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Factors Associated with the Problem Solving Skills among Grade – 7 Students

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Abstract
This quantitative study investigated the relationships among factors such as ages, gender, attendances, Grade – 6 mathematics grades, assignments, and class participation grades with the problem solving skills to determine the factors that affect the mathematics performances of the students. There were 60 respondents who were presently enrolled in a selected private school in Marawi City. Convenient and random sampling were used in selecting the sample while a validated problem solving test with a reliability of .77 was used in collecting the data. The coverage of the test is operations with integers, fractions, ratio, proportion, and percent. Findings show that there are no correlations between ages and attendances with the problem solving skills of the respondents at .05 level of significance. However, there are correlations between their class participations, Grade – 6 mathematics grades, gender, assignments, and Grade – 6 mathematics grades with their problem solving skills at .05 level of significance. It is a challenge for Grade 7 mathematics teachers to use alternative teaching techniques to find solutions to whatever insufficient knowledge of students in the subject and for them to have the same levels of understanding, if possible, with the target skills and level required by the curriculum. The results in this study may serve as one of the guidelines of the students, mathematics teachers, and educators in reforming the mathematics curriculum in order to have effective teaching and learning.

Keywords: problem solving skills, Grade – 7 students, & mathematics performances.

Introduction

What type of mathematical assessment is scary among students of all year levels? It is always escaped by the student and even does not attempt to read it most of the time in a given mathematical test. It measures the level of knowledge of a student to what extent he or she has acquired the basic mathematical concepts can be applied to the given problem.

Problem Solving is also defined as an assessment to which students can solve problems in context that are not confined to one discipline and draw on the knowledge of students a variety of sources (Wikipedia). It is incorporated in arithmetic, algebra, geometry, trigonometry, and higher mathematical fields as an application of such mathematical concepts.

The abilities of students to solve a word problem or apply their skills in mathematics in real situations are affected by several factors in their environment. For instance, many studies (Amelink, 2012;Ayotola&Adediji, 2009; Brad, 2011; Cai & Lester, 2007; Cooper, 2006; Zembar

& Bume, 2006) correlated age, gender, mathematical anxiety, mathematical mental ability, mathematics self – efficacy, and other factors with the mathematical achievements or problem solving skills of the students. It could also be the influences of their parents, teachers, and friends.

The poor performances of Filipino students in sciences and mathematics in international competitions like Trends in International Mathematics and Sciences Survey and found in some studies (Diaz, 2006; Tan & Yebron, 2008) have been the central focus of the successive educational reforms such as, Basic Educational Reform (BEC), Understanding by Design (UBD), and recently K – 12 Enhanced Basic Education. Although, the basic concepts in mathematics are the lacking among slow learners, it is believed that the ability of students to relate with a particular concept through real – life situation is the short – cut of developing the higher order thinking skills among students. This is the main objective of any lesson nowadays in all variety of subjects particularly mathematics, a learner must become creative and critical thinker in the future.

Guro (2010) mentioned in her study that the existing educational problems in Filipino students in the subject must be worse in the province of Lanao del Sur. This was confirmed by other studies (Gumal, 2011; Solaiman, 2013) concerning the qualifications of the teachers handling the subject and the levels of thinking skills in geometry of the respondents. It cannot be avoided to say that there are factors that caused this difficulty of students in mathematics even simple word problems in arithmetic, for instance, the use of language as a medium of instruction which may not easily be understood by some students. However, if the word problem will be translated into local dialect, maybe they can give the correct answer.

This study will investigate the relationships of some factors such as ages, gender, previous mathematics grade, attendance, assignments, and class participation with the problem solving skills among respondents. It is anticipated that that the result of this study will be the basis of the teachers, educators, students, concerned officials, and others in mathematics educational reform of the locality.

Statement of the Problem

The main objective of this study is to investigate the relationships of the factors such as ages, gender, previous mathematics grade, attendance, assignments, and class participation with the problem solving skills among Grade – 7 students in selected secondary schools in Lanaodel Sur. Specifically, it sought to answer the question:

1. Is there a significant relationship between each of the factors such as the ages, gender, previous mathematics grade, attendance, assignments, and class participation and the problem solving skills of the respondents?

Conceptual Framework

Several studies (Amelink, 2012; Ayotola & Adediji, 2008; Brad, 2011; Cai & Lester, 2007; Cooper, 2006; Samuelson, 2006; Zembar & Bume, 2006) in mathematics were conducted in order to identity the possible factors that affect the performance of students in problem solving skills. From the result of several studies, theories of learning and curriculum are revised in order to modify the present one to have good result. For instance, constructivism theory of learning in the focus in the present K – 12 curriculum because it is believed that the student can relate to the topic of the subject on that day if they know how to construct an idea related to it. A student who knows how to construct an idea can understand and analyze the problem.

However, some factors like age, gender, and previous grade in mathematics are usually being correlated with the performance of the students in the field of mathematics. It is confirmed in other studies that the said factors are highly correlated (Amelink, 2012; Ayotola & Adediji, 2008; Brad, 2011; Cai & Lester, 2007; Cooper, 2006; Samuelson, 2006; Zembar & Bume, 2006). It means that the three factors affect the performance of learners. For instance, students are believed to have higher thinking skills than younger students which are being supported by other studies. In the present researches, the correlation between age and mathematics performance or gender and mathematics performance is not highly correlated.

Based on my experiences, an active learner who is always present during discussion of the subject, who frequently answers during class recitation, and who is active in submitting assignments in the subject influence the mathematics performance. This is supported by experiential learning.

In this study, age, gender, mathematics Grade – 6 grade, frequencies of attendance, assignments, and class participation are independent variables and the problem solving skills of the respondents is the dependent variable. Figure 1 presents the conceptual framework of the study.

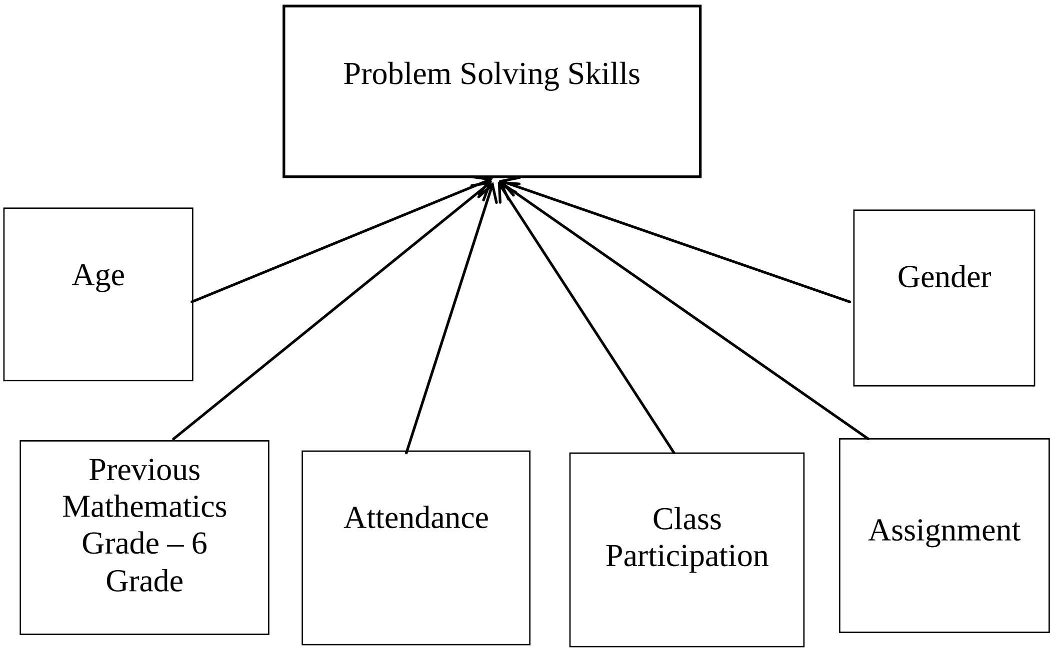

Figure 1. Research Paradigm of the Study

Methods

This study is a quantitative in design that aimed to investigate the relationships of some factors such as ages, gender, previous mathematics grade in Grade – 6, attendance, assignments, and class participation with problem solving skills among respondents. It was implemented in Ranao Council (RC) – Al Khwarizmi International College Foundation, Incorporated at Basak Malutlut, National Highway, Marawi City, Lanaodel Sur. It is comprehensive educational institution which employs the most talented academic mentors and administrators and has the highest standards of academic instruction and training in all levels of the educational ladder. The population in this study was the Grade – 7 students of the school who were enrolled in the school year 2014 – 2015. Convenient and random sampling techniques were used in the selection of the two sections of Grade – 7.

A problem solving test which is in – lined with K to 12 curriculum was used as one of the instruments in the study. The coverage of the examination composed of the topics required in the first grading period such as fractions, radicals, sets, inequalities, ratio and proportion, squares, and simple interest. It was validated by some experts and pilot tested with the reliability of 0.77 using split half. It was given to the respondents on September 20, 2014. The ages, number of attendances from June to August 2014, oral recitations grades, Grade – 6 grades, gender, and assignments were also collected from the mathematics teachers and advisers. Presentations of the data are as follows.

Table 1 shows the frequency of the respondents with respect to their ages and gender. There were 2 males and 12 females whose ages are all 12 years old; sixteen males and 12 females whose ages are all 13 years old; eight males and 8 females with 14 years of age; and, 2 males whose age is 15 years old. The total respondents are 60.

Table 1

Frequency of the Respondents With Respect To Their Ages and Gender from the Involved School

Ages/ Gender	Males	Females	Total
12	2	12	14
13	16	12	28
14	8	8	16
15	2	0	2
Total	28	32	60

Table 2 presents the frequency of the respondents with respect to their grades in assignments and gender. There were 7 males and 7 females whose grades in assignments are between 59 % and 67%. Two males and 6 female got grades of the said criteria between 68 % and 76%. Ten males and 12 females have assignments grades between 77 % and 85%. Between 86% and 94%, 5 male and 7 female respondents took grades in the said range. There were only 4 male respondents who got the highest grade between 95% and 103%.

Table 2

Frequency of the Respondents With Respect To Their Grades in Assignments and Gender from the Involved School

Range of Grades/ Gender	Males	Females	Total
59 – 67	7	7	14
68 – 76	2	6	8
77 - 85	10	12	22
86 – 94	5	7	12
95 – 103	4	0	4
Total	28	32	60

In Table 3, frequency of the respondents with respect to their grades in class participation and gender is shown. Four female respondents have grades between 56% and 63%, while 7 males and 15emales got grades between 64% and 71%. Fourteen males and 10 females have grades between 72% and 79%. Between 80% and 87%, 5 male and 3 female respondents have grades in that range. Only 2 male respondents got the highest grade between 96% and 103%.

Table 3

Frequency of the Respondents With Respect To Their Grades in Class Participation and Gender from the Involved School

Range of Grades/ Gender	Males	Females	Total
59 – 63	0	4	4
64 – 71	7	15	22
72 - 79	14	10	24
80 – 87	5	3	8
88 – 95	0	0	0
96 – 103	2	0	2
Total	28	32	60

Table 4 presents the frequency of the respondents with respect to their grades in Grade - 6 and gender. There were 3 males and 11 females whose grades arein between76 % and 80%. Ten males and 8 females got grades in between 81 % and 85%. Eleven males and 5females have grades in the range of 77 % and 85%. Between 86% and 90%, 11 male and 5 female respondents took grades in the said range. There were 2 male and 8 female respondents in the grade range of 91% to 95%. There were only 2 male respondents who got the highest grade between 95% and 100%.

Table 4

Frequency of the Respondents With Respect To Their Grades in Grade - 6 and Gender from the Involved School

Range of Grades/ Gender	Males	Females	Total
76 – 80	3	11	14
81 – 85	10	8	18
86 – 90	11	5	16
91 – 95	2	8	10
96 – 100	2	0	2
Total	28	32	60

In Table 5, frequency of the respondents with respect to their grades in problem solving and gender is shown. Four female respondents have grades between 50% and 56%, while 5 males and 7 females got grades between 57% and 63%. Six males and 6females have grades between 64% and 70%. Between 71% and 77%, 7 male and 9 female respondents have grades in that range. Six male respondents got the highest grade between 78% and 84%.

Table 5

Frequency of the Respondents With Respect To Their Grades in Problem Solving and Gender from the Involved School

Range of Grades/ Gender	Males	Females	Total
50 – 56	4	10	14
57 – 63	5	7	12
64 – 70	6	6	12
71 – 77	7	9	16
78 – 84	6	0	6
Total	28	32	60

Pearson correlation was used by the statistician in analyzing the data with the results in the next section.

Results

To answer each of the hypotheses, Analysis of Variances (ANOVA) in SPSS 16 was used to analyze the data at .05 level of significance.

H_0: Is There significant relationship between the ages and the problem solving skills of the respondents?

At p – computed value, .836, greater than .05 level of significance (p >. 05) as shown in Table 6, there is no significant relationship between the ages and problem solving skills of the respondents. Thus, this leads to the rejection of the hypothesis and acceptance of the null hypothesis.

Table 6

Pearson Correlation of the Relationship between the Ages and the Problem Solving Skills of Respondents

	Problem Solving	Ages
Pearson Correlation	1	.027
Sig.(2 – tailed)		.836
N	60	60

H_0: Is there significant relationship between the gender and the problem solving skills of the respondents?

At p – computed value, .021, less than .05 level of significance (p <. 05) shown in Table 7, there is significant relationship between the gender and problem solving skills of the respondents. This means that the hypothesis should be accepted and the null hypothesis should be rejected.

Table 7

Pearson Correlation of the Relationship between the Gender and the Problem Solving Skills of Respondents

	Problem Solving	Gender
Pearson Correlation	1	-.298'
Sig.(2 – tailed)		.021
N	60	60

H_0: Is there significant relationship between the attendance and the problem solving skills of the respondents?

At p – computed value, .631, greater than .05 level of significance (p >. 05) as shown in Table 8, there is no significant relationship between the attendances and problem solving skills of the respondents. Thus, the hypothesis must be rejected and acceptance of the null hypothesis. All respondents have perfect attendance except for one female respondent ho has one absent. This shows no correlation between attendances and the problem solving skills of the respondents.

Some researchers (Arulampon, 2007; Moore, 2006) confirmed for this correlation of the attendance of the students with their performances in which attendances worked for bright learners only but not for slow learners.

Table 8
Pearson Correlation of the Relationship between the Attendances and the Problem Solving Skills of the Respondents

	Problem Solving	Gender
Pearson Correlation	1	.063
Sig.(2 – tailed)		.631
N	60	60

H_0: Is there is significant relationship the class participation and the problem solving skills of the respondents?

At p – computed value, .000, less than .05 level of significance (p <. 05), there is significant relationship between the class participation and problem solving skills of the respondents. Table 9 shows the result. So the hypothesis should be accepted and the null hypothesis should be rejected.

Table 9
Pearson Correlation of the Relationship between the Class Participation and the Problem Solving Skills of Respondents

	Problem Solving	Class Participation
Pearson Correlation	1	.496"
Sig.(2 – tailed)		.000
N	60	60

H_0: Is there is significant relationship the Grade – 6 mathematics grades and the problem solving skills of the respondents?

At p – computed value, .000, less than .05 level of significance (p <. 05), there is significant relationship between the Grade-6 grades and problem solving skills of the respondents illustrated in Table 10. This leads to the acceptance of the hypothesis rejection of the null hypothesis. In other words, the basic knowledge in mathematics, of the respondents in their elementary level has something to do with their abilities to solve word problems. It is arithmetic which is the basic foundation in the said field that is very important to students to learn its concepts before solving any equation in algebra and prove geometry to become critical thinker. Mathematics topics in elementary still have the applications in additions, multiplications, ratio and proportion, and others that the students should have the skills to solve it.

This result was confirmed by Brad (2011), Orhun (2003), Lai, et. al. (2006), Samuelson (2012), and Zanzali and Nam (2003) that the basic knowledge in mathematics is necessary in having the ability to solve word problems. Furthermore, it requires higher thinking skills which can only be developed from the constant practice of solving, readiness in knowledge skill mathematics, and reading comprehension to understand the content of a particular word problem. All started from the very basic concepts of the knowledge of the field.

Table 10
Pearson Correlation of the Relationship between the Grade – 6 Mathematics Gradesand the Problem Solving Skills of Respondents

	Problem Solving	Grades
Pearson Correlation	1	.710"
Sig.(2 – tailed)		.000
N	60	60

H_0: Is there is significant relationship between the assignments and the problem solving skills of the respondents?

At p – computed value, .000, less than .05 level of significance (p <. 05), there is significant relationship between the assignments and problem solving skills of the respondents refer to Table 11. Thus, the hypothesis must be accepted and the null hypothesis must be rejected. The most important skill in learning to solve problems or mathematics computations is through constant practice of the concepts in the subject. That is why, students must be given daily assignments or homework activities to let them learn gradually and will prevent them to forget the steps or rules in solving particular mathematics. Eventually, students will have the ability to relate with the new topic as they have doe practices of some exercises at home.

Table 11
Pearson Correlation of the Relationship between Assignments and the Problem Solving Skills of Respondents

	Problem Solving	Assignments
Pearson Correlation	1	.564"
Sig.(2 – tailed)		.000
N	60	60

Discussions

This study confirmed the finding of Zhu (2007) that age of a student does not affect his or her performances because the ability of student to solve a particular word problem in mathematics lies in his or her experiences in solving (experiential skills). In other words, the more the students exposed to mathematics concepts and applications the more they learn and eventually the more they will be able to understand its concepts, create, and criticize such given concepts. That is to say, a younger student who has lot of experiences or constant practices in a field performs better than the older one who never attempted to do even the simpler addition of fractions. This is true for all types of students and in any area which means that their performances in mathematics is not associated with their gender, a confirmation of a finding in this research.

The relationship between the class participation and the problem solving skills of the respondents found to have significant because bright students easily think faster than slow learners. The more the students are able to connect to the concept and willing to share their own ideas to interfere, the more their minds develop and eventually they will able to conceptualize or criticize things. That is why, one of the rules in the new K to 12 curriculum is that class participations among students are highly motivated and are given larger time than the lecture of the teacher. Whereas for the relationship between the attendances and the problem solving skills of the respondents, it is found to have no correlation maybe because all of them were perfect in attendance except for one respondent who made only one absent from the month of June to August 2014.

The correlations between the assignments and the Grade – 6 mathematics grades of the respondents with their problem solving skills are found to have significant following the confirmation of the findings of some researchers (Brad, 2011; Grattoni, 2007; Orhun 2003; Lai, et. al., 2006; Siegler, 2003; Samuelson, 2012; Stein, 1993; Zanzali& Nam, 2003) that the foundations of knowledge of students are highly associated with their performances. Topics in mathematics are hierarchical, as well as, the different fields of the mentioned subject. For instance, algebra starts from arithmetic while geometry starts from algebra and so trigonometry from geometry. In other words, a student who has no knowledge in arithmetic will not be able to solve an equation in algebra. A student who does not know how to solve an equation may not know how to prove e a simple theorem in geometry.

Conclusion

Solving word problems mathematically require higher order thinking skills. A student at least must know how to visualize the concepts in a particular problem and must be able create new concepts that will lead to the solution of the problem. Then, to verify the answers whether correct or not, the student must know how to criticize his or her different solutions to find the best one.

The main reason for the inability of students to solve word problems is their insufficient knowledge in mathematical concepts particularly arithmetic ideas which are being discussed in elementary level. As a matter of facts, this brought to the hatred of students to learn further in the said field not unless some teaching strategies and techniques are applied to them by the teachers to solve this problem, the following recommendations are set forth:

Students who have difficulty in solving word problems must review some mathematical concepts related to the word problems in order to be able to solve it. In order to gain more ideas, it is better to review all basic concepts of mathematics in elementary like operations with integers, ratio and proportion, operations with rational numbers particularly fractions, and some basic geometric concepts which are frequently introduced in the last part of Grade - 6 mathematics.

Implication

Constant practice in solving mathematics concepts, equations, problems, and basic theories in geometry will develop the skills of students in doing it until they are able to apply it in real life situations. However, it is better to start solving word problems in the activities given in elementary mathematics then proceed to the next level to avoid confusions. For instance, start solving word problems involving additions, subtractions, divisions, and others. Try to understand the contents of the word problems.

In some cases, strategies of solving mathematics helps students to solve a given word problem. For instance, obtain the given values based on the information in the word problem and those values being asked. The ability of students to translate sentences into equations helps a lot more to them to obtain the solution. This must be learnt by students in order to familiarize the terms that signify addition like sum, total, more, and others.

The mathematics teachers must not escape the topics necessary for the students to solve word problems like translating some terms into mathematical terms mentioned previously. The terms are better to learn than the strategies in solving word problems because there are different ways of obtaining solutions in word problem without following the introduced strategies in some mathematics books. This is most of the time the reason for the difficulty of most students in solving problems.

Another way of motivating students to solve word problem is to accommodate all of their answers even without following the strategies in the book. That is, short-cut of obtaining solutions must not be restricted by the mathematics teacher to motivate the students to learn and be able to solve problems. however, the teacher must clearly discussed it to them that points are given to the steps in solution when a quiz is given and try to convince them to give solutions with less steps as long as it is accurate. Drawing of the concepts or events in a problem, also known as spatial skills, can help students visualize the concepts of the problem. It must also be motivated to the students to do it if they are helpful to them to analyze how the problem will be solved.

During the discussions of the applications of some mathematical concepts, mathematics teacher must set to it that the students can relate with the problem by trying to give further elaborations. In educational curriculum, it is highly recommended that the examples must be applicable to the daily living of students or at least they are able to see it in their environment, so that slow learners can have interest to listen and learn the discussions of the concepts by the teacher.

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