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DESCRIPTION OF BASIC KNOWLEDGE MATHEMATICS STUDENTS OF CLASS X HIGH SCHOOLS IN KONAWE DISTRICT

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Abstract

This research is a type of exploratory research that aims to describe the Basic Mathematical Knowledge (PDM) of class X students of SMA Negeri in Konawe Regency. The population in this study were all grade X students of SMA Negeri in Konawe District, where the determination of the study sample was carried out by combining simple random sampling techniques (cluster random sampling) and proportion of strata (Proportional Stratified Random Sampling). The approach used is a quantitative approach, while the data analysis used is descriptive. Descriptive analysis is intended to describe the characteristics of research variables by using the highest score, lowest score, average, standard deviation, variance, and percentage of student achievement in each indicator. The average PDM test of students is still in the low category, with an average of 39.13. As many as 76.7% or 345 students from 450 samples scored below 50 with a standard deviation of 15.31. From 40 indicators of PDM questions tested, students were only able to answer four indicators well (presentation of correct answers above 70%).

Keywords: Basic Mathematics, Knowledge, students

A. Introduction

The problem of learning outcomes in mathematics is one problem that is still a problem in the world of education in Indonesia, and this can be seen in the results of the implementation of the National Examination (UN) Senior High School in 2018. The value of Mathematics Subjects experienced the most significant decline in the implementation of the Senior High School. Head The Ministry of Education and Development Section of the Ministry of Education and Culture, Totok Suprayitno said for the Senior High School in Natural Sciences department, the average score of the Mathematics National Examination in 2018 reached 37.25. That score has decreased

by 4.67 compared to 2017, with an average value of 41.92. The Social Sciences department, the National Mathematics UN score decreased to 4.73. For the language department, the National Mathematics UN score dropped 2.48. The decline in the value of the National Examination also occurred in Mathematics in Junior High Schools (SMP). Totok Suprayitno stated that there was a decrease in the average national exam results for the junior high school level for Mathematics subjects by 50.31 in 2017 to 43.32 in 2018 (http://www.republika.co.id). This is supported by previous studies which found that there were still many students who had below-average mathematics learning outcomes. The results of research conducted by Halistin, et al. (2015: 17) in class IX students of the SMP Negeri Kendari city of 1,321 students obtained that the average test of students' basic mathematics knowledge is in the low category with an average of 55.73. There are 194 students out of 405 students whose math scores are less than 55 (Maonde, 2013: 113-142), and the average mathematic score of 97 students is 53.5 (Rahim, 2012: 49-62). On the other hand, basic knowledge of mathematics has a positive effect on mathematics learning achievement (Margiana, 2015: 24).

Junior High School National Exam results in low mathematics subjects will have an impact on the results they will get when they are at the Senior High School (SMA). This will become a continuous problem if it is not resolved as early as possible by looking for what the causes are because the ability of mathematics competence in SMP students is a prerequisite ability that students must master to understand mathematics at the SMA (Farman, Chairuddin, & Hali, 2019: 83). Inline revealed by Ruseffendi (1991: 260) that in order to master the material concepts in mathematics properly, it must also master the concepts of the prerequisite materials well. If it is compared to understanding mathematics as building a house, if the foundation is not strong, then the house will fall down, and conversely.

Many factors cause the low learning outcomes of mathematics, both internal and external factors. Suryabrata said that internal factors are physiological and psychological factors (for example, achievement motivation and cognitive abilities), while external factors are environmental and instrumental factors such as teachers, curriculum, learning models all of which constitute a unity interrelated and work in an integrated manner to achieve the goals set (Sumadi, 1993: 27).

Through the experience experienced by researchers while becoming a teacher at the high school level, the low student mathematics learning outcomes, one of the causes is the low basic mathematics knowledge of students. The phenomenon that is often found by teachers is that many students have not been able to operate integers either addition, subtraction, multiplication, or division of integers and fractions. The fact is that integer operations are operations that are needed in almost all material in mathematics. Basic knowledge of mathematics which is minimal causes students to be difficult to solve problems in each learning process that has a low impact on student mathematics learning outcomes.

B. Literature Review

Schwartz et al. (in Halistin et al. 2015: 18) state that people learn by developing their existing knowledge and abilities. It is essential to develop educational activities that are relevant to the knowledge students have so that they can study well. Correspondingly, Gollub et al. (in Ali and quoted again by Halistin et al. 2015: 18) suggest that the basic knowledge that students carry in learning situations is considered to be an essential factor in facilitating the depth of the learning process.

Dochy et al. (In Hailikari and quoted again by Halistin et al. 2015: 18) identified eight theories that tried to explain the influence of basic knowledge on learning. Although these theories differ in their approach, they are still closely related to one another or overlapping in some circumstances. All of them are associated with different phases in information processing. These theories offer various interpretations of how basic knowledge influences learning through a variety of processes: (1) In the learning process, basic knowledge functions as a "category label" that influences the way new information is organized and added to the existing knowledge structure (the restructuring) approach): (2) Basic knowledge functions as an assimilative context in which new material is linked to existing ones and as a result knowledge is increased and more easily found through the elaboration process; (3) Activation of basic knowledge increases access to that knowledge during the learning process (the accessibility approach); (4) Basic knowledge influences learning through existing readiness so that relevant information can be received more readily (the selective attention approach); (5) Basic knowledge influences learning through cues: the more basic knowledge, the more knowledge available in one's memory (the availability approach); (6) Activating basic knowledge when learning new material

can improve memory and retrieval of information from existing knowledge. (the retrieval approach); (7) Basic knowledge is arranged through schemata, which influences the interpretation and understanding of new situations (the schema-transfer approach) and, finally, (8) More basic knowledge, resulting in faster information processing (representation-saving approach).

C. Methodology

This research is an explorative type of research aimed at describing in-depth about the basic knowledge of mathematics in class X students of SMA Negeri in Konawe District. The population in this study were all grade X students of SMA Negeri in Konawe District. The determination of the study sample was done by combining simple random sampling techniques (cluster random sampling) and the proportion of strata (Proportional Stratified Random Sampling) where researchers randomly selected 15 SMA from a total of 22 SMA in Konawe District. Based on a simple random technique from a total of 22 SMA in Konawe District, 15 SMA were obtained as research samples as follows: (1) SMA Negeri Anggaberi; (2) SMA Negeri 1 Wawotobi; (3) SMA Negeri 2 Unaaha; (4) SMA Negeri Amonggedo; (5) SMA Negeri Lambuya; (6) SMA Negeri Tongauna; (7) SMA Negeri 1 Besulutu; (8) SMA Negeri 1 Konawe; (9) SMA Negeri 1 Pondidaha; (10) SMA Negeri 1 Unaaha; (11) SMA Negeri 1 Wonggeduku; (12) SMA Negeri 2 Wawotobi; (13) SMA Negeri Meluhu; (14) SMA Negeri 1 Abuki; dan (15) SMA Negeri 1 Uepai. From 15 SMA that were used as research samples, a random sample of 30 students consisted of 15 students in the Natural Sciences department and 15 students in the Social Sciences department, so that the total sample was 450 students.

Data collection techniques in this study were obtained by using a multiple-choice selection PDM test of 40 numbers which is the accumulation of students' absorption of mathematics since the student got mathematics lessons starting from elementary school until now which are very basic in nature such as addition, subtraction, multiplication, division, root shape, square rank and fraction that are measured through indicators: (i) concepts and operations of addition (+), subtraction (-), multiplication (x), division (:), root ($\sqrt{}$), exponent (x^n); (ii) fractions; (iii) percent; (iv) algebra; and (v) the application. After being given a PDM test on 450 students, the results obtained in the form of scores from each student then the results will be analyzed using descriptive statistical analysis intended to describe the characteristics of research variables using the highest score, lowest score, average, standard deviation , variance and percentage of student achievement on each indicator and the level of difficulty on each item. Therefore, this research uses a quantitative descriptive approach.

Before use, the PDM test is first tested. The results of the validity and reliability analysis based on trials were conducted by researchers by giving PDM test instruments to 150 respondents spread in 5 high schools in Konawe District. The five state high schools are (1) SMA Negeri 1 Pondidaha; (2) SMA Negeri 1 Unaaha; (3) SMA Negeri 1 Wawotobi; (4) SMA Negeri 1 Wonggeduku and (5) SMA Negeri 1 Uepai. The validity of the instrument measured was empirical validity based on students' PDM test data using the biserial correlation coefficient formula. Based on the analysis using the SPSS ver 21 application, it was found that all test items tested were valid at $\alpha = 0.05$, with rtable = 0.1348. This means that the instrument being tested is suitable for use in this study. The reliability coefficient (r_{ii}) is 0.93, which means that the PDM test results of the 40 test items have a very high consistency.

D. Finding and Discussion

1. *Findings*

The results of data processing analysis using descriptive statistics obtained the following results:

Table 1. Descriptive Statistical Analysis of Basic Mathematical Knowledge

		Score	Interval
N	Valid	450	450
	Missing	0	0
Mean		39.13	4.59
Median		37.50	5.00
Mode		35.00	5.00
Std. Deviation		15.31	.88
Variance		234.39	.77
Range		77.50	4.00

Minimum	10.00	1.00
Maximum	87.50	5.00
Sum	17607.50	2066.00

(Data processed with SPSS ver 21)

Table 2. Frequency Distribution of Basic Mathematical Knowledge

Score		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	80-100	8	1.8	1.8	1.8
	70-79	16	3.6	3.6	5.3
	60-69	23	5.1	5.1	10.4
	50-59	58	12.9	12.9	23.3
	0-49	345	76.7	76.7	100.0
	Total	450	100.0	100.0	

(Data processed with SPSS ver 21)

The results of the analysis of basic mathematical knowledge based on Table 1 obtained an average value (mean) of 39.13, a median of 37.50 and a mode of 35.00 scattered from a value of 10.00 (minimum value) to 87.50 (maximum value) with a standard deviation of 15.31 and variance of 234.39. Based on the description of the results of the descriptive analysis, the average basic knowledge of mathematics in class X SMA Negeri Konawe is still relatively low. Table 2 shows that 76.7% or 345 students from 450 samples received grades below 50, and 12.9% or 58 students received grades between 50 - 59, so that if the accumulated number of students who received a PDM score below 60 were 403 students or around 89.6%. This is inversely proportional to the number of students who score above 80, only eight students or 1.8%.

The description of students' basic mathematical knowledge can be seen from the achievement of the indicators for each item. Each question answered is categorized in the level of difficulty to see the extent of mastery of students' concepts (Difficulty Index: Easy > 70%; 70% ≥ Medium ≥ 30%; Difficult <30%). The higher the difficulty index value indicates the better students' knowledge of the indicators being tested. The difficulty index (DI) for each item can be seen in Table 3 below.

Table 3. Index Test Item Difficulty of PDM

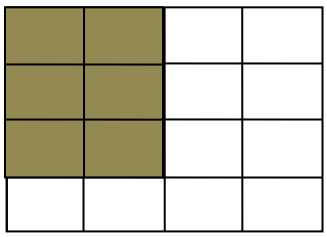
No	Indicator	Question	NR	%	DI
1	Concepts and operations of (+), (-), (x), (:), (√), (x^n)	The sum of 2 + 10 = …..	396	88,0	Easy
2		The sum of 32 + (-43) = …..	253	56,2	Medium
3		Results of $44 + (-15)\ x\ 24 : -2 =$ …	195	43,3	Medium
4		Which is solved first from the form $(12-6)\times 14-24:3=\cdots$	224	49,8	Medium
5		The result of $10 : 2$ is	369	82,0	Easy
6		The result of $(20 : 2) : 5$ is …	324	72,0	Easy
7		Find the sum of $\sqrt{144}+18$	202	44,9	Medium
8		Results of -16×-12 is	272	60,4	Medium
9		Results of $-20+7+(7+(-3\times 3))$ equal to …	256	56,9	Medium
10		Nine times nine equals to…	368	81,8	Easy
11		If p = -2, then p^2-2p-7 = …	132	29,3	Difficult
12		Results of $\sqrt{2}(\sqrt{75}-\sqrt{27})=\cdots$	159	35,3	Medium

13		The fraction $\frac{56}{42}$ in simplest form is	159	35,3	Medium
14		The sum of $\frac{2}{7}+\frac{4}{7}$ is ...	161	35,8	Medium
15		Results of $\left(\frac{2}{5}+\frac{3}{10}\right):\frac{7}{10}=\cdots$	157	34,9	Medium
16		Numbers consisting of integers and fractions are commonly called ...	205	45,6	Medium
17	Fractions	Results of $2\frac{1}{5}:4\frac{3}{7}=\cdots$	179	39,8	Medium
18		Results of $\frac{2}{5}\times\left(\frac{2}{3}+\frac{1}{6}\right)$ is ...	98	21,8	Difficult
19		The result of $\frac{2}{3}+\frac{5}{4}=n$. The value of n is . . .	95	21,1	Difficult
20		Result of $3\frac{1}{2}+4\frac{2}{3}-2\frac{3}{4}$ is ...	189	42,0	Medium
21		0,5% is equal to ...	211	46,9	Medium
22		Percent means ...	286	63,6	Medium
23	Percent	The form of $\frac{5}{25}$ when expressed in terms of percent becomes ...	114	25,3	Difficult
24		Sum of 35% + 0,45 = ...	149	33,1	Medium
25		20% of Rp 1.400.000 is ...	141	31,3	Medium
26		If $-x+2=-3$, then value of x is ...	80	17,8	Difficult
27		If $x-5=2$, then $x+3$ = ...	146	32,4	Medium
28	Algebra	The value of x that satisfies equation $2(3x-5)=2x+6$ is ...	119	26,4	Difficult
29		The value of x for equation $\frac{(x-2)}{3}+\frac{(2x-5)}{2}=2$ is ...	73	16,2	Difficult
30		A truck loaded 420 watermelons, then arrived at the Mandonga Market, 240 watermelons were dropped. A moment later, 320 melons were raised and left for Pasar Panjang. Arriving at the Pasar Panjang, watermelon lowered 140 pieces and 298 melons. So the rest of the watermelons and melons in the truck are ...	183	40,7	Medium
31		The lengths of the sides of a triangle are 2x cm, (2x + 2) cm, and (3x + 1) cm. If the circumference is 24 cm, the longest side length is ...	119	26,4	Difficult
32	Application	The earthquake in Aceh caused sea levels to drop 9 meters. After that the sea water rise as high as 21 meters, so that there was a tsunami that sank the top of a building up to 5 meters below the surface of the tsunami waves. So, the height of the building from the surface of sea level is ...	92	20,4	Difficult
33		In class, there are 22 boys and 18 girls. The percentage of female students in the class is ...	148	32,9	Medium
34		Rafa wants to buy a bag at a price of Rp.75. 000. Because there is a 15% discount, Rafa must pay as much as ...	120	26,7	Difficult

35		Mei has a ribbon with a length of $\frac{2}{3}$ m. Mei bought more ribbons with a length of $\frac{5}{4}$ m. Mei ribbon length now is ...	115	25,6	Difficult
36		Ahmad is 16 meters to the left of the flag pole. Dela is 4 meters to the right of Ahmad and Asrun is 6 meters to the left of Dela. If the position of the flagpole is considered to be zero, then the distance of Asrun from the position of the flagpole is ...	134	29,8	Difficult

Hint: For question 37 – 40 below, choose:

a. If (1), (2) and (3) are correct;
b. If (1) and (3) are correct;
c. If (2) and (4) are correct;
d. If only (4) is correct.

37		Rahma has pocket money of Rp.39.500. Rahma wants to buy a math book for Rp.65.000. Rahma also still has two savings accounts, each containing Rp.45.000. The following statements are true: (1) The total amount of Rahma's money plus his savings is Rp.129.500 (2) Rahma's savings are greater than the price of math books (3) Rahma's remaining money is Rp.64.500.00. (4) To get math books, Rahma had to add pocket money of Rp.26.500.00.	126	28,0	Difficult
38	Application	Consider the following picture.  The land area of Mr. Adi in Konawe Mr. Adi has a piece of land in the Konawe area, he intends to sell his land in parts. If the area shaded island that Mr. Adi sells for Rp. 1.500.000 / plot, then: (1) The land area for sale is $\frac{6}{16}$. (2) The total land area that is not for sale is $\frac{9}{16}$ (3) $\frac{1}{2}$ of the remaining land Pak Adi is five plots (4) The selling price of Mr. Adi's land is Rp. 15,500.00.00	137	30,4	Difficult
39		Father brought of mangosteen. The mangosteen was given to Mother $\frac{2}{5}$ parts, Aunt $\frac{4}{7}$ parts, and the remainder for Sister, the following statements are true: (1) Sister gets $\frac{1}{35}$ part (2) The younger brother gets the fewest parts (3) The sum of parts obtained by Mother and Sister is $\frac{15}{35}$ (4) Mother got more mangosteen than Auntie	71	15,8	Difficult

40	Budi has marbles as much as 50% of Susan's marbles, while Ema has marbles as much as 64% of Budi's marbles. If Budi's number of marbles is 200, the following statement is true: (1) Susan's number of marbles is 300 (2) The number of Ema marbles is 128 items (3) Ema has more marbles than Susan (4) Ema has marbles as much as 32% of Susan's marbles.	86	19,1	Difficult

NR = Number of students who answered right, DI = Difficulty index

The percentage of difficulty index for PDM items is presented in the graph below:

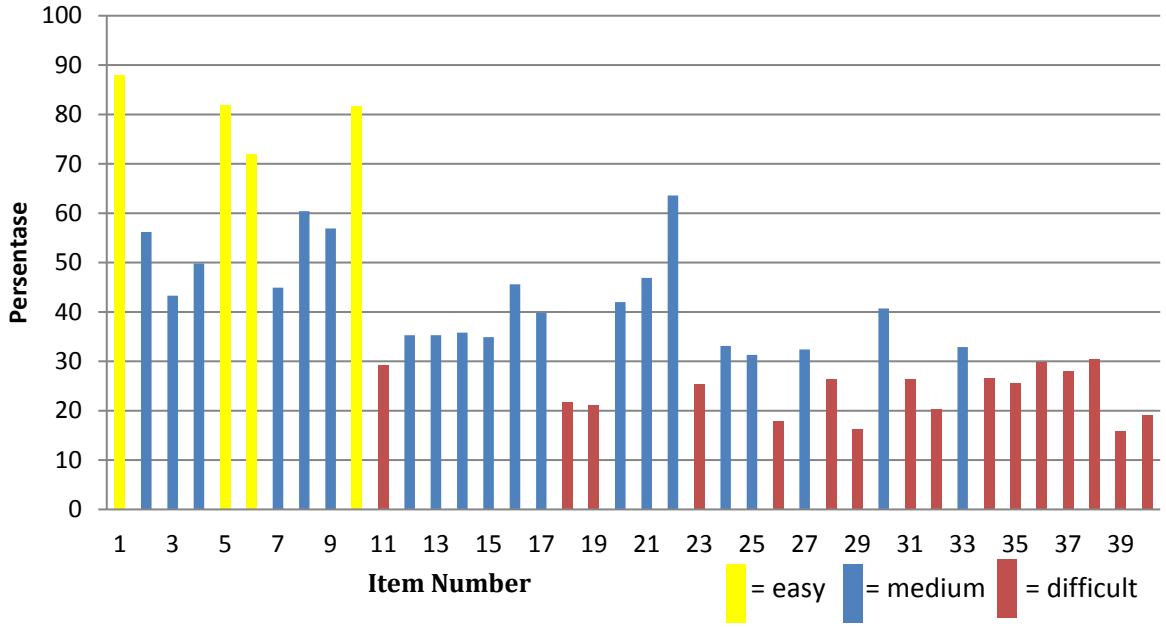


Figure.1. Index Test Item Difficulty of PDM

2. Discussion

This study was designed to describe the basic mathematical knowledge of grade X students of high schools throughout Konawe, which we know together they have received formal education for at least nine years. Mathematics is not a stranger to them, from elementary school even from kindergarten (TK) they have been taught about numbers, how to operate the concepts of addition, subtraction, multiplication, division, rank, root form, percent, and algebraic form on integers and its fractions and applications. Learning mathematics does not stop at elementary school, in junior high school, for at least three years they meet again with mathematics to better understand in-depth the basic knowledge they have gained while in elementary school.

The results of basic mathematics knowledge tests obtained by grade X students of SMA Negeri in Konawe District with a total sample of 450 students, as shown in the graph, are very disappointing. Of the 40 questions given, only four indicator questions can be answered easily, namely questions number 1, 5, 6, and question number 10. These four questions have in common not to contain negative integers, so herein lies the ease of students in answering questions. Instead, 16 questions are considered difficult by students. The sixteen questions are questions number 11, 18, 19, 23, 26, 28, 29, 31, 32, 34, 35, 36, 37, 38, 39 and question number 40. The answer to this problem is a. 1, the indicator of this problem is the integer rank. The number of students who answered correctly was only 132 people, and the remaining 318 dominant students chose c. -7, most students are still wrong in determining the squared results of negative round squares so that $p^2 - 2p$ is assumed to be 4 - 4 = 0, so the rest is -7.

Problem numbers 18 and 19, are on the same indicator that is the form of fractions. There are similarities between the two problems, namely the existence of adding fraction numbers, they are still wrong in adding fractions. The five questions with the percent form indicator, there is one problem that has a difficult level of difficulty, namely question number 23, only 114 students answered correctly about this problem, most students answered d. 25% when the correct

answer is c. 20% They only see the denominator of the fractional form, which is made into 25% percent. Even though it is something wrong.

From four questions with algebraic form indicators, three difficult questions, namely questions number 26, 28, and 29. Problem number 26, students have not been able to determine how many x values that satisfy the equation. This is related to the difficulty of operating the addition or subtraction of negative integers.

For application questions, out of 11 questions, only two questions have a medium category, the remaining nine questions are questions that are categorized as difficult for class X high school students in Konawe district. The two questions that are categorized as a medium are questions number 30 and 33. Number 30 deals with indicators of addition and subtraction of integers, and number 33 is a matter of percentage indicators. This means that other indicators are still considered difficult by students.

Problems categorized as being also received serious attention for the writer, there are 20 questions that are categorized as medium and 18 of them have the percentage of students who answer correctly below 60 percent namely questions number 2, 3, 4, 7, 9, 12, 13, 14, 15, 16, 17, 20,21, 24, 25, 27, 30 and question number 33. Nearly 60% of students incorrectly answer the questions above, they are still wrong in adding integers with different signs, determining which operations must be done first, determining the roots of an integer, simplifying and operating the root form. The fraction shape indicator consists of questions numbers 13, 14, 15, 16, 17, and 20. As many as 60% of students have not been able to simplify the fraction form, the sum of the fractions with the same and different numbers, the definition of mixed fractions, addition, subtraction, and division of mixed fractions, which is different. For indicators of fraction and percent forms, consisting of questions number 21, 24, and 25. Nearly 60% of students have not been able to convert a percent into a fraction and decimal forms and vice versa. They also cannot multiply the percent form with a number.

E. Conclusion

Based on the results of the analysis and discussion, it can be concluded that the average basic knowledge of students of class X in Konawe high school is still in the low category, many students have weaknesses in PDM, especially in indicators related to (1) ranks; (2) percent; (3) addition of fractions; (4) algebraic forms; and (5) Application of algebraic form indicators, percentages, addition, subtraction, multiplication, division of different integers of signs and fractions.

The teacher needs to pay attention to the basic mathematical knowledge factors in the process of teaching and to learn so that he can control and improve these factors to achieve the expected learning goals to improve mathematics learning outcomes. The selection of appropriate learning models and methods is also very much needed by the teacher to remind the students about the PDM materials, to streamline the time during the learning process, the teacher can also use ofline learning video media related to PDM material that students can watch at any time so that the ability of PDM students can increase resulting in increased student mathematics learning outcomes.

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