Review on the Barriers Of Mathematics

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Abstract: Although the start of technology in education, many teachers face several challenges when trying to effectively add technology into their classroom teaching. Additionally, while national statistics cite an amazing improvement in access to computer technology tools in schools, teacher surveys show reliable declines in the use and combination of computer technology to enhance student learning. This article reports on roles of mathematics nervousness, confidence, proactive coping, and test stress in mathematics achievement among 204 (151 females) randomly selected primary and Year 8-10 secondary school students. The negative dimensions of mathematics anxiety, self-esteem, and proactive coping correlated negatively with mathematics achievement and were both poor predictors of and barriers to mathematics achievement. In addition, females scored significantly higher on negative self-esteem and forward stress variables than males. Overall, the findings have practical significance indicating psychological areas where attention, counseling efforts and educational interventions need to be directed to help the at-risk and weak students.

Keywords: *barriers, mathematics achievement, mathematics anxiety, self-esteem, proactive coping, test stress, secondary school students*

I. Introduction

Mathematics is one of the challenging subjects in which primary and secondary school students often perform poorly. There is currently general concern about poor examination results in Brunei [22]. Some of the authors blamed low results on poor teaching skills [18]. For students in Brunei primary and secondary schools the problems have been observed to be due to lack of proper understanding of mathematical language and misinterpretation of mathematical concepts [3; 8; 30].A number of suggestions have been made to solve the problem. They include several ideas on preventing math anxiety [20] and the on-going efforts in Brunei to develop mathematics screening tests for lower and upper primary school students. The purpose of these instruments is to diagnose mathematics learning problems for young children. Studies have also emphasized the importance of using suitable methods, such as cooperative learning, to teach mathematics to slow learners [1; 30]. It has further been suggested that teachers should use instructional techniques that improve students' attitudes towards mathematics [14; 25].

A) Mathematics Anxiety and Academic Achievement

Mathematics anxiety (MA) is an extreme emotional and unreasonable fear of mathematics based on impractical feelings of dissatisfaction hopelessness, and helplessness associated with repeated failure or lack of experience of success. For example, a study on statistics (a branch of mathematics), found that mathematics anxiety had a number of negative elements on overall performance in mathematics such as procrastination, interpretational anxiety, test and class anxiety, fear of asking for help, fear of failure, task aversion, negative computational self-concept, and fear of the statistics instructor [24]. MA is thus a non-productive experience that harms future learning as the student's inability to do numerical operations leads to psychological pain, discomfort, reduced interest and motivation as well as avoidance of mathematics and mathematics lessons [21; 26]. There are several ways mathematics anxiety may be reduced. One of them is to help learners to identify the various ways they conceptualize mathematics and then assist them to notice their faulty conceptualizations [7]. Mathematics anxiety had a significant negative correlation with mathematics performance [9].

B) Self-Esteem and Academic Performance

Earlier research (e.g. [27; 10])showed that self-esteem had two dimensions, positive and negative, and that it had positive links or connections with academic success (e.g. [11]) However, new research disputes this concluding claim and suggests that the relationship between self-esteem and

academic achievement might be mediated by other variables. For example, a researcher found a significant positive relationship between self-esteem and academic achievement in pre-university students but no big gender differences in their self-esteem scores [4]. The results of this study showed that the two genders' difference in academic achievement was not caused by differences in self-esteem but rather by differences in academic motivation [4]. Another relatively recent previous study [27] found that gender discrepancy in mathematics achievement was significant when the influence of motivation was evaluated in female and male students.

C) Proactive Coping and Academic Achievement

Academic achievement appears to be facilitated and fostered by many factors including motivation and coping styles for stressful situations. The role of motivation in academic achievement is, however, made complex by the fact that there are many different types of motivation. It was found that both intrinsic and extrinsic motivation contributed to students' mathematics achievement in an additive fashion, whereas extrinsic-related motivation appeared to have a negative effect on their Western counterparts' learning [32]. There were six separate components of there were six separate components of achievement motivation: confronting doubt, facing difficulties, assuming personal responsibility, calculating risks, solving problems and motivated for perfection [28]

D) Test Stress and Academic Achievement:

Stress is one of those many factors that in the present study are hypothesized to have negative effects on academic achievement. The study aimed at finding out if any relationship existed between psychological stress and academic achievement in high IQ teenagers [19]. Academic achievement was found to be negatively and significantly correlated with all types of stress assessed in this study. It was also reported the negative relationship between academic achievement and psychological stress [12; 23; 2].

E) Method, Analysis, procedure and result of Mathematics Anxiety, self esteemed, Proactive Coping and Test stress Scored

E1) Method

Under this procedure, Malai Hayati Sheikh Hamid, Masitah Shahrill, Rohani Matzin, Salwa Mahalle & Lawrence Mundia collected data from students in different grades or levels of secondary school in the Brunei education system. The field survey research design differs from the telephone, online and postal survey techniques in that the researcher has to individually go into the educational institutions to collect the data. The explanation and reason for employing this survey mode was two-fold. First, the researchers wanted to involve as many secondary school students as possible across three educational levels. Second, the investigators wanted to give on-the-spot help to respondents who needed support in completing the research instruments properly so as to increase the number of practical returns.

E2) Illustration

Using a list of government secondary schools from the Ministry of Education, four schools were randomly chosen for this study. The selected schools represented two of the four regions of Brunei. From these schools, 204 participants were selected randomly for purposes of the study. In which 151 (74%) are females and 53 (26%) are. males. The sample consisted of 106 (52%) Form 2s, 54 (26%) Form 3s, and 44 (22%) Form 4s. Form 2 is equivalent to Year 8 or Grade 8, Form3 is equivalent to Year 9 or Grade 9 and Form 4 is equivalent to Year10 or Grade 10 in education systems. In terms of Age, the oldest and youngest research participants were aged 18 and 14 years respectively. Overall, only 45 (22%) of the participants self-reported that they liked mathematics while the rest (majority) were most interested in other subjects. On another part biographical item, only 61 (30%) students happily indicated that they performed well in mathematics. Additional biographical information pertaining to the work and description of the participants is presented in Table 1

Demographical description of the participants (N=204)			
Description	***Form 2 (Grade 8) n = 106***	**Form 3 (Grade 9) n = 54**	**Form 4 (Grade 10) n = 44**
Females (n = 151)	*82*	*36*	*33*
% of subsample	*77*	*67*	*75*
% of whole sample	*40*	*18*	*16*
Males (n = 53)	*24*	*18*	*11*
% of subsample	*23*	*33*	*25*
% of whole sample	*12*	*9*	*5*
Mean age	*14.320*	*14.790*	*15.360*
Standard deviation	*0.770*	*0.950*	*1.030*

(Table-1) International Education Studies; Vol. 6, No. 11; 2013

E3) Instruments

Data for the study were collected by one instrument divided into five sections (A – E).

PART-A

In this part present study consisted of a 7-item personal information questionnaire constructed by the researcher. This section collected demographic information such as gender, age, participants' educational level or class as well as interest in selected school subjects.

PART-B

This part contained the 14-item Mathematics Anxiety Scale-Revised, MAS-R [5]. All the items in this new record had 5-point Likert-type scales (ranging from 1 SD to 5 SA). Seven of the item were positively worded while the other half (7) were negatively phrased. The negatively stated items were reverse scored. As suggested or implied by its name, MAS-R measures mathematics anxiety (MA). Following the measures used the positive and negative items for the MAS-R scale were selected as two subscales (called Positive MA and Negative MA) in the present study [6].

PART-C

This part comprised of the old but typical or determining 10-item Self-esteem Scale, SE [27] which is still widely used. Half of the items in this scale are negatively stated and reverse scored. Items in this inventory had 4-point Likert-type scales (ranging from 1 SD to 4 SA). This short and well-established self-esteem scale measures an individual's feelings of self-esteem. Employing the procedures used the positive and negative items for SE scale were also designated as two subscales (referred to as Positive SE and Negative SE). [5; 6]

PART-D

This part offered the 14-item Proactive Coping scale, PC [13]. Eleven items of this questionnaire were written in the positive and three in the negative direction, requiring both positive and negative scoring respectively. The items were rated on 5-point Likert-type scales (ranging from 1 Not at all true; to 5 completely true). Based on the procedures used the positive and negative items for the PC scale formed two subscales (labeled as Positive PC and Negative PC) [5; 6].

PART-E

This part was composed of the 15-item Impact of Event scale, IE [15]. The IE scale did not have positive and negative items. Instead, it had two categories of items, 7 of which were termed as "intrusive" and another 8 items labeled as "avoidance" [15]. In the present study, the items for this instrument were scored following 4-point Likert-type scales (ranging from 1 not at all; to 4 often). The intrusive and avoidance items were treated as forming two subscales (known as Intrusive IE and Avoidance IE). In the present study IE scale measured the stress which may be occurred before the test, during the test or after the test. Malai Hayati Sheikh Hamid, Masitah Shahrill, Rohani Matzin, Salwa Mahalle & Lawrence Mundia also collected the respondents' continuous assessment math grades for the previous academic term from school records. In predictions of academic success, previous research has used grades as measures of academic achievement or performance. In the present study the grades A, B, C, D, E, F were decided according to the percentage like A = 80-100%; B = 70-79%; C = 60-69%; D = 50-59%; E = 40-49%; F = 0-39% obtained from the different assessment tasks in whole Brunei education system. The letter grades were then converted to their numerical equivalents (e.g. A = 5; B = 4; C = 3; D = 2; E = 1; and F = 0) and used as a grouping variable. Being sensitive data and for ethical reasons, the grades were analyzed and reported only at the group level. Students who obtained A-B-C grades were mentioned as high math achievers or top math achievers coded 2 for analysis purposes while on the other hand students who obtained D-E-F grades were mentioned as low math achievers or bottom math achievers coded as 1 for the analysis purposes. And students with C-D grades shows in the middle of range that is average level. The explanatory statistics and reliability coefficients for the psychological scales are presented in Table 2.

Variables	1	2	3	4
Mathematics Anxiety (MA)	1			
Self-esteem (SE)	0.136	1		
Proactive Coping (PC)	0.223**	0.147*	1	
Impact of Event (IE)	0.140*	0.097	0.229**	1
Math Achievement	0.031	-0.187**	0.141*	-0.141
Mean	49.245	27.794	46.808	37.421
SE mean	0.398	0.250	0.560	0.489
Standard deviation	5.688	3.572	8.005	6.986
Split-half reliability	0.700	0.820	0.730	0.760

(Table-2) International Education Studies; Vol. 6, No. 11; 2013

The correlations in Table 3 may be interpreted in many ways. The low and non-significant correlations suggest that the scales were measures of different constructs and did not repeat each other. The questionnaire scores and test grades used in the present study were considered to have had good natural strength in that students obtained them in their respective schools. In addition, students obtained math test grades as part of continuous assessment. Such assessments apply less pressure, anxiety, tension, and stress to students compared to the harsh burden of the final examinations.

Inter-correlations of subscales and mathematics attainment (N = 204)									
Factors	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***
Math Achievement	*1*								
Negative MA	-0.258**	*1*							
Positive MA	0.182**	-0.118	*1*						
Negative SE	-0.308**	0.338**	-0.187**	*1*					
Positive SE	0.063	- 0.064	0.217**	-0.022	*1*				
Negative PC	-0.154*	0.251**	-0.198**	-0.022	-0.160**	*1*			
Positive PC	0.205**	- 0.061	0.256	-0.113	0.286**	0.009	*1*		
Intrusive IE	-0.041	0.021	0.143*	-0.022	0.170*	0.003	0.303**	*1*	
Avoidance IE	-0.026	-0.261**	-0.094	0.156*	-0.084	0.1833**	0.034	0.343**	*1*
Mean	1.573	23.848	25.509	13.583	14.210	9.019	37.789	17.235	20.186
Standard deviation	1.482	4.852	4.167	2.664	2.439	2.657	7.528	4.210	4.313

(Table-3) **International Education Studies; Vol. 6, No. 11; 2013**

** P < .05 (two-tailed)*

*** P < .01 (two-tailed)*

E4) Data Analysis

All data analyses were performed on SPSS Version 17.0 [17]. Data from all the four psychological tests as many methods were used to analysis the data like: descriptive, nonparametric, and parametric statistics. In which Descriptive and nonparametric statistics included the frequencies, percentages, mean, standard deviation, and Spearman's rank-order correlations. The parametric statistics included t-tests for independent groups, and multiple regression analysis. As discussed above that on three scales that is Negative MA, Negative SE and Negative PC were reverse-scored prior to analyses. Also, the IE scale did not have positive and negative items as it had only two sets of items called "intrusive" and "avoidance". In view of this, reverse scoring was not applied to IE scale items. Biographical data were analyzed descriptively. The participants' mathematics grades were changed in to the ranks like: A = 5, B= 4, C = 3, D = 2, E = 1, F = 0.

E5) Procedures

Authorization to perform the study in schools was obtained from school authorities and class teachers on behalf of the students and parents. Earlier to administering the instruments, the researchers orally explained to the participants the reason of the study and the admirable conditions or needs for being concerned in the study. This discussion centered on the legal rights of the participants immediate issues such as moderate participation, confidentiality, ambiguity, confidentiality, physical and psychological harm, and knowledgeable permission. No deception was used or involved in this study. Students were given a lot of time to perform well the study but if any student felt uncomfortable in the study of research then he was free to withdraw from the study.

E6) Result

From above if the Participants' Mathematics Anxiety, Self-Esteem, Proactive Coping, and Test Stress Scores is compared then the coming result is that the self-esteem (SE) scale had the lowest standard error while the proactive coping (PC) variable had the highest standard deviation and most varied responses (Table 2).In the table 2 and table 3 students' mean scores, standard and standard deviations on the main scales and subscales are presented at the bottom of the table respectively. If the Gender Differences in Mathematics Anxiety, Self-Esteem, Proactive Coping, and Test Stress Scores on the Main Scales is see from the above tables then getting result is that No significant difference was detected for the whole sample between females and males on the main mathematics anxiety scale: t (202) = 0.869, p > .05 [M1 = 49.450, SD1 = 5.999; M2 = 48.660, SD2 = 4.694]. However, the whole sample differed significantly on the main self-esteem scale by gender: t (202) = 2. 680, p < .01 [M1 = 28.185, SD1 = 3.020; M2 = 26.679, SD2 = 4.668]. The difference between the two genders on the main proactive coping scale was statistically insignificant: t (202) = 0.097, p > .05 [M1 = 46.841, SD1 = 8.361; M2 = 46.717, SD2 = 6.965]. Gender differences on the eight subscales and mathematics achievement are presented in Table 4.

Differences in psychological attributes and math achievement by gender (N = 204)						
Factors	**Females (n = 151)**		**Males (n = 53)**		***T*** **(df=202)**	***P*** **(2-tailed)**
	Mean	***SD***	***Mean***	***SD***		
Negative MA	*24.046*	*4.722*	*23.283*	*5.212*	*0.985*	*0.326*
Positive MA	*25.569*	*4.535*	*25.339*	*2.901*	*0.345*	*0.731*
Negative SE	*13.814*	*2.541*	*12.924*	*2.914*	*2.110*	*0.036**
Positive SE	*14.371*	*2.362*	*13.754*	*2.615*	*1.588*	0.114
Negative PC	*9.092*	*2.738*	*8.811*	*2.426*	*0.662*	*0.509*
Positive PC	*37.748*	*7.847*	*37.905*	*6.602*	*-0.131*	*0.896*
Intrusive IE	*17.609*	*4.142*	*16.169*	*4.259*	*2.161*	*0.032**
Avoidance IE	*20.351*	*4.186*	*19.717*	*4.667*	*0.920*	*0.359*
Math Achievement	*1.516*	*1.482*	*1.735*	*1.482*	*-0.926*	*0.355*

(Table – 4) International Education Studies; Vol. 6, No. 11; 2013

The results fixed in these tables shown that both math anxiety (MA) and test stress (measured by the IE scale) were relatively high in all the three student cohorts (Forms 2-4). In the present study, Negative MA was found to be a barrier to success or good performance in mathematics for two reasons. First, Negative MA correlated negatively and strongly with mathematics achievement (Table 3).

Conclusion:

As the data is collected by Malai Hayati Sheikh Hamid, Masitah Shahrill, Rohani Matzin, Salwa Mahalle & Lawrence Mundia in Brunei secondary school students, which shows the relationship between Mathematics Anxiety, Self esteemed, Proactive coping and Impact of Event and mathematics achievement. By the above discussion we see that Females were more affected with Negative SE and Intrusive IE than males. Low math scorers (less able students) were more affected by Negative MA and Negative SE than high scorers (more able students). On the positive note, Positive PC was found to be a good interpreter of mathematics achievement that needs to be fostered in students. The studies investigate the one of Brunei's distressing educational problems and tried to classify the factors that might help explain poor performance in mathematics. The present study by the investigators is to identify variables that might help to explain the school students' deficiencies in mathematics achievement. Thus the above study shows that it is very important that mathematics teachers should be properly trained and counseling students with high support needs in mathematics learning.

References:

1. **Ahmad, A. (2001). Mathematics for slow learners. In K. Y. Wong, & M. A. K. Clements (Eds.),** ***Energising science, mathematics, and technical education for all: Proceedings of the sixth annual conference of the Department of Science and Mathematics Education*** **(pp. 138-147). Gadong: University of Brunei Darussalam.**
2. **Alatorre A. S., & Reyes, R. L. (1999). Psychological stress, internalized symptoms and academic achievement of Hispanic adolescents.** ***Journal of Adolescent Research,***
3. **Anit, S., & Suffolk, J. (2001). Investigating understanding by primary six pupils of word problems involving multiplicationand division. In K. Y. Wong, & M. A. K. Clements (Eds.),** ***Energising science, mathematics, and technical education for all: Proceedings of the sixth annual conference of the Department of Science and Mathematics Education*** **(pp. 290-300). Gadong: University of Brunei Darussalam.**
4. **Aryana, M. (2010). Relationship between self-esteem and academic achievement amongst pre-university students.** ***Journal of Applied Sciences, 10*****(20), 2474-2477.**
5. **Bai, H., Wang, L., Pan, W., & Frey, M. (2009). Measuring mathematics anxiety: Psychometric analysis of abi-dimensional affective scale.** ***Journal of Instructional Psychology, 36,*** **185-193.**
6. **Bai, H. (2011). Cross-validating a bi-dimensional mathematics anxiety scale.** ***Assessment, 18*****(1), 115-122.**
7. **Chiu, M. S. (2012). Identification and assessment of Taiwanese children's conceptions of learning mathematics.** ***International Journal of Science and Mathematics Education, 10,*** **163-191.**
8. **Chin, K. S., & Clements, M. A. K. (2001). O-level students' understanding of lower secondary school geometry.**
9. **Daneshamooz, S., & Alamolhodaei, H. (2012). Cooperative learning and academic hardiness on students' mathematical performance with different levels of mathematics anxiety.** ***Educational Research, 3*****(3), 270-276.**
10. **Fleming, J. S., & Courtney, B. E. (1984). The dimensionality of self-esteem, II.** ***Journal of Personality and Social Psychology, 46,*** **404-421.**
11. **Fogiel, M. (1989).** ***The psychology problem solver*****. Piscataway, NJ: Research and Education Association.**
12. **Ford, D. Y. (1993). An investigation of paradox of under achievement among gifted black students.** ***Roeper Review, 16*****(2), 78- 84.**
13. **Greenglass, E. R., Schwarzer, R., Jakubiec, D., Fiksenbaum, L., & Taubert, S. (1999).** ***The proactive coping inventory, PCI): A multidimensional research instrument.*** **Retrieved May 10, 2012, from**

14. **Haq, F. S., & Mundia, L. (2012). Comparison of Brunei pre-service student teachers' attitudes to inclusive education and specific disabilities: Implications for teacher education. *Journal of Educational Research, 105*(5), 366-374.**
15. **Horowitz, M., Wilner, N., & Alvarez, W. (1979). Impact of event scale: A study of subjective stress. *Psychosomatic Medicine, 41*, 209**
16. **J. Kyeleve, & O. Chukwu (Eds.), *Globalisation trends in science, mathematics and technical education: Proceedings of the annual conference of the Department of Science, Mathematics and Technical Education* (pp. 259-268). Gadong: University of Brunei Darussalam.**
17. **Kirkpatrick, L. A., & Feeney, B. C. (2011). *A simple guide to SPSS for version 17.0*. Belmont, CA: Wadsworth.**
18. **Ladis, Z. (2009). Teaching skills blamed for poor maths. *The Brunei Times, 22*, 2.**
19. **Malik, P. R., & Balda, S. (2006). High IQ adolescents under stress: Do they perform, Poorly? *Anthropologist, 8*(2), 61-62.**
20. **Martinez, J. G. A. (1987). Preventing math anxiety: a prescription. *Academic Therapy, 23*(2), 117-125.**
21. **Mathison, M. (1977). *Curricular interventions and programming innovations for the reduction of mathematics anxiety*. ERIC database (#ED154430).**
22. **Mohd, L. (2007). Ministry's concerns over decline in good exam results. *Borneo Bulletin*, May 2, page 8.**
23. **Moore, B. J. (1997). Three case studies of gifted students who underachieve in high school. *Dissertation Abstract International Section A: Humanities and Social Sciences, 57*(6-A), 3394.**
24. **Onwuegbuzie, A. J. (2001). *I will begin my statistics assignment tomorrow: The relationship, between statistics anxiety and academic procrastination.* Retrieved May 21, 2012.**
25. **Rajagopal, S. D., & Bakar, A. A. (2004). Improving students' attitudes towards mathematics by changing classroom learning environment through cooperative learning strategy. In I. P. A. Cheong, H. S. Dhindisa, I.**
26. **Richardson, F. C., & Suinn, R. M. (1972). The mathematics anxiety rating scale: Psychometric data. *Journal of Counseling Psychology, 19*(6), 551-554.**
27. **Rosenberg, M. (1965). *Society and the adolescent self-image.* Princeton, NJ: Princeton University Press.**
28. **Sagiea, A. (1994). Assessing achievement motivation: Construction and application of a new scale using Elizur's multifaceted approach. *The Journal of Psychology: Interdisciplinary and Applied, 128*(1), 51-61.**
29. **Tella, A. (2007). The impact of motivation on students' academic achievement and learning outcomes in mathematics among secondary school students in Nigeria. *European Journal of Mathematics, Science and Technology, 3*, 149-156.**
30. **Vaiyatvutjamai, P., & Clements, M. A. K. (2004). Analysing errors made by middle school students on six linear inequations tasks. In I. P. A. Cheong, H. S. Dhindisa, I. J. Kyeleve, & O. Chukwu (Eds.), *Globalisation trends in science, mathematics and technical education: Proceedings of the annual conference of the Department of Science, Mathematics and Technical Education* (pp. 173-182). Gadong: University of Brunei Darussalam.**
31. **Veloo, P. K., & Diah, A. H. M. (2004). Instrumental instruction and its influence on development of number sense. In I. P. A. Cheong, H. S. Dhindisa, I. J. Kyeleve, & O. Chukwu (Eds.), *Globalisation trends in science, mathematics and technical education: Proceedings of the annual conference of the Department of Science, Mathematics and Technical Education* (pp. 183-192). Gadong: University of Brunei Darussalam**
32. **Zhu, Y., & Leung, F. K. S. (2011). Motivation and achievement: Is there an East Asian model? *International Journal of Science and Mathematics Education, 9*, 1189-1212.**

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