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Computational and Problem-Solving Skills in Mathematics of AIMS Students

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Abstract

Life is an arena of problems. A human child has to meet and solve problems as he grows; problems on his physical surroundings, his intellectual associations, and in his social contacts. These dilemmas grow in number and complexity as we age. His success in life is, in large measure, determined by the capacity and competence to solve them. Mathematics is a subject of problems and studying Mathematics is different from studying other subjects because it is learned by doing and solving boundless problems. For this reason, the efficiency and ability in solving problems are guarantees for success in learning this kind of subject. The researchers, being Mathematics instructors, observed that the students find difficulty in solving Mathematics problems. The researchers generally identified the salient reasons for this kind of conflict namely: poor background in algebra, poor verbal and contextual understanding, and poor logical ability. Conclusively, a direct relationship can be inferred between the problem-solving skills of students and the salient factors affecting the specified ability. From this observation, the researchers want to conduct an immediate action in order to quench this growing phenomenon. Seventy-five (75) or 63.0% of the respondents are graduates of private schools while 44 or 37.0% are graduates of public schools. On computational skills, the respondents can perform the four basic operations in real numbers, apply the properties of equalities of real numbers as well and derive formulas from a given equation. On problem solving skills, the result indicates that respondents are not good in problem solving which involves plane and solid figure. Recommendations were arrived at to enhance the computational and problem-solving skills of the students.

Keywords: Computational Skills, Problem-Solving Skills, Mathematics, Asian Institute of Maritime Studies

INTRODUCTION

Life is an arena of problems. A human child has to meet and solve problems as he grows; problems which are on his physical surroundings, his intellectual associations and in his social contacts. These dilemmas grow in number and complexity as we age. His success in life is, in large measure, determined by the capacity and competence to solve them.

Figuratively, Mathematics is a subject of problems and studying Mathematics is different from studying other subjects because it is learned by doing and solving boundless problems. For this reason, the efficiency and ability in solving problems are guarantees for success in learning this kind of subject.

As stated in Education Act of 1982 or Batas Pambansa 232, Section 9 on the rights of students: "The students shall enjoy the right to receive primarily through competent instruction, relevant quality education in line with national goals and conducive to their full development as persons with human dignity".

The above-mentioned provision reiterates that the interest and welfare of the students are the first and foremost concern of the school. Thus, they should be given quality education in order to satisfy the requirements in this provision of the law.

Theoretically, problem solving is one of the highest types of learning because the response is not solely dependent on past associations, schema and conditioning. Also, these skills are not innate and inherent upon the moment of his or her birth. Typically, the response is dependent upon the ability of the solver to manipulate abstract ideas, to use aspect and modification of previous learning and to perceive small differences as an implication of his broad understanding.

Relatively, problem solving demands not the repetition of responses but the creation of each when a more complex situation arises that mental synthesis and initiative are needed to adjust in order to compensate for the given problem. Therefore, competency in problem solving, like physical growth and social development is the result of continuous development. It is a process by which the choice of an appropriate strategy enables a student to proceed from a given problem to its distinctive solution.

The researchers, being Mathematics instructors, observed that the students find difficulty in solving Mathematics problems. The researchers generally identified the salient reasons for this kind of conflict namely: poor background in algebra, poor verbal and contextual understanding, and poor logical ability.

In higher education, the basic fundamental of mathematics is algebra. Throughout the scope of this course, various advanced and basic techniques can be sought to solve lots of problems involving different situations and principles. As the radical of mathematics in higher education, algebra inculcates the required contextual comprehension in mathematics as it mainly encompasses the nature of problem solving itself. Thus, a student with minimal background on algebra contributes directly to meager problem-solving skills. In majority, English, Mathematics, and Science are the three basic foundations of education. Among these three courses, all of them are relevant in order to build and facilitate learning. But relatively, a student can hardly understand and conceptualize subjects without the use of the common medium, the English language. This course mainly covers the comprehension and proficiency in reading and language that are mainly required to identify what is stated in a given problem. For this reason, a poor English or verbal ability may diminish the probability of solving problems in mathematics.

From philosophy, logic is defined as a branch of philosophy that deals with man's correct thinking. Nominally, an individual's logic greatly affects the way he or she conceptualizes things to the method in which he or she may use in order to solve a given problem. As rational beings, we differ from one another in the way we think and distinguish things. Due to this, lack of logical ability acts a constant determinant as to how an individual portrays and recognizes a given problem different from the proper manner it should be treated. As a result, he or she may view a problem differently that it directly corresponds to an incorrect analysis.

Conclusively, a direct relationship can be inferred between the problem-solving skills of students and the salient factors affecting the specified ability. From this brilliant observation, the researchers want to conduct immediate action in order to quench this growing phenomenon.

Statement of the Problem. This study determined the computational and problem-solving skills of the college students in AIMS during, the Y term of the second semester SY 2015 - 2016. Specifically, it answered the following:

1. What is the profile of the respondents in terms of:
   1.1. Type of high school attended;
   1.2. Grade in College Algebra?

2. What is the score of the respondents in computational and problem-solving skills in Solid Mensuration?

3. What are the errors committed by the students in their computational and problem-solving skills?

4. Is there a significant relationship between the scores of the respondents in computational skills and problem-solving skills in terms of:
   4.1. Type of high school attended;
   4.2. Grade in College Algebra?

5. Based on the findings, what plan of action may be proposed to enhance the problem-solving skills of the students?

Hypotheses. At 0.05 level of significance, the following hypotheses was tested:

There is no significant relationship between the scores of the respondents in computational skills and problem-solving skills with respect to their aforementioned profiles.

Significance of the Study. From the result of the study, the researchers envision to benefit the following:

1. *Students.* Since the aim of teaching are learning. Students will benefit for the enrichment of the subject content, development of new methodology of teaching and the production of instructional materials.

2. *Mathematics Instructors.* The study benefits the instructors for they can use the materials to help their slow learner students in improving their problem-solving abilities in Mathematics.

3. *School Administrators.* It will serve as basis for planning of more effective programs and activities for the students.

4. *Parents.* This study will help parents to become more aware of their duties and responsibilities towards their children. They can also help in the development and utilization of appropriate and better instructional materials that will lead to the improvement of their children's learning specifically in Mathematics.

Theoretical Framework. The core theoretical argument in Mathematical Problem-Solving Skill elaborated by Schoenfeld (1992) was that the following four categories of problem-solving activity are necessary and sufficient for the analysis of the success or failure of someone's problem solving attempt:

1. The individual's knowledge;
2. The individual's use of problem-solving strategies, known as heuristic strategies;
3. The individual's monitoring and self – regulation (an aspect of metacognition); and,
4. The individual's belief system about himself or herself and their origins in the students' mathematical experiences.

Furthermore, he mentioned that one's mathematical knowledge is clearly a major determiner of one's' mathematical success or failure. Students identify the facts, questions and visualize the situation.

Students then select a strategy, pattern recognition, working backwards, guess and test, simulation or experimentation, reduction or expansion or organized testing or exhaustive listing of logical deduction.

To find answer using computational algebraic and geometrical skills and to reflect or extend by checking the answer to find out if the computation is correct, if the question is answered and alternative solution are found.

Student should be made to solve problems, individually and think of many ways of solving a given problem and utilized problem solving strategies that make students learn mathematics.

Conceptual Framework. The study is guided by a conceptual model utilizing the Input-Process-Output model. The input includes the profile of students, test in computational skills and test in problem solving skills. The process includes the validation of instrument, requesting of permit to conduct for a survey and lastly administering the test questionnaire. The output of the study is an action plan to enhance the problem-solving ability of the students.

Scope and Limitations of the Study. This study was conducted in AIMS, Y- term, second semester, SY 2015-2016. The study covered only the midterm topic of Solid Mensuration based on the OBE such as polygon, triangle, quadrilateral, circle, prism and cylinder. The respondents of the study are the students enrolled in Solid Mensuration.

LITERATURES

According to Ashlock (2008), basic approaches to problem solving is to use a number of techniques suited to the mathematical problem involved and selecting the techniques, which can solve the problem in less time and cost involved. That is, one must evaluate the effectiveness of different techniques and select the one which satisfied the above criteria, particularly in a mathematical test. By practicing many problems, it enables a person to quickly choose the technique in an examination situation. The practice makes the cognitive retrieval faster and therefore quickly chooses the technique among many techniques. Experience will guide in a feasible direction. There is no alternative to continuously solve different mathematical problems to develop mathematical problem-solving ability.

The basic mathematical problem-solving techniques one can use are trial error; pattern seeking; developing relationships among variables and using pictorial from to represent problems; and use special ideas like geometry and concepts to solve special problems.

As stated by Carin (2005) mathematical ideas and their application to Mathematics problems vary from one mathematical problem to the next. The secret of solving mathematical problems is to be flexible and use above all creativity and insightful thought process and to change the methodology if one way approach does not work as expected. As well, identify a mix of problem-solving techniques which is optimal given the time and resources available at a time. In mathematical problem solving, brainstorming techniques also provide unique insights to a mathematical problem. It is also important to identify relevant information and to discriminate the important information from the rest given the mathematical problem.

In addition, one must acquire much knowledge of Algebraic techniques, Geometric ideas, statistical ideas, rules of formal logic and logical concepts, number theory, arithmetic basic operations, binary number systems, counting techniques, linear programming techniques, matrix algebra, pattern seeking and summation problems, probability laws, calculus ideas such as differentiation, integrals and differential equation solving techniques, complex numbers, probability distributions and solid geometrical concepts and ideas. Without a deep understanding in these techniques and its applications in Science, Social Sciences and in modern technology, one may only have limited capacity in solving mathematical problems.

Feden (2003) discussed the steps in problem solving: the first and most important step in solving a problem is to understand the problem. Read the problem clearly and grasp its meaning. Superficial or careless reading does not pay in mathematics. Be sure that you understand clearly what is given and what you are expected to find or prove. Keep these things in mind throughout your work; take sufficient time to think; plan thoroughly before you start. Identify which skills and techniques you have learned can be applied to solve the problem at hand; a problem is generally made up of a series of steps. So, when doing problems, do it step-by-step. Do not get overwhelmed by the entire problem at once. Break it down into small manageable pieces; even if you have to copy something, be sure that you do it correctly; draw diagrams and sketches wherever possible. They often help in understanding and solving problems; work at your maximum speed; be mentally alert, aggressive and confident; form the habit of verification. Always check whether the answer you found seem reasonable. Also review the problem and method of solution so that you will be able to more easily recognize and solve a similar problem; when doing word problems, first convert the problem into mathematics. Usually, this step is the most challenging part of an applied problem. If possible, start by drawing a picture. Label it with all the quantities mentioned in the problem. If a quantity in the problem is not a fixed number name it by a variable. Identify the goal of the problem. Then complete the conversion of the problem into math, i.e. find equations which describe relationship among the variables, and describe the goal of the problem mathematically. As a final step, you should convert the answer of your math problem back into words, so that you have now solved the original applied problem.

According to Taplin (2007), for many reasons, the state of society has reached a stage where it is more critical than ever to educate people in the traditional values of their culture. In recent years there has been considerable discussion about whether it is the responsibility of schools to impart values education. There is growing pressure for all teachers to become teachers of values, through modeling, discussion and critiquing values-related issues.

There are many opportunities to teach the principles of values education through existing subjects and topics. The purpose of this article is to suggest one of the many ways in which values education can be incorporated into existing mathematics curricula and approaches to teaching mathematics. In particular, it will focus on ways in which values education can be enhanced by utilizing a problem-solving approach to teaching mathematics.

These quotations are concerned with the following values such as: equipping students to meet the challenges of life; developing general knowledge and common sense; learning how to be discriminating in use of knowledge, that is to know what knowledge is appropriate to use for what purposes; integrating what is learned with the whole being; and arousing attention and interest in the field of knowledge so it will be mastered in a worthy way.

Increasing numbers of individuals need to be able to think for themselves in a constantly changing environment, particularly as technology is making larger quantities of information easier to access and to manipulate. They also need to be able to adapt to unfamiliar or unpredictable situations more easily than people needed to in the past. Teaching mathematics encompasses skills and functions which are a part of everyday life.

However, as mentioned by Carmine (2001) presenting a problem and developing the skills without a context. It allows the students to see a reason for learning the mathematics, and hence to become more deeply involved in learning it. Teaching through problem solving can enhance logical reasoning, helping people to be able to decide what rule, if any, a situation requires, or if necessary to develop their own rules in a situation where an existing rule cannot be directly applied. Problem solving can also allow the whole person to develop by experiencing the full range of emotions associated with various stages of the solution process.

There are three types of problems to which students should be exposed according to Carmine (2001). There are, word problems, where the concept is embedded in a real-world situation and the student is required to recognize and apply the appropriate algorithm or rule (preparing pupils for the challenges of life); non-routine problems which require a higher degree of interpretation and organization of the information in the problem, rather than just the recognition and application of an algorithm (encouraging the development of general knowledge and common sense); and "real" problems, concerned with investigating a problem which is real to the students, does not necessarily have a fixed solution, and uses mathematics as a tool to find a solution (engaging pupils in service to society).

According to Ureta (2008) the main goal of mathematics education in schools is the "mathematization" of the child's thinking.

Clarity of thought and pursuing assumptions to logical conclusions is central to the mathematical enterprise. There are many ways of thinking and the kind of thinking one learns in mathematics is an ability to handle abstractions, and an approach to problem solving.

Universalization of schooling has important implications for mathematics curriculum. Mathematics being a compulsory subject of study, access to quality mathematics education is every child's right. We want mathematics education that is affordable to every child, and at the same time, enjoyable. With many children exiting the system after Class VIII, mathematics education at the elementary stage should help children prepare for the challenges they face further in life. In our vision, school mathematics takes place in a situation where: children learn to enjoy mathematics; children learn important mathematics; mathematics is a part of children's life experience which they talk about; children pose and solve meaningful problems; children use abstractions to perceive relationships and structure; children understand the basic structure of mathematics and teachers expect to engage every child in class.

On the other hand, mathematics education in schools is beset with problems. The core areas concern are a sense of fear and failure regarding mathematics among a majority of children; a curriculum that disappoints both a talented minority as well as the non-participating majority at the same time; crude methods of assessment that encourage perception of mathematics as mechanical computation; and lack of teacher preparation and support in the teaching of mathematics. Systematic problems further aggravate the situation, in the sense that structure of social discrimination gets reflected in mathematics education as well.

According to Dorado (2006), sometimes it is important to give problems which contain too much information, so the pupils need to select what is appropriate and relevant. To be able to solve these problems, the pupils cannot just use the bookish knowledge which they have been taught. They also need to apply general knowledge and common sense.

Another type of problem, which will encourage pupils to be resourceful, is that which does not give enough information. These problems are often called Fermi problems, named after the mathematician who made them popular. When people first see a Fermi problem, they immediately think they need more information to solve it. Basically though, common sense and experience can allow for reasonable solutions. The solution of these problems relies totally on knowledge and experience which the students already have. They are problems which are non-threatening, and can be solved in a co-operative environment. These problems can be related to social issues.

Meanwhile as stressed by Salandanan (2001), sometimes pupils can be asked to make up their own problems, which can help to enhance their understanding. This can encourage them to be flexible, and so realize that there can be more than one way looking at a problem. Further, the teacher can set a theme for the problems that the pupils make up, such as giving help to others or concern for the environment, which can help them to focus on the underlying values as well as the mathematics.

Non-routine problems can be used to encourage logical thinking, reinforce or extent pupils' understanding of concepts, and to develop problem-solving strategies which can be applied to other situations.

Yap (2000) cited that the findings of new problems is not only a higher qualitative stage in the process of solving problems, but also an efficient means to foster the learning of mathematics, as stated by outstanding figures in Mathematics Education. A major goal of high school mathematics is to equip students with knowledge and tools that enable them to formulate, approach, and solve problems beyond those that they have studied. They should have opportunities to formulate and refine problems because problems that occur in real settings do not often arrive neatly packaged. Students need experience in identifying problems and articulating them clearly enough to determine when they have arrived at solutions.

Gregorio (2004) cited that in the past, the sole purpose of teaching mathematics was the mastery of fundamental knowledge and skills. Today, mathematics educators also they recognize the need to develop higher order thinking as a positive attitude toward the subject. For example, children should not simply wait for the teacher to give directions and information. They have to be active problem solvers with a determination to persevere until a reasonable solution is attained. They should explore reason out, and take initiatives to investigate mathematical principles and "create" new ideas. These three should constitute the major aims of teaching mathematics in the classroom and should have far reaching implications in terms of instructional procedures. With these aims in mind, teachers should provide their pupils with appropriate learning experiences.

Teachers do not seem to have much problems where the acquisition of knowledge and skills is concerned. Observations commonly point out, however, that teachers conduct most lessons in mathematics toward the development of knowledge and skills, probably because of the misguided belief that these are the only things that matter in mathematics teaching. Probably, too, it is easier for a mathematics teacher to make children master facts and follow algorithms than to teach them mathematical investigations.

Grandel and Symour (2004) stated that vital and essential application of mathematical relationship were frequently in evidence in homes, shops, offices, streets and playground, and such relationship were anywhere and everywhere. They found out that Arithmetic played a large part in everyday life of average citizens and that arithmetical calculations were evident in stores, shops, offices and firms.

Johnson (2005) in his article, the review mentioned that the teacher will find that the use of vocabulary exercise similar to that applied in reading will broaden and sharpen the understanding of words used in Mathematics and improve the work in problem-solving. The important point for the teacher to bear in mind is that the ideas represented by a given vocabulary contribute to the reading difficulties of a statement. Thus, words in the following sentences are all in the first 2,500 in the Thorndike word lists, but the context in which they are used involved ideas that are unintelligible to fourth grade children. 'The square of the sum of two numbers is equal to the square of the first number added top twice the product of the first and second number added to the square of the second number". The teacher must develop the meaning of a situation and the background necessary to understand it. Otherwise, the children will not succeed in solving the problem.

Kennedy (2005) in his study revealed that the ability to read plays an important role in quantitative thinking for there are special kinds of reading skill required in problem solving in addition to the ability to read and comprehend textbook and workbook.

Research has shown that pupils who excel in problem-solving are significantly superior to those who are poor in problem-solving in the following fields. Computational ability; ability to estimate answers to verbal problems; range of information about social uses of arithmetic; ability to read graphs; charts, tables; ability to see relations to number series; general and non-verbal reasoning abilities; general ability; level of mental ability.

Floumoy (2006) stressed that problem solving cannot be taught as a skill since the condition in verbal problems dealing with social situation usually vary from problem to problem depending on his intelligence, his reading ability his understanding of numbers operations, and his background of experience. However, the mathematics teachers should give special help in mathematical sentences which give the basis of the solution of the equation.

It was explained that experiences such as the following will develop mathematical reasoning without the use of paper and pencil in making computation: learn short-cut for adding, subtracting, multiplying and dividing small numbers without the aid of paper and pencil; practice in solving word problem with simple numbers for exact answers without paper and pencil, read from the textbook by the pupil; practice in solving word problems mentally with simple numbers for exact answers without paper and pencil, read from the textbook by the pupil; practice in solving word problems mentally with simple numbers as the pupils listen to the teachers read them; learn to judge when to use sounded numbers and when to use exact numbers; practice in estimating answer to word problems, experience in selecting familiar "reference measure" and learning to use those in interpreting unfamiliar problems; practice in reading and using table, graphs and scales.

Thorpe (2007) recommended in her study that the teacher should recognize the three steps involving verbal problems solving by the equation method such as: write the equation; solve the equation; and interpret the solution to equation.

She further stressed that the minimum interpretation should be the correct labeling of the number which is the solution to the equation. The equation approach to problem solving helps the teacher to diagnose students' difficulties. A student who consistently writes correct equations but gets in-correct answer either cannot compute correctly or does not understand how to solve an equation. A student who cannot solve verbal problems but can solve equations needs help in reading and interpreting verbal problems.

The good and the poor problem solvers are not significantly different in the general skills used in literacy such as those included in the Gates Tests in General Reading, but they do differ significantly in the special reading skills required in Arithmetic, namely the ability necessary to give special attention to teaching pupils inferior in problem-solving the special reading skills peculiar to Arithmetic.

Well-constructed arithmetic textbooks and workbooks often provide excellent reading exercises, which develop the reading skills required in problem solving and extend the vocabulary. Teacher should not hesitate to use suitable reading exercise in arithmetic textbooks and workbooks, beginning with those that are somewhat below the level of problems which the pupil can solve reasonably well and gradually progressing to exercises of greater difficulty found in textbooks for the higher grades some of the more valuable kinds of helps in problem-solving.

In a research study of Tan and Limjap (2010) a mathematical problem-solving process among students had been investigated by numerous researchers from abroad, but little is done with regards to a comprehensible and coherent theoretical framework that highlights the mathematical problem-solving heuristics among high school students here in the Philippines. A grounded theory research was undertaken to find out the mathematical problem-solving heuristics among Filipino high school students. Thirty participants representing different problem solvers were interviewed over a period of three months. Interviews were analyzed using Pandits grounded theory methodology and the constant comparison method. Five main processes have been identified and explained that encompass the mathematical problem-solving heuristics among seniors. The multi-district yet related processes are: 1) understand the problem through sense-making, organizing and constructing useful information from the problem, 2) planning solutions strategies by identifying conjecturing and selecting strategies; 3) executing the plan; 4) checking the process and strategies undertaken; and 5) reflecting and extending the problem. The study revealed that the multi-distinct yet relate processes could serve as a grounded frame of reference in which students do mathematical problem solving. The mathematical problem-solving heuristics / process were neither linear nor just cyclical in nature, but is experienced and underwent by problem solvers with varying degree of creativity and flexibility depending on the problem at hand, their metacognitive skills, prior knowledge and some other factors. Problem solvers can either be successful or not in solving mathematical problems. The framework proposes that certain intervening factors such as self-concept, belief, personality, exposure, motivation, attitude, environment, prior knowledge and skills, ability and faith could have influence in the multi-distinct processes of mathematical problem-solving heuristics. The success or failure of the students in passing through each heuristic may be determined by these factors. Over-all, the study gives a clearer picture on the processes students undergo, and the role or influence that their metacognitive skills and other intervening factors may play in the success or failure in doing the task.

Sadia and Bordado (2010) determined the effectiveness of the 4MAT System of Instruction in enhancing the performance in mathematics of the fourth-year high school students of Central Bicol State University of Agriculture during the school year 2009-2010. The 4MAT System is a cycle of instruction that addresses the students learning style and brain dominance. The system was used in teaching Fundamental Counting Principles, Combination, Permutation and Probability.

The study of Costillas and Ibe (2009) determine the effects of the situated-cognition teaching model on mathematical problem-solving skills of the students and their extent of transfer of these skills to other domains, namely Analytic Geometry, Solid Mensuration and General Chemistry. This study further investigated if English proficiency moderated the problem-solving skills and extent of transfer of the skills to other domains. Non-Equivalent Control Group Design was used with two intact classes of first year engineering students who underwent 42 hours instruction, each in a regular schedule of the same time slot and room and taught by the researcher herself. The instruments used include a Semantic Differential Scale for Content Validation of the Pretest/Posttest, then the Formative Tests, an interview schedule, 28 situated teaching plans for the experimental group, journals and the problems solving tests in the other domains.

Furthermore, qualitative data disclosed that the situated-cognition teaching model developed values of cooperation in a group task, using common sense to have more accurate data, showing eagerness to learn new things, and realizing the importance of mathematical problem-solving skills not only in the classroom but also in everyday living. Better interactions between teacher and students and among students themselves were also mentioned.

This study revealed that the situated-cognition teaching model can help improve the mathematical problem-solving skills of students and the extent of transfer of problem-solving skills to selected domains, particularly General Chemistry, most especially for students with higher level of English proficiency. This supports the theory of Choi and Hanaffin (1995) which underscores the importance of providing a more realistic way of conceptualizing a particular situation for the students to become better problem solvers.

From the above conclusion, it is recommended that situated-cognition be used as a teaching model for enhancing the problem-solving skills of the students or used to complement the conventional model. This can be done by conducting training for proper dissemination modeling and mentoring. To verify the results, parallel studies should be conducted considering different types of school subjects, contents, and courses.

Del Rosario (2009) in her study revealed that Mathematics teachers are continually faced with the challenges of how to help students understand and like Mathematics. It is quite sad to note that in the University of Santo Tomas, although students are generally accepted on the basis of scholarship, there are many underachievers and failures in College Algebra. Because of the need to study the root causes of the foregoing situation, the author decides to analyze the underlying factors of the problem of failures in the said course.

For school administrators, the results of this research could indicate the need for a continuing development and re-training program for Mathematics teachers which would emphasize not only mastery of course content and methodology but also profound understanding of the factors that contribute to better learning.

Costoy (2006) determined the relationship of students' attitude towards Mathematics to their performance in arithmetic computation skills (ACS) and problem solving (PS) among college freshmen at Polytechnic State College of Antique. The respondents in the study were 275 randomly selected college freshmen enrolled during the first semester of SY 2005-2006.

Researcher made test on ACS and PS involving whole numbers, fractions, decimals and percent; and questionnaire on students' attitude towards Mathematics were the instruments used for gathering the data. The statistical tools used were the frequency count, percentages, means, T-test, ANOVA, chi-square and Pearson r. Alpha level was set at .05.

The study revealed that students' attitude towards Mathematics was favorable and their performance in ACS and PS was satisfactory. Likewise, female students who graduated in private school and taking Engineering, Computer Science and Education courses has satisfactory performance; while male students who graduated in private school and taking Community development, Marine engineering, Business Education and Industrial Technology courses had unsatisfactory performance in ACS and PS.

Students' attitude towards Mathematics as well as performance in ACS and PS did not differ between male and female but significantly differ among students taking different courses and the type of school they graduated from.

No significant influenced was found to exist in students' attitude towards Mathematics when they were grouped as to gender and type of school, they graduated from but a significant influenced was found to exist when grouped as to course taken. Also, no significant influenced was found to exist in their performance in ACS and PS when grouped as to gender but there was a significant influenced when grouped as to course taken and type of school graduated from. Lastly, there was a slight relationship existing between students' attitude towards Mathematics and their performance in ACS and PS.

METHODOLOGY

Research Design. The descriptive method of research, specifically the survey design will be employed in this study. Its purpose is to describe a certain condition and problem as it exists and to explore the causes of such problem under study.

Kerlinger (2000) stated that descriptive method is an appropriate step in conducting research to gather information about the present existing condition. Its purpose is to describe the entire situation as well as to explore the causes of a situation as it exists at the time of the study. It likewise determines the nature of the prevailing conditions with the practices and seeks descriptions of the activities.

The descriptive survey research design is the most appropriate for the study since the main purpose is to determine the problem-solving strategies of first year college maritime and engineering courses in Math 123.

Locale of the Study. The study was conducted in AIMS in Pasay City. The school is a merchant marine college founded by Capt. Wilijado P. Abuid and his friends in August 13, 1993. As of now, AIMS is using a bi-semestral program called X-term and Y-term wherein students take 4 subjects for each term for 9 weeks with 6 hours per session for 3-unit subject. There are seven (7) courses being offered in the undergraduate program namely: B.S. in Marine Engineering, B.S. Naval Architecture and Marine Engineering, B.S. in Marine Transportation, B.S. in Custom Administration, B.S. Business Administration major in Maritime Management, B.S. Hotel and Restaurant Management, and B.S. in Computer Science. The school is also offering graduate programs such as Master in Customs Administration, Master in Maritime Administration and Doctor of Philosophy in Maritime Administration.

Respondents of the Study. The respondents of the study were 119 Maritime Transportation students enrolled in Math 213, Y-term of the first semester, SY 2015 – 2016. There were 4 sections, two sections in the morning and two sections in the afternoon. All students enrolled in the subject were taken as the respondents.

Research Instrument. The survey questionnaire consists of three parts. Part I contains the profile of the respondents such as type of high school attended and grade in Math 113 (College Algebra). Part II consists of 10 items involving computational skills. Part III consists of 10 items involving problem solving skills. Part II and Part III items were taken from questions in bank which have undergone item analysis. (Refer to Appendix B). Rubrics were also used in scoring for Part II and III.

Data Gathering Procedure. The researchers secured permission from the Allied department Head for the use of confidential records on the grades of respondents in College Algebra and also a letter to the Dean asking permission to conduct the survey. The respondents in the morning section were gathered and took the exam in the afternoon and it was proctored by instructors handling Math 213 subjects. Vice versa, the afternoon respondents took the exam in the morning. After the retrieval of the questionnaire, it was then checked by the researchers. Rubrics were used in scoring students' answers. Results were tabulated, analyzed and interpreted.

Statistical Treatment. To answer the statements of the problem, the following statistical tools were used.

1. *Frequency and percentage* were used to analyze the profile of the respondents.

2. *Weighted Mean, Mean, and Standard Deviation* were applied to determine scores in computational skill and problem-solving skill.

3. *Chi-square* was utilized to determine the significant relationship between the score and the type of school attended.

4. *Person r* was utilized to determine the significant relationship between the score and the grade in College Algebra.

RESULTS AND DISCUSSION

Table 1

Distribution of Respondents in terms of Type of High School Attended

Type of School	Number of Respondents	%
Private	75	63.0
Public	44	37.0
Total	**119**	**100.0**

Table 1 shows the distribution of respondents in terms of type of high school attended. Seventy-five (75) or 63.0% of the respondents are graduates of private schools while 44 or 37.0% are graduates of public schools. Tuition fee at AIMS is quite expensive since it is a private maritime school. This indicates that most of the students at AIMS can afford the tuition fee as majority of them graduated from private high schools.

Table 2

Distribution of Respondents' Grades in College Algebra

Grades	Number of Respondents	%
95-99	2	1.7
90-94	5	4.2
85-89	20	16.8
80-84	46	38.7
75-79	46	38.7
Total	**119**	**100.0**
Mean	**80.94%**	
Standard deviation	**4.81**	

Table 2 presents the final grades of the respondents in College Algebra. Forty-six (46) or 38.7% of the respondents have a final grade between 75% to 79%, 46 or 38.7% of the respondents have a final grade between of 80% to 84%, 20 or 16.8% have a final grade between 85% to 89%, five (5) or 4.2% of the respondents have a final grade of 90% to 94% and lastly, two (2) or 1.7% of the respondents have a final grade of 95% to 99%.

The mean grade of the respondents is 80.94% and standard deviation of 4.80. This means that the respondents are averagely performing in College Algebra.

Table 3
Test Scores in Computational Skill

Scores	Number of Respondents	%
32 and above	32	26.9
16 – 31	76	63.9
15 and below	11	9.2
Total	**119**	**100.0**
Mean	**24.9**	
Standard deviation	**7.6**	

Shown in Table 3 are the scores in computational skills test. Out of 119 respondents, 76 or 63.9% got a score between 16 to 31, 32 or 26.9% of the respondents got a score of 32 and above, and about 11 or 9.2% of the respondents got a score of 15 and below.

The mean score on the computational skills of the respondents is 24.9 with a standard deviation of 7.6. This implies that the respondents can perform the four basic operations in real numbers, apply the properties of equalities of real numbers as well and derive formulas from a given equation.

Table 4
Scores on Problem Solving Skills Test

Scores	Number of Respondents	%
32 and above	4	3.4
16 – 31	58	48.7
15 and below	57	47.9
Total	**119**	**100.0**
Mean	**15.7**	
Standard deviation	**9.7**	

Table 4 reveals the scores of the respondents in test on problem solving skills. There are 58 respondents or 48.7% who got a score from 16 to 31, 67 respondents or 47.9% who got a score of 15 and below and only four (4) respondents got a score from 32 and above.

The mean score of the respondents is only 15.7 which are far from even half of the total score. The standard deviation is 9.7 which show that there is a big variance among the scores of the respondents. The result indicates that respondents are not good in problem solving which involves plane and solid figure. Respondents had a hard time applying their computational skill acquired from lower mathematics subject in problem solving.

Table 5
Chi-square Results between Scores of Respondents in Computational Skills and Type of High School Attended

Type of School	Scores in Computational Skills			Total
	32 above	16 – 31	15 below	
Private	14	56	5	75
Public	18	20	6	44
Total	32	76	11	119
Computed Chi-square	10.264			
Critical Value (α=.05)	5.991			
Verbal Interpretation	Significant			

Table 5 divulges the computed chi-square is 10.264 which is higher than the critical value of 5.991 with df = 2, the difference between the scores in computational skills and the type of school is significant.

This implies that the computational skills of the respondents are related to where they studied in high school. The respondents have different capabilities in computational skills which may be attributed to the textbooks used and also to the teachers who handle the subject.

On the contrary, Gozum and Cura (2011) in their studies found no significant difference in the Adversity Quotient of the engineering students based on the type of high school they graduated from.

Table 6
Chi-square Results between Scores Respondents in Problem Solving Skills and Type of High School Attended

Type of School	Scores in Problem Solving Skills			Total
	32 above	16 – 31	15 below	
Private	2	41	32	75
Public	2	17	25	44
Total	4	58	55	119
Computed Chi-square	2.913			
Critical Value (α=.05)	5.991			
Verbal Interpretation	Not Significant			

As presented in Table 4.6, the obtained chi-square value is 2.913 which is lower than 5.991 with df = 2, the difference between the problem-solving skills and the type of school attended is not significant.

This implies that whether a respondent is a graduate of public or private school their problem-solving skills are do not differ.

Conclusion. Based on the findings of the study, the following were derived:

Most of the students are graduates of private school. This indicates that they can afford the expensive tuition fee of AIMS. The respondents have shown a low to average performance in College Algebra. Respondents have good performance on the computational skills but had a poor performance on the problem-solving skills. Accordingly, the respondent who may be very good at computation does not necessarily mean to be good at problem solving. Scores on the computational skills is significantly associated to the type of school where the respondents graduated while the scores on the problem-solving skills are not associated. Scores on the computational skills is significantly related with the final grade in college algebra. At the same time, there is a direct relationship between the computational skills and grade in College Algebra of the student. Whereas, scores on the problem-solving skills are not significantly related with the final grade in algebra. Likewise, the respondents' problem-solving skills is also directly related with the final grade in algebra.

Recommendations. Based on the conclusions, the following are recommended:

The school administrators must create programs that will allow students to engage in activities that will enhance their computational skills and problem-solving skills as well.

The school must adopt a diagnostic assessment instrument for determining the strengths and weaknesses of incoming freshmen students that will be a basis of remedial instructions.

Teachers must revisit the Outcomes-Based Instruction syllabus to see if the objective is met.

The teachers need to update and examine their teaching methods and should acquaint themselves in dealing with students of different abilities.

The teachers must constantly monitor students' performance and conduct post-evaluation test assessment.

Considering that computational skill and problem-solving skill constitute distinctly different areas. Teachers must emphasize to the students the importance of the computational skills in problem solving.

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