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Mathematical Creativity, Mathematics Self-Efficacy, and Mathematics Problem-Solving Performance of High School Students in Different Curricular Programs

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ABSTRACT

This descriptive-correlational study generally aimed to determine if mathematics self-efficacy and mathematical creativity can predict mathematics problem-solving performance of high school students. Further, it also aimed to determine the level of mathematics self-efficacy, level of mathematical creativity, and level of problem-solving performance of high school students as a whole and when classified according to curricular program. The respondents of this study were the two hundred twenty-four (224) high school students enrolled in a national high school in Iloilo. Cluster sampling was used to determine the participants in the study. Three researcher-made instruments were used in this study: the Mathematics Self-Efficacy Rating Scale (MSERS), the Mathematical Creativity Test (MCT), and the Mathematics Problem-Solving Test (MPST). These instruments were content-and face-validated by a panel of three experts and were pilot tested to determine their administrability. Mean and standard deviation were employed for the descriptive analysis of the study. The inferential statistical tools employed were the One-way Analysis of Variance (ANOVA), Pearson's Product-moment Correlation Coefficient (Pearson's r) and the Stepwise Multiple Linear Regression Analysis, all set at .05 alpha level of significance. This study found that the participants' level of mathematics self-efficacy and mathematics problem-solving performance when taken as an entire group was average, while their level of mathematical creativity, as a whole and in terms of fluency, flexibility, and originality, was moderately low. It was also found out that there existed a significant difference in self-efficacy; creativity in terms of fluency, flexibility, and originality; and mathematics problem- solving performance when the participants were classified according to curricular program. In addition, it was found that a moderate positive correlation existed between the participants' mathematics self-efficacy and their mathematical creativity. Finally, the result of this study revealed that mathematics self-efficacy and mathematical creativity are predictors of mathematics problem-solving performance when participants were taken as a whole group. When classified according to curricular program, mathematics self-efficacy and mathematical creativity are predictors in the Regular Class participants but not in the Special Science Class, School for the Arts, and School of the Future participants. Furthermore, mathematical creativity was found to be the best predictor of mathematics problem solving performance when participants were taken as a whole group and when classified as to curricular program.

Keywords: mathematical creativity, mathematics self-efficacy, mathematics problem solving, curricular programs,

Introduction

Problem solving is considered to be an important life skill one must possess but then is considered to be difficult to develop by many. Curriculum developers recognize that providing problem-solving experience is critical if students are to be able to use and apply mathematical knowledge in meaningful ways. In fact, problem solving is one of the twin goals of the Mathematics Curriculum in the Philippine Basic Education level. It is through problem solving that student develop deeper understanding of mathematical ideas, become more engaged and enthusiastic in lessons, and appreciate the relevance and usefulness of mathematics. However, developing successful problem solvers is a complex task, requiring a range of skills and dispositions (Stacey, 2005). Students need deep mathematical knowledge, a strong self-belief that they can do it, and general reasoning ability as well as heuristic strategies for solving non-routine problems.

Torrance (1974) defines creativity as a product of fluency, flexibility, and originality. According to Gil, Ben-Zvi, and Apel (2007), fluency is the ability of producing many ideas, while flexibility refers to the number, the degree, and the focus of approaches that are observed in a solution. The term "originality" refers to the possibility of holding extraordinary, new, and unique ideas. According to Onda (1994), creativity plays an important role in students' academic achievement. When a person believes that he or she has the ability to act creatively, he or she likely has the purpose and self-confidence to achieve his or her creative goals. It is believed that one way to promote creativity is to develop a person's self-efficacy (Edelson, 1999). Bandura (1986) argued that one's successful functioning with respect to a certain task is best served by reasonable accurate efficacy appraisals, although the most functional efficacy judgments are those that slightly exceed what one can actually accomplish, for this over estimationmay serve as motive to increase effort and persistence. As a consequence, curricular performance is highly influenced and predicted by students' perceptions of what they believe they can accomplish. Students with higher self-efficacy are more successful in mathematics because they can perform better cognitively, have more motivation to continue in the face of difficulties, have less math anxiety, and are more likely to study mathematics (Watson, 2015).

The Department of Education (DepEd) Bureau of Secondary Education has designed Special Curricular Programs for students with special talents and skills but are enrolled in the regular schools. The Special Curricular Programs shall focus on special academic disciplines namely: Science, Technology and Engineering, Arts, Sports, Journalism, Foreign Language and Technical-Vocational education that shall develop the full potential of students. Through the Special Curricular Programs, it is envisioned that DepEd will produce globally competitive learners who are equipped with 21st century. With the implementation of the k-12 curriculum, the Department of Education aims for learners to develop their learning and innovative skills which includes creativity and problem-solving (DO 21 s. 2019).

But as the rank of the Philippines in the international standardized assessments such as TIMMS (Mullis et.al., 2020) and PISA (OECD, 2019) remains at the bottom, the goal of the Philippine Basic Education Curriculum in Mathematics is far from being reached. Thus, this study is conducted to determine if mathematics self-efficacy and mathematical creativity can predict mathematics problem-solving performance of high school students. Further, it also aimed to determine the level of mathematics self-efficacy, level of mathematical creativity, and level of problem-solving performance of high school students as a whole and when classified according to curricular program.

METHODS

This descriptive-correlational study aimed to find out whether mathematics self-efficacy and mathematical creativity can predict mathematics problem-solving performance of high school students as a whole and when classified according to curricular programs. According to McBurney & White (2009), descriptive-correlational research design aims to provide static pictures of situations as well as establish the relationship between different variables.

The participants of this study were the randomly selected fourth year students of a national high school in Iloilo, Philippines. Cluster sampling was used to determine the number of participants in each curriculum program. Fish-bowl method was then employed in each program to determine the sections that were included in the study. One section represented each of the curricular programs except for the Regular class which was represented by three sections. One each from sections 1 to 4, sections 5 to 8, and sections 9 to 12. This was done to ensure that the regular class would be well represented due to its larger population compared to the other programs. One section was randomly selected each from sections 1 to 4, sections 5 to 8, and sections 9 to 12. Table 1 presents the frequencies and percentages of participants when classified according to curricular program.

Table 1-Distribution of Participants as to Different Curricular Programs

Curricular Program	No. of students	%
Regular Class (RC)	131	58.48%
Special Science Class (SSC)	30	13.39%
School for the Arts (SA)	34	15.18%
School of the Future (SOF)	29	12.95%
Total	224	100%

Three researcher-made instruments were used in this study: the Mathematics Self-Efficacy Rating Scale (MSERS), the Mathematical Creativity Test (MCT), and the Mathematics Problem-Solving Test (MPST). These instruments were content-and face-validated by a panel of three experts and were pilot tested to determine their administrability.

Table 2 shows the scale used to interpret the means obtained in the Mathematics Self-efficacy Rating Scale (MSERS):

Table 2- Mathematics Self-Efficacy Scale

Scale	Description
$5 \le x \le 6$	High
$4 \le x < 5$	Moderately High
$3 \le x < 4$	Average
$2 \le x < 3$	Moderately Low
$1 \le x < 2$	Low

Table 3 shows the scale used to interpret the scores obtained in the Mathematical Creativity Test (MCT). The scale was based on the highest score that was attained by the participants which were taken after all responses were checked. The highest score was divided by 5 to determine the five levels of the scale, which are as follows:

Table 3- Mathematical Creativity Scale

Scale	Description
Top 20%	Very High
Second 20%	Moderately High
Middle 20%	Average
Fourth 20%	Moderately Low
Bottom 20%	Very Low

Table 4 shows the scale used to interpret the scores obtained in the Mathematics Problem-Solving Test (MPST).

Table 4- Mathematics Problem Solving Scale

Scale	Description
40< x ≤50	High
30< x ≤40	Moderately High
20< x ≤30	Average
10< x ≤20	Moderately Low
0< x ≤10	Low

The data gathered were subjected to appropriate statistical treatment. The Statistical Packages for the Social Sciences (SPSS) software version 17 was used to analyze the data gathered. The mean was used to determine the level of the mathematics self-efficacy; the level of mathematical creativity as a whole and in terms of fluency, flexibility, and originality; and the level of mathematics problem-solving performance of the participants. Standard deviation was employed to determine the participants' homogeneity or heterogeneity. To determine whether there were significant differences in the mathematics self-efficacy, mathematics problem-solving performance, and mathematical creativity of the participants, the researcher employed the One-Way Analysis of Variance. The researcher employed the Pearson's Product-Moment Correlation Coefficient (Pearson's r) to determine significant relationship between mathematics self-efficacy and mathematical creativity. A Multiple Linear Regression was used to predict mathematics performance from the mathematics self-efficacy and mathematical creativity.

RESULTS

Table 5 presents the level of self-efficacy of the participants. It shows that the participants had an average level (M=3.93, SD = 0.85) of self-efficacy when taken as a whole. When classified according to curricular program, the participants from the Regular class had an average level (M=3.67, SD=0.88) of mathematics self-efficacy; while participants from the rest of the programs have a moderately high level of self-efficacy.

Table 5 - Level of Mathematics Self-Efficacy of the Participants as a Whole and When Classified According to Curricular Program

Curricular Program	M	Description	SD
Entire Group	3.93	Average	0.85
Regular Class	3.67	Average	0.88
Special Science Class	4.56	Moderately High	0.61
School of the Arts	4.16	Moderately High	0.67
School of the Future	4.14	Moderately High	0.65

Legend. High (5 ≤ x ≤ 6), Moderately High (4 ≤ x <5), Average (3 ≤ x <4), Moderately Low (2 ≤ x <3), Low (0≤ x <1)

Table 6 presents the level of mathematical creativity as a whole and in terms of fluency, flexibility and originality of the participants. When taken as a whole group, the participants level of mathematical creativity as a whole is moderately low (M=166.23, SD=84.78). In terms of fluency, flexibility, and originality, the participants also obtained a moderately low level of creativity. When grouped according to curricular programs, the participants from the Special Science class obtained an average level (M=243.50, SD=88.10) of mathematical creativity which is higher than the rest of the other programs with a moderately low level of mathematical creativity.

Table 6 - Level of Mathematical Creativity as a Whole and in terms of Fluency, Flexibility, and Originality as a Whole and When Classified According to Curricular Program

Curricular Program	As a whole			Fluency			Flexibility			Originality		
	M	D	SD	M	D	SD	M	D	SD	M	D	SD
Entire Group	166.23	ML	84.78	56.95	ML	27.45	50.66	ML	24.59	58.63	ML	35.17
Regular Class	149.73	ML	81.42	51.44	ML	26.19	45.34	ML	22.91	52.95	ML	34.01
Special Science Class	243.50	A	88.10	84.53	A	27.39	72.93	A	23.62	86.03	A	39.76
School of the Arts	162.53	ML	70.29	53.79	ML	21.34	51.41	ML	25.34	57.32	ML	29.46
School of the Future	165.17	ML	70.04	57.00	ML	23.14	50.76	ML	19.48	57.41	ML	29.34

Legend. M = Mean, D = Description, SD = Standard Deviation

Mathematical Creativity Scale

As a whole: High (H) (392< x ≤489), Moderately High (MH) (294< x ≤391), Average (A) (196< x ≤293), Moderately Low (ML) (98< x ≤197), Low (L) (0< x ≤97)

Fluency: High (H) (132< x ≤164), Moderately High (MH) (99< x ≤131), Average (A) (66< x ≤98), Moderately Low (ML) (33< x ≤65), Low (L) (0< x ≤32)

Flexibility: High (H) (124< x ≤155), Moderately High (MH) (93< x ≤123), Average (A) (62< x ≤92), Moderately Low (ML) (31< x ≤61), Low (L) (0< x ≤30)

Originality: High (H) (152< x ≤189), Moderately High (MH) (114< x ≤151), Average (A) (76< x ≤113), Moderately Low (ML) (38< x ≤75), Low (L) (0< x ≤737)

Table 7 presents the level of problem-solving performance of the participants. The participants, when taken as a whole group, had an average level (M=20.33, SD=9.45) of mathematics problem-solving performance. Among the curricular programs, the participants from the Special Science class had the highest level of mathematics problem-solving performance with mean (M=35.77, SD=6.23). The participants from the School of the Future obtained an average level (M=20.93, SD=6.03) of mathematics problem-solving performance. Participants both from the Regular class and the School of the Future had a moderately low level of mathematics problem-solving performance with mean (M=17.37, M=17.62), respectively, and standard deviation (SD=7.71, SD=6.71), respectively.

Table 7 - Level of Mathematics Problem Solving Performance of the Participants as a Whole and When Classified According to Curricular Program

Curricular Program	M	D	SD
Entire Group	20.33	Average	9.45
Regular Class	17.37	Moderately Low	7.71
Special Science Class	35.77	Moderately High	6.23
School of the Arts	17.62	Moderately Low	6.71
School of the Future	20.93	Average	6.03

Legend: High (40< x ≤50), Moderately High (30< x ≤40), Average (20< x ≤30), Moderately Low (10< x ≤20), Low (0< x ≤10)

Table 8 presents the result of the One-Way Analysis of Variance (ANOVA) to find out whether significant difference existed in the mathematics self-efficacy, of the participants when classified according to curricular program.

Table 8 - Differences in the Mathematics Self-efficacy of the Participants When Classified According to Curricular Program

	Sum of Squares	df	Mean Square	F	p-value
Between Groups	23.53	3	7.84	12.44*	.00
Within Groups	138.74	220	0.63		
Total	162.26	223			

* p-value < 0.001

Based on the results, there is a significant difference in the mathematics self-efficacy of the participants when classified according to curricular program with *F* (3,220) = 12.44 and *p*=0.000. Results of the Scheffe in Table 9 show that the Regular class participants' self-efficacy is significantly lower as compared to those of the other curricular programs.

Table 9 - ***Results of the Scheffe Test on the Differences in the Mathematics Self-efficacy among the Compared Groups***

Compared Groups		Mean Diff.	p
Regular Class	**School for the Arts**	-0.49*	0.02
Regular Class	**School of the Future**	-0.47*	0.04
Regular Class	**Special Science Class**	-0.88*	0.00
School for the Arts	**School of the Future**	0.02	1.00
School for the Arts	**Special Science Class**	-0.39	0.27
School of the Future	**Special Science Class**	-0.41	0.27

* p< 0.05

Table 10 shows that there was a significant difference in the mathematical creativity as a whole and in terms of fluency, flexibility, and originality of the participants when classified according to curricular program even at p<0.001.

Table 10 - ***Differences in the Mathematical Creativity as a Whole and in Terms of Fluency, Flexibility, and Originality of the Participants When Classified according to Curricular Program***

Categories		Sum of Squares	df	Mean Square	F	p
Mathematical Creativity	**Between Groups**	215 303.17	3	71 767.72	11.38*	0.00
	Within Groups	1 387 396.21	220	6 306.35		
	Total	1 602 699.39	223			
Fluency	**Between Groups**	27 148.13	3	9 049.38	14.13*	0.00
	Within Groups	140 909.22	220	640.50		
	Total	168 057.36	223			
Flexibility	**Between Groups**	18 615.90	3	6 205.30	11.75*	0.00
	Within Groups	116 236.63	220	528.35		
	Total	134 852.53	223			
Originality	**Between Groups**	26 849.33	3	8 949.78	7.91*	0.00
	Within Groups	248 961.17	220	1131.64		
	Total	275 810.50	223			

* p<0.001

Results of the Scheffe Test in Table 11 show that the difference occurred between the Special Science Class and each of the other curricular programs

Table 11 - ***Results of the Scheffe Test on the Differences in the Mathematical Creativity as a Whole and in Terms of Fluency, Flexibility, and Originality among the Compared Groups***

Compared Groups		Whole		Fluency		Flexibility		Originality	
		Mean Diff.	p	Mean Diff.	p	Mean Diff.	p	Mean Diff.	p
Regular Class	**School for the Arts**	-12.8	0.87	-2.36	0.97	-6.08	0.60	-4.37	0.93
Regular Class	**School of the Future**	-15.45	0.83	-5.57	0.77	-5.42	0.72	-4.46	0.94
Regular Class	**Special Science Class**	-93.78*	0.00	-33.10*	0.00	-27.60*	0.00	-33.08*	0.00
School for the Arts	**School of the Future**	-2.64	1.00	-3.21	0.97	0.65	1.00	-0.09	1.00
School for the Arts	**Special Science Class**	-80.97*	0.00	-30.74*	0.00	-21.52*	0.00	-28.71*	0.01
School of the Future	**Special Science Class**	-78.33*	0.00	-27.53*	0.00	-22.18*	0.00	-28.620*	0.02

* p< 0.05

Results of the One-Way Analysis of Variance in Table 12 show that there was a significant difference in the mathematics problem-solving performance of the participants when classified according to curricular program, with F(3, 220)=55.20 and p=0.00.

Table 12 - ***Differences in the Problem-Solving Performance of the Participants when Classified According to Curricular Program***

	Sum of Squares	df	Mean Square	F	p-value
Between Groups	8559.88	3	2853.29	55.20*	0.00
Within Groups	11371.67	220	51.69		
Total	19931.55	223			

* p < 0.001

Result of the Scheffe Test in Table 13 shows that the Special Science class participants' mathematics problem-solving performance was significantly higher as compared to the other curricular programs.

Table 13- ***Results of the Scheffe Test on the Differences in the Problem-Solving Performance of the Participants among the Compared Groups***

Compared Groups		Mean Diff.	p
Regular Class	**School for the Arts**	-0.25	1.00
Regular Class	**School of the Future**	-3.57	0.12
Regular Class	**Special Science Class**	-18.40*	0.00
School for the Arts	**School of the Future**	-3.31	0.35
School for the Arts	**Special Science Class**	-18.15*	0.00
School of the Future	**Special Science Class**	-14.84*	0.00

* p< 0.05

Table 14 presents the Pearson's Product-Moment Correlation Coefficient or Pearson's r to determine whether significant relationship would exist between mathematics self-efficacy and mathematical creativity as a whole and in terms of fluency, flexibility, and originality. Based on the results, there was a significant relationship (r =0.44, p=0.00) in the participants' mathematics self-efficacy and mathematical creativity as a whole. This signifies that there is a moderate positive correlation between the participants' mathematics self-efficacy and their mathematical creativity as a whole. Significant relationships were also noted between mathematics self-efficacy and mathematical creativity in terms of fluency (r=0.45, p=0.00), flexibility (r = 0.42, p=0.00); and originality (r=0.41, p=0.00).

Table 14 - ***Relationships among the Participants' Scores in Self-efficacy and Creativity as a Whole and in Terms of Fluency, Flexibility, and Originality***

		Mathematical Creativity	Fluency	Flexibility	Originality
Mathematics Self-efficacy	**r**	0.44*	0.45*	0.42*	0.41*
	p-value	0.00	0.00	0.00	0.00
	n	224	224	224	224

*p< 0.001

Table 15 shows that mathematics self-efficacy (t=4.01, p=0.00) and mathematical creativity (t=6.45, p=0.00) significantly predicted the mathematics problem-solving performance of the participants (F(2,221)=49.68, p=0.00 even at p<0.01) when taken as a whole group. When classified according to curricular programs, the self-efficacy (*t*=2.04, *p*=0.043) and the mathematical creativity (*t*=4.02, *p*=0.00) are both significant predictors of the mathematics problem-solving performance of the Regular class (*F*(2,130)=21.05, *p*=0.00 even at p<0.01) participants but not of the other programs.

Table 15 - ***Predictors of Mathematics Problem-Solving Performance of High School Students***

Model		R	R^2	Adjusted R^2	b	t	p	F	p
Entire Group	**Regression**	0.56	0.31	0.30				49.68*	0.00
	Constant				2.06	0.83	0.41		
	Mathematics Self-efficacy				2.76	4.01*	0.00		
	Mathematical Creativity				0.05	6.45**	0.00		
Regular Class	**Regression**	0.50	0.25	0.24				21.05*	0.00
	Constant				6.11	2.39*	0.02		
	Mathematics Self-efficacy				1.64	2.04*	0.04		
	Mathematical Creativity				0.04	4.02*	0.00		
Special Science Class	**Regression**	0.34	0.12	0.05				1.76	0.19
	Constant				41.19	4.27*	0.00		
	Mathematics Self-efficacy				-2.09	-1.12	0.27		
	Mathematical Creativity				0.02	1.30	0.20		
School for the Arts	**Regression**	0.35	0.12	0.07				2.19	0.13
	Constant				3.87	0.53	0.60		
	Mathematics Self-efficacy				2.45	1.44	0.16		
	Mathematical Creativity				0.02	1.36	0.18		
School of the Future	**Regression**	0.33	0.11	0.04				1.55	0.23
	Constant				7.71	1.01	0.32		
	Mathematics Self-efficacy				2.71	1.58	0.13		
	Mathematical Creativity				0.01	0.75	0.46		

* p<0.05

Legend: Dependent Variable: Mathematics Problem-Solving performance

Predictors: Mathematics Self-efficacy, Mathematical Creativity

RC=Regular Class, SSC=Special Science Class, SA=School for the Arts, SOF = School of the Future

DISCUSSION

The participants' level of mathematics self-efficacy when taken as an entire group was average. When taken according to curricular programs, Regular class participants had an average level mathematics self-efficacy and Special Science class (SSC), School for the Arts (SA) and School of the Future (SOF) participants have moderately high level of self-efficacy. This shows that among the curricular programs, the Regular class participants had the lowest level of mathematics self-efficacy while the Special Science class participants had the highest level. The three special programs (SSC, SA, and SOF) had a moderately high level of mathematics self-efficacy maybe because the core curriculum in the K to 12 Basic Education Curriculum (BEC) from Grade 7 to Grade 10 are enriched by additional subjects in a special academic discipline that allows the students to maximize their potential intellectual skills. Thus, these students are more exposed to varied activities than the Regular class students. Furthermore, the Regular class participants are the most varied in their level of self-efficacy. One factor considered for this is that the Regular class students are composed of students with varied background and abilities, unlike the other three special curricular programs wherein the students were screened according to their special talents and skills.

When taken as an entire group, the participants' level of mathematical creativity as a whole and according to fluency, flexibility, and originality was moderately low. These results indicate that the participants when taken as a whole group were not that creative enough in solving the problems presented to them. Some students seemed to be contented in providing few answers/questions only. Maybe the problems posed by their teachers most of the time are problems that have only one solution. Another is that, maybe the students were not given time to reflect on what they had learned or not learned by posing questions regarding the problem given. One way of knowing whether students know the lesson or not is by how they ask or construct their questions. According to Jensen (1973), for students to be creative in mathematics, they should be able to pose mathematical questions that extend and deepen the original problem as well as solve the problems in a variety of ways. Furthermore, the participants were very varied in their responses. This indicates that there are some of them who were very creative but there were also some who were not.

When taken according to curricular programs, the Special Science class participants had an average level of creativity as a whole and according to fluency, flexibility and originality. The Special Science class offers advance mathematics subjects to these students than the rest of the curricular programs in the high school. Their students were more exposed to a variety of problems in mathematics, thus giving them better opportunity to be creative. The Regular class, School for the Arts and School of the Future participants had an average level of creativity as a whole and moderately low in terms of fluency, flexibility, and originality. Their low level of mathematical creativity suggests that these students might not have been exposed to a variety of problems. Furthermore, a large standard deviation indicates that the Special Science class participants were the most varied group of all the curricular programs were very varied in terms of their creativity in mathematics. Furthermore, the data revealed that the Special Science class was the most varied group. This means that there are some of them who were very creative and there are some who were not so creative at all. The School of the Future participants were the least varied of all. This means that they are the most homogeneous group among all the curricular programs considered when it comes to mathematical creativity as a whole. In terms of fluency, the most varied group is the Special Science class. This indicates that there are some of them who can generate a lot of correct responses but there are also those among them who cannot. In contrast, the School for the Arts was the least varied among the curricular programs in terms of fluency. In terms of flexibility, the School for the Arts is the most varied in generating different kinds of solutions/questions to the problems presented to them. This means that some of them can provide a number of different solutions/questions but there are also some of them who cannot. The least varied among all the curricular programs is the School of the Future. In terms of originality, the Special Science class is the most varied in generating solutions/questions that were not taught in the other curricular programs. This implies that in this group some can generate original responses and there are also in this group that cannot. The School of the Future is the least varied in generating original responses.

The mathematics problem-solving performance level of the participants as a whole group is average. This indicates that they were able to master the basic of what should be learned in problem solving. But this also indicates that they have to work more to elevate their level higher. Among the curricular programs, the participants from the Special Science class had the highest level of mathematics problem-solving performance. This result is expected for they are the frontliner of the school when it comes to science and mathematics education. The participants from the School of the Future obtained an average level of mathematics while those from the Regular class and the School of the Future had a moderately low level of mathematics problem-solving performance. This indicates that the students still need to exert more effort to improve their skill in problem solving. To promote understanding, problems that should be presented to students should be those that do not have rules to memorize, do not require one solution only and those that offers opportunity to explore and come up with their own method for solution. According to Burns (2000) children can have the tendency of acquiring the required computational skill but still cannot do problem solving. One reason for this is not that they have poor computational or reading skill but they do not know what operation to apply to the given problem. But according to Burns, this problem can still be improved by giving clear and definite instructions in problem solving.

The self-efficacy of the Regular class participants is significantly lower than the other programs. Thus, students from the Regular class should be scaffolded in doing mathematics problem solving. In this way, they would gradually develop their self-belief that they can do problem solving. No significant differences in the self-efficacy among the Special Science class, School for the Arts and the School of the Future were noted.

The mathematical creativity as a whole and in terms of fluency, flexibility, and originality of the participants in the Special Science class are significantly higher than the other programs. On the other hand, no significant difference existed in the mathematical creativity as a whole and in terms of fluency, flexibility, and originality among the Regular class, School of the Future and School for the Arts. All students, especially those with potential talent in mathematics, need academic rigor and challenge as well as creative opportunities to explore the nature of mathematics and to employ the skills they have developed. Young children explore mathematics naturally and yet the skills-based mathematics encountered in many classrooms fails to connect their natural curiosity with the established curriculum of mathematics. Instead, they are immersed in a classroom environment where mastery and understanding are assessed on the basis of their ability to rapidly solve problems presented in a straightforward manner (Carpenter, 1986; Ginsberg, 1996; Schoenfeld, 1987).

The mathematics problem-solving performance of the participants in the Special Science class are significantly higher than that of the other programs. This is because the Special Science class is the frontier program of the high school when it comes to science and mathematics education thus the focus of this program is more on the development of the science and mathematics skills of the students. This implies that the curriculum is in a good track of providing quality mathematics instruction to their students. Furthermore, this signifies that the other curricular programs have to work more to improve the problem-solving performance creativity of their students. However, mathematics problem-solving performance among the Regular class, School of the Future, and School for the Arts did not significantly differ.

A moderate positive correlation existed between the participants' mathematics self-efficacy and their mathematical creativity as a whole and in terms of fluency, flexibility, and originality. It implies that when a person has a high mathematics self-efficacy, it follows that he/she has a high level of mathematical creativity in generating unique and unusual responses or solutions. This implies that developing the mathematics self-efficacy of the students could also help in developing their mathematical creativity.

Mathematics self-efficacy and mathematical creativity are predictors of mathematics problem-solving performance when the participants were taken as a whole. In fact, 31% of the variability in the mathematics problem-solving performance of the participants can be explained by the mathematics self-efficacy and mathematical creativity. This result is parallel with the findings of Camarista (2012). However, this is in contrast with the findings of Yailagh, Lloyd, and Walsh (2009), wherein they reported indirect effect of self-efficacy on mathematics achievement. Furthermore, mathematical creativity was found to be a better predictor than mathematics self-efficacy. When classified according to curricular program they were predictors of the mathematics problem-solving performance of the Regular class. However, they were not significant predictors of mathematics performance of the Special Science class, School of the Future and School for the Arts.

Finally, mathematics problem-solving performance can be predicted by the formula $y=2.06+2.76x_1+0.05x_2$, where y is the mathematics problem-solving performance of the participants and x_1 and $x_2$are variables representing the self-efficacy and creativity of the participants, respectively. The formula suggests that if creativity is held constant, for every point increase in a student's self-efficacy can cause an increase of about 2.76 of his mathematics problem-solving performance.

When classified according to curricular programs, self-efficacy and mathematical creativity are both significant predictors of the mathematics problem-solving performance of the Regular class participants but not of the other programs. In fact, 24.8% of the variability in the mathematics problem-solving performance of the Regular class participants can be explained by their mathematics self-efficacy and mathematical creativity. This can be summarized by the equation $y= 6.11 +1.64x_1+0.04x_2$, where y is the mathematics problem-solving performance of the participants and x_1 and x_2 are variables representing the self-efficacy and creativity of the participants, respectively. The formula suggests that if creativity is held constant, for every point increase in a student's self-efficacy can cause an increase of about 1.64 of his mathematics problem-solving performance and if self-efficacy is held constant, for every point increase in a student's creativity can cause an increase of about 0.04 of his mathematics problem-solving performance. It can remarkably be noted that in the Special Science class that even if the mathematics self-efficacy and the mathematical creativity of the participants were not predictors of their mathematics problem-solving performance, there are other factors that were not taken into consideration in this study, that can significantly predict the mathematics problem-solving performance even at $p<0.01$.

Furthermore, this shows that when creativity is held constant, every increase in the self-efficacy of the Special Science class marks about 2.09 decrease in the mathematics problem-solving performance of the participants. But this effect of self-efficacy on the mathematics problem-solving performance of the Special Science class is not significant. This means that this effect is not true to most of the Special Science class participants. The relationships of these variables can be summarized by the equation $y=6.11+1.64x_1+0.04x_2$, where y is the mathematics problem-solving performance of the participants and x_1 and x_2 are variables representing the self-efficacy and creativity of the participants, respectively. This result is parallel to the study of Schoevers, et. al. (2021) where they found that creativity is a significant predictor of students' performance on all types of geometrical problems, but most strongly associated with performance on open-ended non-routine problems. Camarista (2012), in his study on mathematically gifted pupils, states that creativity is needed to succeed in problem solving.

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