

Mathematical Thinking towards Efficient Approach to Problem Solving

Genalyn L. Capelo, Ph.D.

Isabela State University

Cauayan City, Isabela, Philippines

genalyn.l.capelo@isu.edu.ph; gencapelo@yahoo.com

Article Info

Volume 82

Page Number: 4277 - 4280

Publication Issue:

January-February 2020

Abstract:

Mathematics is a discipline indispensable in man's daily survival. It finds its place in almost all endeavors man engages in. However, it is a subject much feared by a number of students. Few if there are, who finds mathematics easy and pleasurable and these are the exceptional few endowed with the brain for figures, hence the need to put a great deal of emphasis on different activities and strategies for better understanding and learning. The confines of my study catered to developing thinking of learners to develop in them the efficiency towards problem solving situation. The salient features of this study focused on the difficulties surfaced at in learning Mathematics, the factors that deter in learning the subject, the learning enhancement activities, and the strategies implemented to make learning feasible and convenient. The findings reveal that the respondents find difficulty in the derivation and application of formulae- rules and principles to a problem under study, and weaknesses in understanding in the regrouping of numbers. Tracing out what factors are affective of these difficulties, student factor came out dominant. On the strategies that make students maximize their learning, dominant was on determining appropriate solutions and approaches. This is certainly the entry-point towards gainful learning. It is thus imperative for teachers to be cognizant of what incites learners to go into a more commitment to learning not only to the maximum but also to the optimum.

Article History

Article Received: 18 May 2019

Revised: 14 July 2019

Accepted: 22 December 2019

Publication: 21 January 2020

Keywords: Mathematical Thinking, Strategies, Problem Solving, Descriptive

I. INTRODUCTION

The concern of education is not just with teaching but also with learning. Herein comes two major parties in the field. These are the teacher and the learner. Presently, it is a fact widely accepted that the teachers' key role is confined to enabling the learners to learn. Yet as the climate becomes more complex there are now other roles drawn upon the teachers to realize. These are to function as manager, a problem identifier and solver, a guidance personnel and a human relations staff. Yet it is imparting knowledge and skills to the educands which is his primary function.

The learner's role on the other hand is to come out as active creators and not passive recipient to learning. They are to react to situations, forms concept and must know how to apply them to practical life situations. It is on this premise that the learners take center stage, while the teacher takes the backseat in the learning process. He does not only impart knowledge but he serves as a guide, an adviser and a motivator for students to learn and love learning, especially in areas where learners find difficulty with, such as Mathematics which is the main core of this research study.

Mathematics is one discipline indispensable in man's daily survival. It finds its place in almost all endeavors man engages

in. From his home to its outside walls, Mathematics thrusts its way within. It finds its place in financial and time budgeting, in distance and weight measurements, in the simple and complex purchases man engages in; in business, in science, economics and in other social sciences. It is for these reasons that the importance of mathematics cannot be undermined. It is however, as revealed by various researches conducted, and from the personal experience of the researcher herself, that mathematics is a subject much feared by a number of students. Few if there are, who find mathematics easy and pleasurable and these are the exceptional few endowed with the brains for figures. Mathematics is one of the languages to enter into the global village, a village where knowledge and skills competition are the predictors to come out members to this village.

Mathematics equips man with basic mathematical knowledge and skills which every citizen must possess to become more efficient in the performance of his roles as a person and as a member of the society. It develops in man a sense of reasoning, of giving meaning and sense to abstract concepts, in formulating solutions to relax and find more convenient steps and processes in one's search for answers.

The imperatives of teaching mathematics and effective learning are thru maximizing participation in classroom activity. Current trends in teaching Mathematics necessitate a classroom environment where the practice of problem solving and analysis, formula application and other activities that involve the manipulation of figures are possible. Learners can develop applications if they are involved in doing things and if they have the proper motivation and opportunity to express their own concepts and relate it to the various situations and circumstances around them. Such a practice involves cooperative learning. This is a learning process which extends the students ability to acquire knowledge through discovery and teamwork. It prods students to develop a “push through” attitude, making them act and perform till they reach their goal and objective. This drives them towards critical thinking, decision-making process and problem solving skills. In the process of cooperative learning, the teacher assumes the role of a consultant rather than the typical authority figure, where he lets the learners to collaborate in creative and meaningful way as they carry with their lessons.

Efficiency in mathematical problem comprehension is not simply an end product of learning. It is the ultimate goal. It is a driving force that guides the learner and a result of activity that allows for full integration of meaning. Thus, it is necessary that teaching must be geared not only on the constructive interpretation but more so on the constructive aspect where the learner can project his own view as anchored on his thinking and comprehensive skills. Mathematics is highly cognitive in nature, thus teachers must put a great deal of emphasis on different activities and strategies for better understanding and learning.

The researcher is teaching at Isabela State University-Cauayan Campus where she handles, mathematics subjects. Her experience of having students’ difficulty in understanding situations and problems in mathematics gave her the drive to arrive at some ways of developing mathematical thinking in approaching problem solving situation, hence this study.

OBJECTIVES

Describe the profile of the respondents in terms of age, sex, high school graduated from, parents’ educational attainment, parents’ occupation, number of children in family.
Identify the difficulties students have in learning mathematics.
Determine the factors the respondents consider as deterrent in learning the subject and to what extent are these felt.
Find out activities to be undertaken to enhance learning mathematics.
Ascertain efficient approach to mathematical problem-solving situation.

METHODOLOGY

The descriptive method of research was utilized in the conduct of the study. This was conducted at Isabela State University-Cauayan City Campus. The respondents were the freshmen mathematics students in the University .

In coming about the needed data, the researcher made use of the questionnaire-checklist aside from her observation and experience in teaching the subject. Her frequent contact with the learning situation was a very viable source of the data in

this study, aside from the feedbacks of some fellow teachers handling mathematics subjects.

The interview also served as the secondary data-gathering instrument. This was necessary to crosscheck the data gathered through the questionnaire, and this also added additional insight in the treatment of the study.

RESULTS AND DISCUSSION

Table I. Profile of the Respondents

Profile	Frequency	Percent
Age		
21-23	4	4.00
18-20	53	53.00
15-17	43	43.00
Sex		
Male	71	71.00
Female	29	29.00
High School Graduated From		
Public	78	78.00
Private	22	22.00
Parents’ Educational Attainment		
College Graduate	32	32.00
Technical- Vocational Graduate	4	4.00
High School Graduate	55	55.00
High School Graduate	55	55.00
Elementary Graduate	9	9.00
Parents’ Occupation		
Farming	49	49.00
Laborer	20	20.00
Government Employee	9	9.00
Businessman	8	8.00
Vendor	3	3.00
Oversees Contract Worker	2	2.00
Driver	9	9.00
Number of Children in Family		
7 and above	12	12.00
4-5	43	43.00
1-3	45	45.00

The age distribution of respondents reflects of ages 18-20 where majority belongs. This registered a frequency of 53 or 53%. There were 43 or 43% who confirmed of belonging to ages 15-17 and least was on ages 21-23 where 4 or 4% responded. The findings reveal that the respondents are in their prime years, an age full of idealism and vigor, hence productivity.

On gender, the male group is dominant with 71 or 71% of them. There were only 29 or 29% females. This must be true because the department where the respondents were picked out was the Polytechnic School, one which is conceived to be more of a man’s world.

The kind of secondary school where the respondents graduated from reveals that majority or 78% came from public schools. There were only 22 or 22% who claimed of having come from private school. It is the general contention, although this is not conclusive, that students coming from private school farer better that those in public schools, particularly those in the remote areas or hinterlands, where such schools are less equipped and have scarce instructional materials and devices.

On parents’ educational qualification, considering only the grade/year level fully completed and the main bread winner in

the family, the finding reveals of the high school graduates as common with 55 or 55% responding. This is followed by the college graduates where 32 or 32% confirmed of having finished such grade level. As third in rank were the elementary graduates as evidenced by a frequency of 9 or 9%. Least was on the vocational graduates where only 4 or 4% out of the total universe of respondents was gathered. Parents' educational qualification also presses upon ones child schoolings, as Psychology says, that the process of identification always drives one to have his child fare better if not at par with their parents' conditions.

Parents' occupation is another determinant in one's capacity to send children to school. Parents with stable occupation have better chances in sending their children to school. As revealed, farming is common as reflected by a response of 49 or 49%. Least was on OCW where only 2 or 2% out of the total universe of respondents made the confirmation.

The number of children a family has bears ones capacity to send children to school. As the more children a family has, the lesser is the chance to afford them a better chance for education, unless of course, one is of a well-to-do status. As found out, children ranging from 1-3 were dominant with 45 or 45% responding. There were 43 or 43% who claimed of 4-6 children in the family and less was on 7 and above where 12 or 12% responded.

Table II. Frequency of Mention on Difficulties Encountered by the Respondents in Learning Mathematics

Difficulties Encountered	Frequency	Rank
Word comprehension problem	78	2.5
Derivation and application of formula-Rules and principles	80	1
Weak understanding of regrouping of numbers	78	2.5
Weakness of substitution of numbers to formula	50	6.5
Weakness in the operation of decimal numbers	50	6.5
Weakness in fractional computation	61	5
Poor analysis of the problem	65	4
Frequency of Mention*		

The table presents the areas of difficulties incurred by students. As revealed, dominant was on derivation and application of formula-rules and principles where 80% responded. As next were on word comprehension problem and weak understanding of regrouping of numbers where each gained a response of 78 or 78%. Least considered was weakness in substitution of numbers to formula and weakness in the operation of decimal numbers.

Table III. Weighted Mean Distribution of Factors Considered as Deterrent to Learning Mathematics

Factors	Weighted Mean	Q.D.	Rank
Student Factor			
Poor comprehensive ability	2.64	M.A.	4
Personal/Family problems	2.55	M.A.	5
Poor health	2.45	M.A.	6
Weak foundation in Math	2.97	M.A.	1

Distance of home to school	2.76	M.A.	3
Too many intervening activities	2.77	M.A.	2
Over-all Mean	2.69	M.A.	

School Factor

Teacher's tardiness	2.43	S.A.	5
Teachers non-preparation of subject	2.16	S.A.	8
Lack of Teaching Devices	2.36	S.A.	6

Non-comfortable concerns

Thermal comforts	2.24	S.A.	7
Visual comforts	2.76	S.A.	2
Acoustic comforts	2.80	M.A.	1
Adequate water facilities	2.61	M.A.	4
Library facilities	2.63	M.A.	3

Over-all Mean

Environmental Factor

Presence of recreation stalls near the school	2.68	M.A.	2
Sanitation aspects	2.72	M.A.	1
Non-conducive school ground for activities	2.60	M.A.	3

Over-all Mean

2.66 M.A.

Note: QD means Qualitative Description

Interpretation:

1.00-1.50-(NA or Not Affective); 1.51-2.50- (SA or Slightly Affective); 2.51-3.50-(MA or Moderately Affective); 3.51-4.50-(A or Affective); 4.51-5.00-(VA or Very Affective)

Learning the subject is circumscribed to several factors. On student factor, what came most affective was on weak foundation in math where a mean of 2.97 meaning moderately affective was gained. Least affective was poor health with a mean of 2.45.

On school factor, most affective was on acoustic comfort having a mean gain of 2.80 meaning moderately affective. Least was teachers non-preparation which registered a mean 2.16.

On environment factor, considered dominant was on sanitation aspects gaining a mean 2.72. This connotes further upkeep of sanitation aspects like comfort rooms and drinking facilities.

Looking at the cluster of factors that deter the learning process, the table reveals student factor as most affective, registering a mean of 2.69. As rank number 2 was environment factor with a mean gain of 2.66. Least affective was school factor, which registered a mean of 2.49.

The grand mean computed was 2.61 which indicated that in general, all the factors were considered as only moderately affective. This implies a need to come up with alternative factors to ease out the determined deterrents.

Table IV. Weighted Mean Distribution of Development Strategies for a More Efficient Approach to Problem Solving

Factors	Mean	Q.D.	Rank
Word Problem Study	3.25	M.E.	4
Problem Clarification	3.30	M.E.	2
Determining Appropriate Solution	3.37	M.E.	1
Classification Process	3.11	M.E.	5
Team Teaching	3.07	M.E.	6
Cooperative Development Teaching	3.05	M.E.	7
Ordering multi-digit numerals	3.0	M.E.	8
Evaluation Procedures or			

Rechecking of Answers 3.27 M.E. 3

Over-all Mean 3.17 M.E.

Note: QD means Qualitative Description

Interpretation:

1.00-1.50-NE or Not Effective); 1.51-2.50- (SE or Slightly Effective); 2.51-3.50-(ME or Moderately Effective); 3.51-4.50-(E or Effective); 4.51-5.00-(VE or Very Effective)

Getting across difficulties is posed with several teaching strategies. These are devised ways by which teachers get into an easier and more convenient learning process. Of the different strategies cited, the common strategy was on determining appropriate solution. This registered a mean 3.37 meaning moderately effective. In fact, even with the interview conducted with the other teachers teaching mathematics, this was also the common approach adopted by them.

The over-all mean gained was 3.17, which indicates that all the strategies cited were moderately effective.

Table V. Frequency of Mention Distribution of Activities Undertaken to Enhance Learning Mathematics

Activities	Frequency	Rank
Intensive Drill Work	78	2
Assignments	67	3
Classroom Competitions	80	1
Research Works	54	7
Remediation	50	8
One-on-One Correspondence	58	5.5
Warm-up Activity Through identification	58	5.5
Encouraging Group Participation-Cooperative Learning and Doing	63	4
Frequency of Mention*		

Aside from factor consideration in learning the subject, activities relevant to learning were also considered. As reflected in the table, what came out common activity was the holding of classroom competition where 80 responded. This is followed by checking of assignments reflecting a response of 67.

Least held was on remediation, which registered only a frequency of 50 or 50%.

The finding implies the concern of the teacher in maximizing learning by resorting to activities that augment the learning process.

CONCLUSION

Mathematics has been most feared subject by students. Only a few have the inclination to it. There are areas of difficulties identified, however these are difficulties that are gotten across of through alternative measures and strategies and through the initiative of the teacher.

Learning Mathematics is enhanced by the holding of activities relevant to learning Mathematics and the manipulation of figures. In as much as these activities and the strategies are considered, the chance of learning the subject is a possible result.

RECOMMENDATIONS

In view of the findings surfaced at, the researcher recommends the following:

More training on strategies and approaches in problem solving should be conducted for mathematics teachers.

Student conveniences should be strengthened to encourage them for interest and love for the subject.

More dedication and patience should be exerted by teachers in teaching the subject.

More activities expressive of learning the subject should be conducted not only in classroom but also off-classrooms.

More researches along this line should be conducted.

REFERENCES

1. Bressound . "Learning Mathematics: The cognitive science approach to mathematics education. Norwood, NJ: Ablex Publishing. 2005.
2. C. Brown, & T. Murphy, "Research in undergraduate mathematics education". Reference Services Review, 28(1), 65-80, 2000.
3. W. Camara & G. Echternacht, The SAT I and high school grades: Utility in predicting success in college, 2000.
4. D. Conley, "The challenge of college readiness". Educational Leadership, 64(7),23, 2007.
5. J. Davis & S. Titus, "Case for a Comprehensive Model of College Readiness. Journal of College Readiness, 33 (6), 1046-1062, 2011.
6. K. Hutchison, "Confronting America's challenge in math and science education", International Educator, 15 (4), 4-7, 2006.
7. M. Long, P. Iatarola & D. Conger, "Explaining Gaps in Readiness for College Math: The Role of High School Courses. Education Finance and Policy, Vol.4, No.1, pp. 37-49, 2009.
8. E. Mendoza, "Factors Associated with Mathematical Achievement of College Entrants of the Philippine Union College". (Unpublished Thesis). University of the Philippines. 1991
9. A. Robbins. A modeling-based college algebra course and its effect on student achievement. PRIMUS, xv (3), 193-214, 2004
10. T. Thiel, S. Peterman, & M. Brown. "Addressing the crisis in college mathematics: Designing courses for students success. Change: The Magazine of Higher Learning, 40(4), 44-49, 2008.