore, students with this ability possess high order thinking skills (King, Goodson, & Soul, 2016; Reys, Lindquist, Lambdin, & Smith, 2009). The skills consist of critical and creative thinking. The critical thinking is a thought process to solve mathematical problems involving collection, organization, analysis, elaboration, and synthesis of information or knowledge that has been acquired by the students in advance (Krulik, Rudnik, & Milou, 2003). Problems are different from routine questions. Problems are non-routine questions whose ways to solve are not immediately visible for the students (Musser, Burger, & Peterson, 2011; Polya, 1973, 1981; Posamentier & Krulik, 2009; Zeitz, 2009). It is called non-routine because the students can not directly use particular formulas or procedures for finding the solution. They need to collect, organize, analyze, elaborate, and synthesize information, or knowledge to devise the solution plans. It is the reason why the ways to solve the questions are not perceptible to the students right away. A model of such questions is: "determine the area of a rectangle whose circumference is 50 cm." Creative thinking is a process of thought directed to arrive at other answers or new ways to solve mathematical problems (Krulik et al., 2003; Matlin, 1994). For instance, the students are instructed to determine the other possible areas of the rectangle in the previous problems or create new solutions. Such problems are called open-ended problems (Bush & Greer, 1999). Furthermore, the critical and creative thinking are also classified as productive thinking (Marzano et al., 1993). Thus, students who are able to solve problems have achieved the fifth dimension of learning.

The ability itself is influenced by students' attitudes to solve problems (Lerch, 2004). The attitudes include motivation, persistence, unyielding, high curiosity, and confidence in unfamiliar situations (Pimta, Tayruakham, & Nuangchalerm, 2009; Zeitz, 2009). The medalists of National Science Olympiad in Mathematics, who were good problem solvers, showed the attitudes as they solved problems (Mairing et al., 2011, 2012). Furthermore, National Council of Teachers of Mathematics [NCTM] (2000) and Ontario Ministry of Education (2006) stated that students can develop the attitudes by learning to solve problems. Accordingly, the students who are able to solve problems have fulfilled the first dimension of learning.

The importance of solving mathematical problems as mentioned above is not yet appropriate to the current schools' conditions. The researcher gave a mathematical problem to 82 students of grade VIII from one of A-accredited junior high schools in one of the regencies/cities in Central Kalimantan in 2016. The result showed that the percentages of students gaining scores of 0, 1, 2, 3, and 4 (scale 0-4) were 65.85%, 24.39%, 3.66%, 2.44%, and 3.66%, respectively. The average score was .54. The students getting scores of 0 or 1, 2 or 3, and 4 could be classified as naive, routine, and good problem solvers, respectively (Muir, Beswick, & Williamson, 2008). Thus, 90.24% of the students were classified as naive problem solvers.

The result was in line with those of other research. The research result on high school students showed that average score of the students' problem solving ability was 2.16 (scale 0-4). In addition, there were 3.1% of the students classified as naive problem solvers, 96.9% of them were routine problem solvers, and none of them were good problem solvers (Mairing, 2017). The research result on elementary school students showed that their ability to solve contextual mathematical problems was very low both in performing numerical operations and in providing justification (Suharta, 2016). This research focused on describing the ability of junior high school students to solve mathematical problems. The result could be used by teachers, schools' principal, and governments to improve the students' ability.

The government should improve the conditions by increasing the ability of the students to solve mathematical problems. The ability can be enhanced if factors that influence the ability are also improved. These factors include competence of teachers, quality of mathematical learning, media and facilities of learning, and learning resources, especially books in school libraries (Ho & Hedberg, 2005; Lonsdale, 2003; Pimta et al., 2009).

Mapping out the qualities of the factors in schools is required in order to improve the students' abilities. The government has actually mapped these qualities through school accreditation. The accreditation is an assessment of schools' qualities, both public and private, conducted by the government through Badan Akreditasi Provinsi Sekolah/Madrasah or Provincial Accredited Board for Schools/Madrasah (BAP-S/M). The assessment results are in the form of levels: A (excellent), B (good), and C (fair). The accreditation intends to obtain descriptions of schools' performances as a means to develop and enhance educational quality, and to determine the extent of a school's properness in the management of educational services (*Badan Akreditasi Nasional Sekolah/Madrasah* (National Accreditation Board for Schools/Madrasah) [BAN S/M], 2010). A school is accredited if it meets specific requirements that involve having a decree of establishment or operation, having students in each grade, having school facilities, having teachers and educational staffs, having graduate students, and implementing the national curriculum. Meanwhile, the schools which do not comply with the requirements will not be accredited.

The establishment of the levels of accreditation is in accordance with the scores determined by a school accreditation instrument. The instrument assesses the quality of the eight national educational standards consisting of contents, processes, competencies of graduates, abilities of teachers and educational staffs, facilities and infrastructure of schools, schools' management, finance, and educational assessments. Schools are accredited into levels A, B, and C if the final scores are 86–100, 71–85, and 56–70 respectively.

A-accredited schools must have a better education quality than the B, C accredited schools and the unaccredited. The good quality should provide positive effects on the abilities of students to solve problems. However, the preliminary research showed a contradictory fact. The contradiction raised a question of whether the school accreditation can be used to map the ability of junior high school students to solve mathematical problems.

Additionally, schools in Indonesia can be classified based on their status, which are public and

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private schools. Both statuses receive support of operational costs from the government. However, private schools are not fully supported by the government. A great deal of the operational costs is charged to parents in the forms of tuition and development fees. In public schools, the salaries of teachers and educational staffs and improvement in the quality of school facilities are funded by the government. Moreover, the government programs to enhance teacher competencies are aimed more to public than private schools.

As self-financed schools, some private schools charge a relative costly tuition fees. The fees are compensated for small classes, and good school facilities. It is intended to lead the students to achieve high academic achievement. However, some private schools accept students who are unaccepted in the public schools. Private schools have also become a choice for some working students because their working hours, which are mostly in the morning, are in the same time as learning hours in public schools. Such differences raise a question whether the difference of government's attention to public and private schools influences the students' ability to solve problems.

Based on the description, the researcher conducted the present research purposing to describe and compare the abilities of eighth grade junior high school students in one of the regencies or cities in Central Kalimantan to solve mathematical problems based on schools' status and accreditation levels. The schools' status is divided into public and private schools. The accreditation levels consist of A, B, C-accreditations, and unaccredited.

This research mapped the quality of schools based on the ability of the students to solve problems. The map provided a description of learning mathematics performances in junior high schools with a certain status and accreditation. The description can be used by the government, the schools' principals, and the teachers to determine and implement policies, programs, or activities to improve the quality of mathematics education. In addition, the results of this research can be applied to evaluate the appropriateness of recent accreditation instruments as a means to map the schools' quality in terms of the management of education services.

METHOD

The design of this research was a 2×4 factorial design with two independent variables which were schools' status and accreditation levels. The first variable had two levels, which were public and private schools. The second variable had four levels, which were A, B, C-accreditations, and unaccredited. The research was conducted in five stages (Cohen, Manion, & Morrison, 2007; Lodico, Spaulding, & Voegtle, 2006). The first stage was the researcher formulating research hypotheses. The hypotheses were:

$$H_0: M_{SA} = M_{SB} = M_{SC} = M_{SN} = M_{PA} = M_{PB} = M_{PC} = M_{PN}$$

H_1 : not H_0

where

M_{SA}, M_{SB}, M_{SC} = The median of students' scores of the A, B, and C-accredited public schools, respectively.

M_{PA}, M_{PB}, M_{PC} = The median of students' scores of the A, B, and C-accredited private schools, respectively.

M_{SN}, M_{PN} = The median of students' scores of the public and private unaccredited schools, respectively

In the second stage, the researcher selected some sample schools from the research population. The population was all grade VIII junior high school students in 2015/2016 academic year from one of the regencies/cities in Central Kalimantan, Indonesia. The population framework was 62 schools in the regencies/cities. The sample was selected using clustered-stratified random sampling. The result was 10 private and 10 public schools selected as the sample (Table 1). All students in the sample schools were given a research instrument by the researcher.

In the third stage, the researcher developed a research instrument in the form of a test consisting of three mathematical problems. The second and third problems were performance assessments adapted from Quasar Tasks (Parke, Lane, Silver, & Magone, 2003). The problems represented two kind of problems, in which the first and the third were closed problems, and the second was open-ended problem. The closed problem is problem with one correct answer. The open-ended problem is problem with several correct answers (Bush & Greer, 1999).

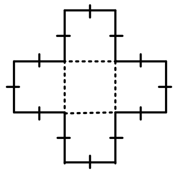
Table 1. Population and sample

	Status	Accreditations			Unaccre-dited
		A	B	C	
Population	Public	5	6	6	11
	Private	7	8	3	16
Sample	Public	2	2	2	4
	Private	2	3	1	4

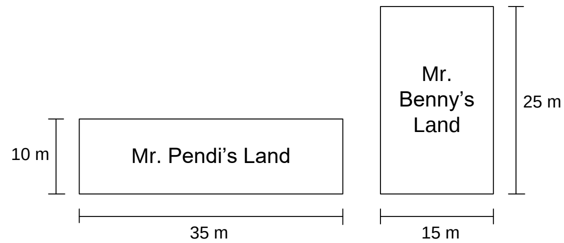
The three problems were in relation to the same concepts, about the area and perimeter of a rectangle. The researcher chose the concepts because the students of grade VIII had learned it since they were in the fourth grade of elementary school. Moreover, it was also one of the concepts tested in the elementary school national examination. The students had also learned the concepts in grade VII. Therefore, the students of grade VIII should have better understanding of the concepts and be able to solve the problems provided in the research instrument.

Mathematical Problems

1. The plane figure on the right side is formed by 5 squares with equal lengths. If the circumference of the plane is 72 cm, the area is ...



2. Mr. Anto has the materials to build a fence of 60 m in length. He will utilize all the materials to fence his rectangular garden.
    (a) What are the length and width of the garden if all the materials are completely used to make the fence? Explain your answer!
    (b) Similar to (a), is there any other possibilities for the length and width of the garden? If the answer is yes, determine the other length and width! Explain your answer
3. Mr. Amir wants to buy a piece of land. Mr. Pendi and Mr. Benny want to sell their land to him in the following size.



    (a) If Mr. Amir wants to buy a land with the largest area, whose land should be bought? Explain your answer!
    (b) If Mr. Amir wants to buy a land with the cheapest cost to build fences, whose land should be bought? Explain your answer!

In the fourth stage, the researcher collected data by giving the three problems to all the students from the sample schools. Each student's solution was scored using a holistic rubric of problem solving (Bush & Greer, 1999; Charles, Lester, & O'Daffer, 1997; Sa'dijah & Sukoriyanto, 2015). The maximum score of each problem was 4 (Table 2). Thus, the maximum score of each student was 3 × 4 = 12.

Table 2. The holistic rubric of problem solving

Score	Description
0	a. Students did not write anything on the solution sheet. b. Students wrote the known and the target, but their understanding of the problems seemed to be not noticeable.
1	a. Students wrote the known and the target correctly; there were steps of solutions, but the ways of solution were not appropriate. b. Students tried to achieve sub-targets, but they did not succeed. c. Students got the answers correctly, but they gave no ways of solution.
2	a. Students used inappropriate ways of solution, and the answers were incorrect, but the solution showed some understanding of the problems. b. Students got the correct answers, but the ways of solution were not understandable, and inappropriate.
3	a. Students applied appropriate ways of solution, but they misunderstood or ignored some parts or some conditions of the problems. b. Students used appropriate ways of solution, but they answered the problems incorrectly without explanation, or they did not write answers. c. Students wrote the correct answers, and gave some evidences indicating that the students applied appropriate ways of solution, but the implementation was not completely correct.
4	a. Students used appropriate ways of solution, implemented it correctly, and wrote the correct answers. b. Students used appropriate ways of solution; the answers were correct, but there were few miscalculations.

The fifth stage was analyzing the data and drawing conclusions. The students' scores were represented using tables and diagrams, and were summarized using specific statistics. The purpose is to provide some descriptions dealing with the problem solving abilities of junior high school students of grade VIII in one of the regencies/cities in Central Kalimantan. Furthermore, the researcher employed a Kruskal-Wallis test to draw conclusions about the hypotheses. The researcher used the test because the result of a Kolmogorov-Smirnov normality test showed that the data were not normally distributed. Additionally, all assumptions of the test were met since the samples were randomly selected and independent, and the scale of scores was ordinal (Daniel, 1989; Kadir, 2010). If the result of the test showed the data support to reject H_0, the researcher would conduct a further test. The intention was to determine which levels of accreditation have the highest students' scores and show significant differences.

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RESULTS

The researcher gave the three problems to all eighth grade students in the 20 sample junior high schools. Each student's solution was scored using the holistic rubric (scale 0–4). There were three problems, so the maximum score for each student was $3 \times 4 = 12$. The result showed that the average scores of the students' problem solving ability was 4.29; it was less than the maximum score (Table 3). This was because the average percentage of students receiving scores of 0 or 1, and 4 in each problem was 69% and 12% respectively (Table 4).

Table 3. Summary of scores

		Accreditations			Unacc-redited	All Stu-dents
		A	B	C		
Public	Average	5.24	2.29	3.31	2.10	4.71
	Median	5	2	3	2	4
Private	Average	3.09	3.13	1.93	4.17	3.49
	Median	3	3	1	4	3
All Students	Average	5.01	2.96	3.07	3.72	4.29
	Median	5	3	3	3	4

The students' can be classified as naive, routine, and good problem solvers based on their ability to solve problems. The government, the school boards, and the teachers certainly expect that their students can be classified as good problem solvers who got score 4 for each problem. The results of this research indicated that the percentage of good problem solvers was 1.91%. The good problem solvers were not even found in the public schools of B, C-accreditations and unaccredited, and in the private schools of A, B, and C-accreditations. Furthermore, the good problem solvers were only found in the public schools of A-accreditation in the percentage of 3.52%, and in the unaccredited private schools with a percentage of .69% (Table 5). However, there were some students receiving scores of 4 at the first, the second, or the third problem, but they did not get a score of 4 for all problems. The percentages of those students in the public and the private schools were 15.5% and 5.6%, respectively (Table 4).

Table 4. The number of students' score in percentage

School Status	Score	Problems 1	2	3	Average
Public	0	15.5	27.7	18.7	20.6
	1	54.9	49.2	26.4	43.5
	2	2.8	6.1	19.5	9.5
	3	5.7	3.1	24	10.9
	4	21.1	13.9	11.4	15.5
Private	0	19.7	26.8	15.8	20.8
	1	71	61.5	39.1	57.2
	2	4.1	2.2	31.4	12.6
	3	2.5	3.8	5.5	3.9
	4	2.7	5.7	8.2	5.6
All Students	0	17	27.4	17.7	20.7
	1	60.5	53.5	30.8	48.3
	2	3.2	4.8	23.6	10.5
	3	4.6	3.3	17.5	8.5
	4	14.7	11.1	10.3	12

Table 5. The percentage of 4-scored students in each problem

School Status	Accreditations A	B	C	Unaccre-dited	All Students
Public	3.52	0	0	0	2.78
Private	0	0	0	.69	.27
All Students	3.14	0	0	.54	1.91

The government, the school boards, and the teachers need to improve the ability of students receiving scores of 0 or 1. The percentages of those students for the first and the third problems (closed problems) were 77.5% and 48.5%, respectively. The percentage for the second problem (open-ended problem) was 80.9%. Furhtermore, there were some students receiving scores of 0 or 1 for the first, second, or third problem, but they did not get a score of 4 for all problems. The percentages of those students in the public and the private schools were 64.1% and 78%, respectively (Table 4). In general, the percentage of students receiving a score of 0 or 1 for each problem (the naive problem solvers) was 39.66%. The naive problem solvers were found more in the C-accredited private schools and the unaccredited public schools with percentages of 92.86% and 70.73%, respectively (Table 6).

Furthermore, the research result indicated that the highest average was found in the A-accredited public schools. This result was also shown by the center line of boxplot of students' scores which was the highest among all schools (Figure 1). The good problem solvers were mostly found in the public schools with A-accreditation. On the contrary, the naive problem solvers were the least found in those schools. Therefore, the students of the A-accredited public schools had the highest ability to solve problems among the other schools descriptively. Meanwhile, the students of the C-accredited private schools had the lowest average of the scores among the other schools. There were no good problem solvers in the schools. Furthermore, the naive problem solvers were mostly found in those schools. The data indicated that there were differences in the students' ability to solve problems between the A-accredited public schools and the C accredited private schools descriptively.

The significance of the score difference was analyzed using the nonparametric test, Kruskal-Wallis. The researcher used the kind of test since the data were not normally distributed. The Kolmogorov-Smirnov test was conducted by using Minitab 16.2.1. The result was $p - \text{value} < .01 < .05 = \alpha$. In addition, all assumptions of the test were met. The assumption was the data drawn by using the proportional clustered-stratified random sampling, the sample schools, were independent since the selection of a school as sample was not influenced by the other schools, and the scale of the total score was interval.

Table 6. Percentages of 0 or 1-scored students for each problem

School Status	Accreditations			Unaccre-dited	All Students
	A	B	C		
Public	27.04	68.57	52.24	70.73	34.26
Private	52.31	51.41	92.86	42.76	4.73
All Students	29.75	54.8	59.26	48.92	39.66

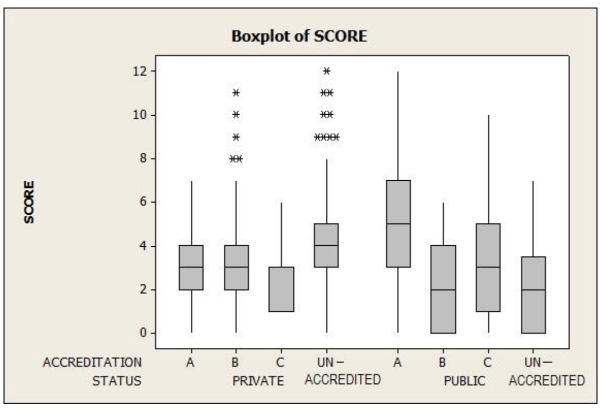

Figure 1. Boxplot of scores based on the schools' status and level of accreditations

The Kruskal-Wallis test result using Minitab 16.2.1 was as follows.

Table 7. The result of the Kruskal-Wallis test

Status* Accreditation	N	Median	Ave Rank	Z
Private*A	65	3	402.6	−3.36
Private*B	142	3	399.5	−5.31
Private*C	14	1	239	−3.56
Private* Unaccredited	145	4	523.8	−.05
Public*A	540	5	625.8	11.1
Public *B	35	2	309.5	−4.28
Public *C	67	3	418.6	−2.97
Public* Unaccredited	41	2	285.3	−5.17
Overall	1,049		**525**	

H = 158.92 DF = 7 P = 0
H = 161.3 DF = 7 **P = 0** (adjusted for ties)

The conclusion of the test, at least one of the scores, was significantly different from the others ($p - \text{value} = 0 < .05 = \alpha$).

The researcher conducted more tests to determine which scores were significantly different. The result indicated that the students' scores from the A-accredited public schools were the highest and were significantly different from those of the other schools, both public and private ones, with $\alpha = 5\%$. Conversely, the lowest scores were in the C-accredited private school, but the scores were not significantly different from the A, B-accredited private schools, and the B, C-accredited and unaccredited public schools (Table 8).

Moreover, the result indicated that the students' scores from the public schools were not always significantly higher than those of the private ones (Figure 2 and Table 8). In A-accredited public schools, the students' scores of were higher than those of the private ones. Conversely, in unaccredited private schools, the students' scores were higher than those of the public ones. In B and C-accredited schools, the scores were not significantly different between the public and the private schools.

According to the data, the results also indicated that the students' scores of A-accredited schools were not always significantly higher than the students' scores of B, C-accredited, and unaccredited schools. In the public schools, the condition was supported by the research data, but in the private schools, the students' scores of A-accredited school were not significantly different from B, C-accredited, and unaccredited schools (Table 8).

The students' scores of A-accredited public schools were significantly higher than those of the unaccredited ones. On the contrary, there were no differences in the private schools. This condition occurred because there were some students who were outliers in two of the four samples of unaccredited private schools (the sign * in the boxplot on Figure 1). The score became outlier if the student's score ranged from 9 to 12. The score was higher than the average students' score of the unaccredited private schools at the level of 4.17. The percentages of the students who became outliers in the two schools were 33.3% and 50%. Those students made the average scores in both schools at the level of 6.13 and 7.33, which were higher than the average scores in the A-accredited public schools. This condition occured because both schools had ideal numbers of students in a class, which were 6 and 7. In addition, both schools were facilitated by good learning facilities and learning process.

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Table 8. The results of further test

Status	Accre-ditations	N	Average	Grouping		
Public	A	540	5.24	X		
Private	Unaccre-dited	145	4.17		Y	
Public	C	67	3.31		Y	Z
Private	B	142	3.13			Z
Private	A	65	3.09		Y	Z
Public	B	35	2.29			Z
Public	Unaccre-dited	41	2.1			Z
Private	C	14	1.93			Z

Note. The same letters in grouping indicated no differences in the measure of central tendency. The different letters indicated the difference.

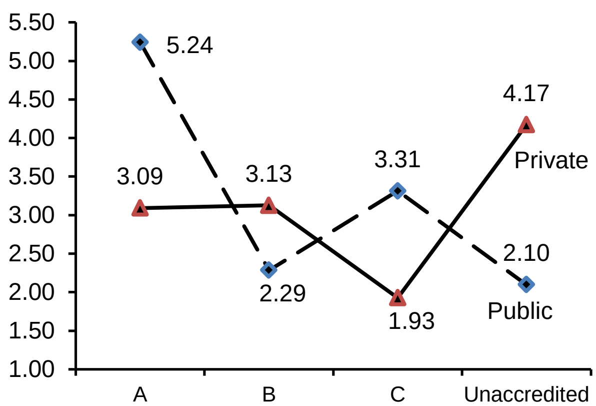

Figure 2. The interaction plot of students' scores

DISCUSSION

Students must have the ability to solve mathematical problems since they will be able to achieve the five dimensions and the main purpose of learning mathematics by solving the problems. However, the results of the present research indicated that the average score of the students was 4.29, and it was less than maximum score of 12. The ability of those students needs to be improved by increasing their motivation and self-efficacy in solving math problems. Teachers are also need to help the students in constructing an appropriate scheme of problem solving by applying conceptual knowledge-based learning. Moreover, teachers are expected to provide a great deal of opportunities for students to solve problems in the classroom and to correct their mistakes, to guide students in using the problem solving stages of Polya, and to provide feedback. Finally, teachers are also expected to evaluate the students' progress of problem solving ability in order to improve their ability (Charles et al., 1997; Hanula, 2002; Ho & Hedberg, 2005; Krulik et al., 2003; Mairing et al., 2011, 2012; Matlin, 1994; Pimta et al., 2009; Polya, 1973; Ruffel, Mason, & Allen, 1998; Woodward et al., 2012).

The students are classified as good, routine, and naive problem solvers. The government, the school boards, and the teachers certainly expect their students to be classified as good problem solvers. However, the result of this study indicated that the percentage of good problem solvers was 1.91%. On the contrary, the percentage of naive problem solvers was 39.66%. The percentage was even greater in the C-accredited private schools, and the unaccredited public schools, at the levels of 92.86% and 70.73%, respectively.

Students can be classified as naive problem solvers since they had some difficulties in understanding the problems and making some appropriate solution plans. Students have some difficulties in understanding the problems because they did not understand the words in the problems, did not process the information/known to form an appropriate mental image, were not able to determine the important information, and did not have any scheme of relevant concepts (Mairing, 2014, 2017; Pape, 2004). The difficulties inhibited the students to solve problems (Tambychik & Meerah, 2010).

Furthermore, students had difficulties in making some appropriate solution plans because they did not have meaningful knowledge of relevant concepts and had limited knowledge of problem-solving strategies. Their knowledge was limited to find some values by substituting the known numbers in the problems to some specific mathematical formulas. They did not elaborate the prior knowledge to construct some appropriate plans, and they did not have any previous experience in solving some isomorphic problems (Mairing, 2014; Pape, 2004). Two problems are said to be isomorphic if they have the same structure but different contents (Sternberg & Sternberg, 2012). In addition, they based the solution plans on one or two means to obtain the answer in which they were trying some numbers to a remembered formula or known equations without understanding of trial and error strategy or using previous means, whereas the previous problem and the problem being solved were not isomorphic (Muir et al., 2008).

The conditions differed from the characteristics of good problem solvers. These solvers understood the problem by forming an appropriate mental image, made some solution plans, and thought about how the plans worked. They also demonstrated metacognitive skills as they implemented the plans. In addition, they looked back to the solution while implementing the plans by checking certain solution against the previous ones, understanding of the problems, or the relevant concepts. The looking back was also carried out at end of the problem-solving activities by substituting the answers obtained to the model representing the problem (Carlson & Bloom, 2005; Mairing et al., 2011, 2012).

Furthermore, good problem solvers were only found in the A-accredited public schools. The result of further test also indicated the students from those schools significantly had the highest scores. It occurred since the schools were favorite schools, so the number of students enrolled to the schools was more than its capacity. The schools were supposed to be a favorite because of the school's achievement in some academic Olympiads or some non-academic competitions, Besides, all students from the schools passed the national exam of junior high schools, and a great deal of the schools' graduates enter favorite senior high schools in the regencies/cities, or in Java. A great deal of registrants made the schools select incoming students based on their best scores of elementary school national exam. Regarding good inputs, the students from the A-accredited public schools had significantly better ability than those in the other schools.

In addition, the schools had good learning facilities such as good buildings, classrooms, learning media, laboratories, and libraries. The good facilities could create such pleasant and convenient school environment and good learning process that the students could develop their abilities, and acquire high learning achievement (Lonsdale, 2003; Tiurma & Ratnawati, 2015; Utami, Sutama, & Subadi, 2012). The condition appealed to elementary school graduates to enter the A-accredited public junior high schools.

On the contrary, the B, C-accredited, and unaccredited public schools had the same characteristics that were accommodating the elementary school graduates in order to continue their study to junior high schools. The purpose was to succeed the 9-year education program launched by the government. Some junior high schools are located in remote area, or can only be reached via river from the center of the district/city, and were the only schools in their respective area. The condition made the schools obligated to accept all elementary school graduates in the surrounding areas with different levels of ability without selection process.

The other common characteristic was inadequate learning facilities in the B, C-accredited, and unaccredited public schools. The condition was different from the A-accredited public schools. Meanwhile, the facilities were one of the factors influencing students' success of learning mathematics. The main indicator of the success was the students' ability in solving mathematical problems (NCTM, 2000).

The characteristic of students' problem solving ability in the B, C- accredited, and unaccredited public schools were not significantly different. In other words, the ability of the students in those schools was the same. This similarity also appeared in the percentage of the naive problem solvers that was higher than 50%, and there were no good problem solvers in those schools. This condition was contrary to the meaning of accreditation where the B-accredited schools ought to have better quality than the C-accredited schools.

The contradiction also occurred in the A, B, and C-accredited private schools, in which the abilities of the students were not significantly different. The condition was indicated by the result of further test. The similarity was also demonstrated by the absence of good problem solvers in those schools. The condition was an impact of the independence of the private schools in financing, developing learning facilities, and improving teachers' competencies.

The incompatibility meaning of accreditation occurred since the accreditation instrument had not been able to map the quality of mathematical learning. The quality was measured by the ability of students to solve mathematical problems. In general, the instrument assessed eight standards regarding the quality of classroom learning contained in the process standard. There were eleven questions in this standard which were more directed to whether teachers created lesson plans and implemented them in the classroom. However, whether the plans were directed to improve the ability of students to solve the problems was not the concern of the standard. In addition, there were no questions about whether teachers posed mathematical problems continuously in the classroom. Did teachers guide their students to understand the problems, to make the solution plans, to implement the plans, and to look back at the solutions? Did teachers evaluate progress of students' ability to solve the problems? Those questions should be in the instrument, so there was a match between the schools' accreditation, and the quality of mathematical learning.

CONCLUSION

The researcher gave three mathematical problems to students from 20 sample schools, which were 10 public and 10 private schools. The students' solutions were scored using the holistic rubric with the maximum score of each student of 12. The result of the research indicated that the average scores of the students of public and private schools were 4.71 and 3.49, respectively.

The scores could be used to classify the ability of the students to solve problems. The classification was good, routine, and naive problem solvers. The students who got a score of 4 for each problem could be classified as good problem solvers. The percentages of good problem solvers in the public and private schools were 2.78% and .27%. Furthermore, the good problem solvers were only found in the A-accredited public schools, and the unaccredited private schools by the percentage of 3.52% and .69%.

The students who scored 0 or 1 for each problem were classified as the naive problem solvers. The percentages of naive problem solvers in the public and private schools were 34.26% and 48.73%, respectively. In the public schools, the highest percentage was from the unaccredited schools with 70.75%, while the lowest was in the A-accredited schools at the level of 27.04%. In the private schools, the highest percentage was in the C-accredited

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schools at the level of 92.86%, while the lowest was in the unaccredited schools at the level of 42.76%.

The scores were analyzed using the nonparametric Kruskal-Wallis test. The result indicated that there was a significant difference in the students' scores in terms of levels of accreditation and the school status. Therefore, the researcher conducted further test. The result of further test showed that the ability of the students of the A-accredited schools to solve the problems was significantly different from the B, C-accredited, and unaccredited in the public schools. However, the students' scores of B, C-accredited, and unaccredited public schools were not significantly different. In the private schools, the ability of the students from the unaccredited schools was not significantly different from those of the A-accredited schools, but there was a significant difference between the B and C-accredited schools. Furthermore, the students' scores from the A, B, and C-accredited private schools were not significantly different.

The students are expected to have the ability to solve mathematical problems since they are able to acquire high order thinking skills and achieve the main goal of learning mathematics by solving the problems. In addition, they are also able to develop the positive attitudes by learning to solve the problems. However, the result of the research indicated that only 1.91% of the students had the expected ability as the good problem solvers.

Therefore, the government should take some actions to improve the ability of students to solve mathematical problems. The government can do so by improving the competencies of the teachers in the public and private schools to create motivating learning environment for their students to develop the ability. It can be conducted by increasing the role of the Council of Teachers of Mathematics. In addition, the government should incorporate problem solving in the standard process of the national school curriculum from elementary to secondary schools. Therefore, the teachers are encouraged to learn and meet the standard in creating lesson plans and implementing the plans in the classrooms.

The government should also create some questions in the accreditation instrument related to the improvement in the students' ability to solve problems, especially on the standards of content, process, graduate's competency, and educational assessment. It should be aimed at the betterment of the school accreditation, so it can indicate how concerned the schools are in improving the ability of their students to solve problems. Therefore, the accreditation result can be the basis for some government policies to improve the quality of mathematics education.

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