

# Problem Solving Approaches and Mathematical Ability of College Freshmen

Julie Villa Dalida

Capiz State University, Poblacion Mambusao Campus, Mambusao, Capiz, Philippines

**Abstract-** This study was conducted to determine the type of problem solving approaches used and the mathematical ability of the college freshmen of CapSU Mambusao in solving word problems. Specifically, it sought to determine the mathematical ability of the respondents and the difference in their mathematical ability when they are grouped according to gender, type of school graduated from, parent's educational attainment and course pursued. It further sought to determine the problem solving approach used by the respondents in solving mathematical problems and the effectiveness of the approach used. Likewise, it sought to find out if type of problem solving approach is related to students' mathematical ability.

The respondents consisted of 175 college freshmen of CapSU Mambusao enrolled during the first semester of school year 2011-2012. The study made use of a self-administered questionnaire and a problem solving test as the main research instruments. Frequency count, percentage, mean, t-test, F-test and chi square were used to analyze and interpret the data. Majority of the respondents was females. Most of them were graduates of National High School. A greater number of the respondents were pursuing the Bachelor of Science in Computer Science. Their parents had attained only elementary education. The mathematical ability of the respondents was "fair". When grouped according to gender, type of high school graduated from, parent's educational attainment and course pursued, t-test and F-test revealed no significant difference in their mathematical ability even though there was variation in scores. Majority of the respondents used an approach in solving mathematical problems. Of the respondents who used an approach, most of them used the "guess and check" approach, while the least used was the drawing a diagram approach. However, there were a considerable number of respondents whose approach could not be determined. On the effectiveness of the type of problem solving approach used by the respondents, the setting-up equation approach was more effective than the guess and check and the drawing a diagram approaches. Unfortunately, respondents who did not use any particular approach in solving problem had a rating equivalent to "needs improvement". On the relationship between type of problem solving approach and mathematical ability of the respondents, chi-square test revealed that these two variables were significantly related.

**Index Terms-** Problem Solving Approaches, Mathematical Ability, College Freshmen

## I. INTRODUCTION

As science and technology advances, mathematics must be so, for it is believed to be the language of science and technology. In fact science teachers realize that the subject cannot be presented without a satisfactory mathematics program. It is adjudged as a part of the environment expected to improve the lives of the learner considering the growing emphasis on technology. Scientist and psychologist, likewise consider it as an effective key to manpower development. Because of this, schools have made it a responsibility to be consistent with manpower development needs through the science of numeric.

There are many strategies and approaches to teaching mathematics. Problem solving involves different strategies to suit a given problem like guess and check, setting up equation, using formulas, drawing a diagram, making a table or looking for a pattern. It is for this reason that teachers should give more practice on the development of these skills or abilities needed for problem solving.

Problem solving is a systematic research by the individual through the given data and a synthesis of the findings into a neatly executed solution. Being systematic involves a step-by-step process. A step-by-step process to be applied in word problem is described by Maffel (1983) as reading activity that involves six steps. The reading skills utilized in the process are (1) reading to obtain a general idea of what the problem is all about; (2) reading to find what the problem is specifically asking for; (3) knowledge of synonymous phrases; (4) perceiving relationship of words and phrases to the whole problems; (5) ability to sequence ideas in a logical order, and (6) noting important details. Moreover, Eargs, M.W. (1980) listed down the steps in problem solving, which she found effective to her classroom, to wit: (1) Comprehension; (2) analysis and organization; (3) Recognition of the process; (4) solution; and (5) checking. The testimony of scientists and others however, indicates that the process of problem solving is not entirely open to consciousness. One may begin by reasoning consciously and deliberately but the solution often comes in its own time, suddenly and "out of nowhere".

Teachers need to provide students with good problem solving strategies and practice in using such strategies. Studies conducted on the relationship between sex and mathematical had varied results. Toledo for instance as mentioned by Gimoto (1996) compared the mathematical concepts of male and female from selected school of Iloilo found out that there were significant difference in their mathematical concept. This finding was supported by Santos as mentioned by Gimoto, who said that intelligence and mathematical ability of boys and girls had a high

degree of variability. Girls on the other hand were superior than boys in achievement and mental ability as mentioned by Alajar (1994). She further concluded that type of high school where students graduated from has relationship to college performance. Moreover, Montano (1990) and Caparino (1984) concluded that students whose parents that were college graduate and undergraduate scored better in mathematics achievement test than students whose parents were in the elementary level. Montano also agreed that educational attainment of parents influence mathematical achievement. Furthermore, student's ability in solving mathematical problems may likewise be influenced by the course he/she is taking according to Montano but it was opposed by Alajar who said that degree pursued by the students had no significant relationship with students' college performance.

However, it has been observed that many students had negative attitude towards mathematics especially on problem solving topics. Students find the subject very hard to learn especially on problems solving topics (Panganiban, 1985). No study had been conducted on the approaches used by students and their ability in solving mathematics problems among freshmen of CapSU Mambusao. It is because of this observation that this investigation on the approaches used by the students in solving word problem in mathematics was conducted. This study also focused on the determination of significant differences on the mathematical ability of the students when they are grouped according to gender, type of high school graduated from, parents' educational attainment and course pursued, on the determination of approaches used by the college freshmen of CapSU Mambusao in solving mathematical problems, on the determination of the most effective approach in solving mathematical problems used by college students, and on the determination of the type of problem solving approach that is related to students' mathematical ability.

## II. RESEARCH ELABORATIONS

The study was descriptive method of research. It was conducted at two campuses of CapSU, the Mambusao Poblacion Campus and the Burias campus. The respondents of the study were 132 females and 43 males. Most of these respondents were pursuing BSCS. As to the type of high school they graduated from, majority of the respondents (67.43%) were graduates from national high school; 27.71 percent were graduates of SUC and only 10.86 percent were graduates of private school. Most of their parents had only attained elementary education.

The instrument of the study was a self-administered questionnaire composed of two parts. Part I was used to determine the profile of the respondents and Part II was a 10-item test where the respondents were made to answer the mathematical problems indicating the approached they used in order to come up with their answers. The test was based on the standardized mathematical Olympiad test arranged from level I to IV and was subjects to content analysis by the subject specialist and school administrators for their comments and suggestions. It was then pretested and the difficulty index and discriminatory power of each item were then computed to determine its strength. Of the 20-item tests tested, 25% were revised and 25% were included without revision, thus completing the final 10-item problem solving test.

The researcher personally administered the questionnaire to the respondents with the help of the subject teachers from each campus to ensure a 100% retrieval. Statistical tools utilized in the analysis of the data were frequency count, percentage, mean, chi-square, t-test, and ANOVA.

## III. RESULTS OR FINDINGS

**Table 1. Distribution of respondents in terms of ability in problem solving.**

Percentage Score	Ability	Frequency	Percent
86 and above	Excellent	3	1.71
81 – 85	Very good	11	6.29
76 – 80	Good	35	20.00
71 – 75	Fair	62	35.43
70 and below	Needs improvement	64	36.57
Total		175	100.00
Mean		73.00	Fair

The result showed that the average mathematical ability of the respondents was 73.00 with a descriptive rating of "fair"

ability. As shown in the table, most of the respondents "need improvements" only 1.71% had "excellent" ability.

**Table 2. Mean score obtained by respondents grouped according to different variable.**

Variable	Frequency	Mean Score	Ability	Statistical Test
Sex				
Male	43	73.00	Fair	T = 0.298 <sup>ns</sup>
Female	132	73.20	Fair	

Type of High School Graduated from SUC				
National High School	38	78.00	Good	F = 0.022 <sup>ns</sup>
Private	119	72.00	Fair	
	18	73.00	Fair	
Parent's educational attainment				
Elementary level				F = 0.18 <sup>ns</sup>
Elementary graduate	47	72.15	Fair	
High school level	43	72.95	Fair	
High school graduate	31	73.32	Fair	
College level	26	72.38	Fair	
College graduate	10	74.60	Fair	
	18	74.76	Fair	
Course Pursued				
BSED	18	77.60	Good	F = 0.58ns
DVM	4	74.00	Fair	
BSFTE	11	73.50	Fair	
BSCS	50	73.33	Fair	
BSAE	14	73.10	Fair	
BSA	29	72.10	Fair	
BEED	40	72.00	Fair	
BSF	9	68.90	NI	

When grouped according to gender, the respondents had the same performance which was “fair”. T-test further concludes that variation in the mean score was statistically insignificant. This finding contradicts popular opinion that males are better in numbers than females. The results also negates the findings of Santos as cited by Gimoto (1996) and Caparino (1984) that mathematical abilities of boys had high degree of variability. However, the result agrees with the findings of Mac Coby and Jacklen (1987) who said that sexes did not differ in the test of total composite abilities.

When grouped as type of high school they graduated from, only the respondents from SUC had “good” ability while respondents from private school and national high school had “fair” ability. ANOVA further revealed that type of school where the students their secondary education has no relationship to student’s mathematical ability. The result disagrees with the findings of Ticao (1986) as cited by Montano (1990) who said that type of school was a significant factor in the varying performances of the students.

According to parents’ educational attainment, the higher the educational level attained by the respondents’ parents, the higher was their mathematical ability. However, the statistical test using ANOVA revealed that there was no significant difference in the mathematical ability when grouped according to parents’ educational attainment. This means that regardless of educational attainment of their parents, their ability is not far from each other. The result negates the findings of Montano and Caparino who concluded that parent’s educational attainment shows a significant relationship to school achievement of their children.

As to course pursued, only BSED students had “good” ability, BSCS, BSFTE, BSA, BEED and BSAE, “fair”; while BSF students had mathematical ability of “needs improvement”. Statistical analysis using ANOVA revealed that there is no difference in the mathematical ability of students regardless of the course they take. It implies that the course taken by the students had nothing to do with their mathematical ability.

**Table 3. Distribution of respondents as to the type of problem solving approach and their ability using this approach.**

Approach	Frequency	Percent	Mean score	Ability
Guess and check	54	30.86	75.30	Fair
Setting up an equation	33	18.86	80.00	Good
Draw a diagram	15	8.57	75.00	Fair
No particular approach used	73	42.71	69.00	Needs improvement
Total	175	100.00		

The study further revealed that majority of the respondents used an approach in solving mathematical problems. Of the respondents who used an approach, 30.86 percent used guess and check approach, 18.86 percent used setting up equation approach and only 8.57 percent used drawing a diagram approach. However, there were 42.71 percent whose approach cannot be determined.

On the effectiveness of the type of approach used by the respondents, setting up equations approach (mean rating 80.00) was more effective than the guess and check (mean rating = 75.30) and drawing a diagram (mean rating = 75.00) approaches. Unfortunately, respondents who did not use any particular approach in solving problem had the lowest rating of 69.00 or “needs improvement”.

**Table 4. Relationship between type of problem solving approach and mathematical ability.**

Type of approach	Mathematical ability			Total
	NI	Fair	Good	
No particular approach	55	17	1	73
Guess and check	5	25	24	54
Setting up an equation	2	11	20	33
Draw a diagram	2	8	5	15
Total	64	62	49	175

Chi- square value = 93.60 \*

\* significant

On the relationship of problem solving approach to the mathematical ability of the respondents, the chi-square test revealed that these two variables are significantly related. The findings agrees with those of Ancheta (1991) and leal (1984) that type of problem solving approach utilized by the teacher develops students’ problem solving ability. A student becomes a good problem solver when he understands the important features of a problem. Appropriate strategies in problem solving will make the teaching-learning process more enjoyable and the student is sure of correct answer. Since the result revealed that type of problem solving approach is related to their mathematical ability, the recommendation made by Palisao (1987) that there should be a mathematics clinic in every division for teachers to seek help needed and to avail of newer teaching strategies and an updated information on the new mathematics education program is necessary.

**IV. CONCLUSIONS**

1. Majority of the respondents was females. Most of them were graduates of National High School. A greater number of the respondents were pursuing the Bachelor of Science in Computer Science. Their parents had attained only elementary education.
2. The mathematical ability of the respondents was “fair”. When grouped according to gender, type of high school graduated from, parent’s educational attainment and course pursued, t-test and F-test revealed no significant difference in their mathematical ability even though there was variation in scores.
3. Majority of the respondents used an approach in solving mathematical problems. Of the respondents who used an approach, most of them used the “guess and check” approach, while the least used was the drawing a diagram approach. However, there were a considerable number of respondents whose approach could not be determined

4. On the effectiveness of the type of problem solving approach used by the respondents, the setting-up equation approach was more effective than the guess and check and the drawing a diagram approaches. Unfortunately, respondents who did not use any particular approach in solving problem had a rating equivalent to “needs improvement”.
5. On the relationship between type of problem solving approach and mathematical ability of the respondents, chi-square test revealed that these two variables were significantly related.

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AUTHORS

**First Author** – Julie Villa-Dalida, Associate Professor, Capiz State University, Philippines, [juvil\\_26@yahoo.com](mailto:juvil_26@yahoo.com)