Teacher's Ability for Solving Mathematical Problems

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Abstract*— The ability of teachers to support the process and learning outcomes that needs to be improved quality and professionalism as a teacher. The purpose of this study is to determine the knowledge of teachers in solving mathematics problems about the national exam questions. Subject in this study was mathematics teachers of SMP/MTs as many as 20 people from ten schools in Pidie District selected by purposive sampling. This research was a descriptive research with the qualitative approach. Research data obtained from the test of professional competence for mathematics problems equivalent to the question of National Examination (UN) at junior high school level, and the results of the discussion with the subject of research. Furthermore, the test results are converted to percentage values and analyzed descriptively. The result of the research shows that 65% of teachers complete in answer thirty math problems. Most teachers have difficulty in solving non-routine math problems and also relate to angular materials and lines, sets, and comparisons. Thus, to improve the professional competence of teachers in mastering mathematics material is needed.

Keywords-component; ability, teacher, mathematics problem, national exam

INTRODUCTION

Presiden Republik Indonesia (2005) in Government Regulation No. 19 of 2005 on National Standards of Education states that there are four competencies that must be owned by every teacher so that can be said professional teacher. The four competencies are pedagogic, professional, social, and personality. Among these competencies are related to each other. If one of the competencies is not owned or has a low value it will impact on other competencies.

In this article will be discussed about one of the competencies of professional competence. This competency is closely related to the ability of teachers to master the subject matter of the subject, although there are some materials that are related to other subjects. However, this reason cannot be a provision for teachers to teach subjects outside of the subject areas studied during education. This is in accordance with the statement of Koehler & Mishra (2009) that professional competence or content knowledge is a knowledge of the material or subject that is usually learned or taught. Furthermore, Shulman (2011) mentions that the content includes knowledge of concepts, theories, ideas, frame of mind, the method of evidence and evidence, and its components. Thus, professional competence cannot be separated from the ability of teachers to master the subject matter in accordance with the learned and taught.

In this case the ability of prospective teachers also needs to be considered and improved so that when a teacher can apply science with the right target. Sulastri, Johar, & Munzir (2012) in the results of their research stated that the ability of subjects vary based on the accuracy of the analysis in solving aspects.

The results of observations at several junior high schools in Pidie District as well as data on Teacher Competency Test (UKG) results show that teachers' ability is still very low in competing at national and international level. This affects the low ability of students in understanding and answering math problems, especially about the UN.

The data of UN Mathematics Subjects for Junior High School/MTs in Pidie District, Aceh in the academic year 2014/2015 obtained an average score of 78.62 (category B) with the highest score of 100 and the lowest score of 17.5. The lowest percentage for mastery of mathematics matter material is in statistical matter and probability that is 64.19%. More clearly can be seen in Table 1.

Based on Table 1 it can be concluded that the material related to non-routine applications and questions is the most difficult mathematical material for junior high school students, especially junior high school students in Pidie District, Aceh. It is interrelated with the material that is considered difficult to be taught by the teacher and also the teacher's understanding in the mastery of the material.

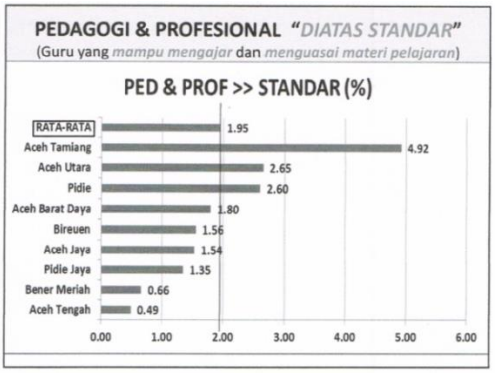
In addition to the impact of teachers' ability on the results of UN students, the results of UKG can also be seen to what extent teachers' understanding of pedagogic and professional competencies. One of the UKG results can be seen in Figure 1.

From Figure 1 it can be seen that Pidie District is one of the districts that have a pedagogical and professional competency value below the standard, where teachers are not

able to teach and do not master the subject matter. Based on this, the purpose of this study is to determine the ability of teachers in the mastery of mathematics material equivalent to the question of National Exam junior level so that can be identified obstacles encountered.

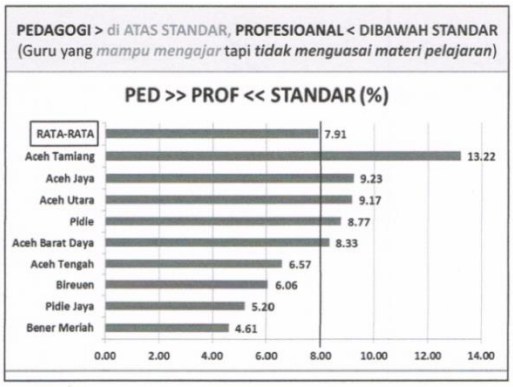
Table 1. The Lowest Percentage of Grain Problems for Student's Ability to Answer Mathematics Problem SM SMP 2014/2015 (BSNP, 2015)

No. question	Assessed Capabilities	Percentage of City / District Level
8	Solve problems related to arithmetic sequence problem	23.76
9	Complete the number of numbers	54.30
22	Calculate the combined area of two triangular, square, parallelogram, split; kite with its size	25.68
25	Determine the length of the top line segment, if the base line length is known or vice versa from two similar trapezoidal images with the sides and side comparisons (legs)	25.16
36	Complete the story related to ball or tube area	25.81
38	Determining the mean value interpretation of the overall data of the average value of the data of one and two different data	49.22
40	Completed the story about the chance of drawing the draw number from the participants and provided by the prize	28.92



(a)

(b)



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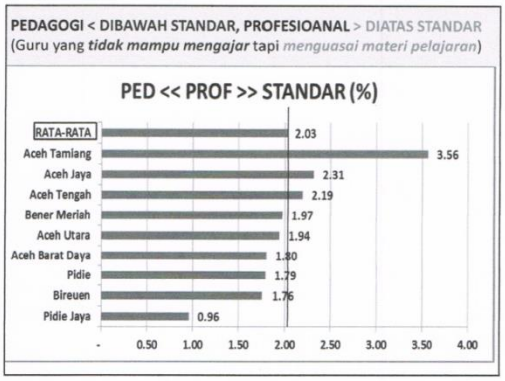

(d)

Figure 1. Competency Test Results in 9 Partner Districts USAID Aceh Province Priorities for Professional and Pedagogic Competencies: (a) above Standards, (b) under Standards, (c) Pedagogic above Standards, and (d) Professionals above Standards
(Source: Pidie District Education Office, Aceh 2014)

METHODOLOGY

The type of research used is descriptive with quantitative approach. The subjects involved were 20 mathematics teachers from ten junior high schools / MTs in Pidie District who were selected by purposive sampling. The research data was obtained from the test result done at the beginning of the meeting and also the result of Focus Group Discussion (FGD). The test problem used is a matter of the UN within a few years chosen based on the level of material and also the material that is considered difficult. Problems are given in the form of multiple choice (choice) as many as 30 questions, but each subject is asked to decipher the answer. This is done in order to know the process of the problem because it can be classified material that is considered still not understood.

RESULTS AND DISCUSSION

Implementation of professional competence test for mathematics problem equivalent about National Examination (UN) junior high school level is followed by twenty mathematics teachers from several schools in Pidie District. The purpose of this test is to determine the teacher's early ability to understand math problems, especially the

UN before the next training. In addition, this is to know the difficulties or constraints of teachers in understanding certain mathematical materials. For the results of the teacher's reply with the rule that the value of greater or above 70% declared complete and vice versa below 70% declared not complete. The percentage of the answers can be seen in Table 2.

Table 2. Percentage of Answers for a Mathematics Test

No	Teacher Code	Answering (%)		Information
		True	False	
1	G1	23	77	Not Completed yet
2	G2	20	80	Not Completed yet
3	G3	73	27	Completed
4	G4	67	33	Not Completed yet
5	G5	60	40	Not Completed yet
6	G6	60	40	Not Completed yet
7	G7	50	50	Not Completed yet
8	G8	53	47	Not Completed yet
9	G9	73	27	Completed
10	G10	70	30	Completed
11	G11	73	27	Completed
12	G12	73	27	Completed
13	G13	73	27	Completed
14	G14	73	27	Completed
15	G15	73	27	Completed
16	G16	73	27	Completed
17	G17	77	23	Completed
18	G18	77	23	Completed
19	G19	77	23	Completed
20	G20	77	23	Completed

Based on Table 2 can be seen that there are 35% of unresolved subjects in answering and understanding math problems that are part of the UN problem. In this case some of the subjects stated that there are some material that is not remembered because it is rarely applied, for example the material that is considered difficult to be found in the class that is not taught. In addition, there is also a problem material that is difficult to understand because it forgets the use of formulas such as statistics about the combined average. For the classification of material that is considered difficult based on the wrong answer answered by the subject can be seen in Table 3.

Based on Table 3 it can be seen that there is one problem with the wrong Angle and Line material being answered by all subjects. From the process of completion obtained through the subject answer found that the obstacles experienced as understanding the concept of the number of angles that are associated with the line and also algebraic operations. In this case the concept of subject geometry is still low let alone be associated with other material. Though this form of question are often issued in the matter of the UN.

In addition to geometry, the set and comparison are also materials that are largely mis-answered by the subject. In the case of a set of problems related to the mapping, most subjects use the wrong formula. This is because the lack of understanding about the material. In addition, there are some teachers who just guess the answer without making the process of completion because the matter in the form of choice.

Table 3. Classification of Matter Missed in Professional Competence

No question	Material	Amount (%)
1	Social Arithmetic	10
2	Comparison	90
3	Two-Variable Linear Equation System	0
4	Comparison	20
5	Two-dimensional figure	20
6	Statistics	20
7	Two-dimensional figure	15
8	Two-dimensional figure, angle	30
9	Statistics, comparison	55
10	The Set	90
11	Function	10
12	Angles and Lines	45
13	Angles and Lines	100
14	Operation Algebra	5
15	Operation Algebra	10
16	Operation Algebra	10
17	Operation Algebra	35
18	The Equation of the Straight Line	15
19	The Equation of the Straight Line	40
20	Two-Variable Linear Equation System	30
21	Two-Variable Linear Equation System	0
22	Flat Field	20
23	Quadratic Functions	35
24	The Equation of the Straight Line	20
25	Comparison	10
26	Flat Field, Comparison, Angle	10
27	Flat Field, Comparison, Angle	15
28	Flat Field, Comparison,	60
29	Flat Field	35
30	Statistics	20

For comparative material, there are some questions that relate to or relate to other materials so that in the process of completion it requires a proper understanding of the comparison. In this case most of the questions related to the comparison are still answered less precisely by the subject. Welder & Simonsen (2007) mentioned that in understanding the concept of comparison requires an understanding of the concept of variables. It is closely related to the basic material of algebra. According to Welder (2006) there are eight prerequisite concepts in mastering the basic algebra: numbers and numerical operations, ratios/proportions, the order of operations, equality, patterning, algebraic symbolism including letter usage, algebraic equations and functions, and graphing.

In Government Regulation (2008) no. 74 of 2008 stated that professional competence includes competence for mastery of subject matter in depth and in-depth in accordance with standard contents of educational unit program, subject, and / or group of subjects that taught. In addition, relevant scientific, technological or artistic discipline concepts and methods, which are conceptually shaded or coherent with the educational unit, subjects, and / or subject groups to be tested.

Professional competence is very supportive in the learning process. This is in line with the statements of Ball, Thames & Phelps (2008) that understanding of content or subject matter is necessary in teaching. If a teacher does not have an understanding of the material to be taught then the learning process will have difficulty. This will have an impact on the wrong material to be taught to learners. Therefore, special content-related training is required to develop teachers' ability in mastering mathematical material.

CONCLUSION

Based on the results of the study it can be concluded that 65% of teachers complete in answer thirty math problems. Most teachers have difficulty in solving non-routine math problems and also relate to angular materials and lines, sets, and comparisons. Thus, to improve the professional competence of teachers in mastering mathematics material is needed.

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