The Influence of Gender and SPM's Mathematics Grade towards the Students' Achievement in Mathematics at UiTM Terengganu

Ruzaidah A. Rashid
ruzai019@uitm.edu.my
Faculty of Business and Management
Universiti Teknologi MARA Cawangan Terengganu, Malaysia

Zamzulani Mohamed
zamzu568@uitm.edu.my
Faculty of Computer & Mathematical Sciences,
Universiti Teknologi MARA Cawangan Terengganu, Malaysia

Nazuha Muda @ Yusof
nazuh571@uitm.edu.my
Faculty of Computer & Mathematical Sciences,
Universiti Teknologi MARA Cawangan Terengganu, Malaysia

Zokree Abdul Karim
zokree@uitm.edu.my
Faculty of Computer & Mathematical Sciences,
Universiti Teknologi MARA Cawangan Terengganu, Malaysia

ABSTRACT

This paper aims to investigate gender performance in mathematics among students at UiTM Terengganu and also to determine the relationship between students' achievement in mathematics and Mathematics grade in Sijil Pelajaran Malaysia (SPM). The data was collected randomly from 86 students who took Business Mathematics course in 2018 through distribution of questionnaires. Descriptive analysis was used to overview the students' profile. Meanwhile, the Independent t-test and Spearman Rank Correlation were used in inferential analysis. The findings concluded that there was no significant difference in students' mathematics achievement between gender for this course. However, there was a significant positive relationship between mathematics achievement and Mathematics grade among students. As a conclusion, special attention must be given to the students who scored minimum grade in Mathematics at SPM level so that they can perform well at tertiary level.

Keywords: Mathematics, gender, achievement, Sijil Pelajaran Malaysia

INTRODUCTION

The significance of having a strong foundation in mathematics as a prerequisite for admission into tertiary institutions in most disciplines is well acknowledged. Achievement in mathematics varies across nations, regions, and a different of socio-economic and demographic characteristics. There are extensive and prominent discussions among educators and researchers specifically with regards to the gender related issues in mathematics achievement. For instance, the previous studies found that females scored lower than males on standardized test of mathematics (Gallagher and Kaufman, 2005; Cleary, 1992), and there are more males than females scoring in the two extreme ends (Willingham and Cole, 1997; Wang and Maxey, 1995). Besides that, there are also many researches (Fadzilah et al, 2017; Asiahwati, 2018) proved the achievement of mathematics in secondary school gives advantages for students to score better in mathematics subject at tertiary level. It is therefore the interest of this paper to examine the gender performance in mathematics and the achievement of mathematics among students at UiTM Terengganu.

Currently, most academic institutions are dominated by female students and this issue has always been debated among nations. Even though male students have historically enjoyed a large performance edge in mathematics, recently, a lot of evidence has documented a trend that such gap has been declined (Lindberg et al. 2010). Most of the findings reveal that the mathematics gender gap has decreased to the level that it is no longer significant, thus leading to the hypothesis of ''gender similarities in mathematics achievement''.

At the university level, in most disciplines that require mathematics, the high skill of mathematics is an indicator of potential for students' success in all levels of academic endeavors. Many researches show that students hold incredible perceptions regarding the knowledge of mathematics and science from the secondary school, which can influence on the achievement in mathematics courses at the university. It is highly undoubted that students' prior knowledge and academic achievement which result from students' prior cognitive mathematical ability has significant impact in their mathematics achievement. Therefore, students who enter university with poor grades in mathematics tend to face difficulties in understanding the subject, even in easy topics of the subject itself.

Gender and achievement in mathematics

Inconsistencies in mathematics achievement between male and female students has been discussed because mathematical understanding is important in maintaining the nation's economic competitive advantage in a global environment (Birenbaum, Tatsuoka & Xin, 2005).

According to Ding (2006), there were no significant variances in mathematics performance for both males and females. It is supported by Kaleli-Yilmaz and Hanci (2015) in their findings which proved gender was not a determining factor of mathematical performance on the Trends in International Mathematics and Science Study (TIMSS) assessment for students in Grades 4, 8, and 11. Kaleli-Yilmaz and Hanci also found that performance of males better than females in some countries and lower than females in others whereas students perform

almost equally by gender in the United States. Kaleli-Yilmaz and Hanci determined that gender plays no significant role in mathematical scores. Dalton (2018) determined that the findings of his study did not prove a correlation between gender and mathematics for any of the grade levels or for either grade band.

Hyde et al. (1990) proved that female students scored slightly better than male students when they averaged all of the effect sizes over the general population. It was found that there are no gender differences in problem solving but female students outperformed male students in computation of both primary and secondary school levels. However, at the high school level and college levels, it has been overturned as male beat female students. According to Van de gaer, Pusjens, Damme, and De Munter (2008), there were gender differences in mathematics participation and in mathematics achievement across secondary school, but the differences changed over time; at the beginning of school in mathematics achievement boys scored significantly higher than girls, but the gap closes and girls even better than boys at higher grade levels. Cherney and Campbell (2011) concluded that males significantly attain 2 higher mathematics scores than females when pursuing a profession in field of sciences and mathematics. In the analysis of National Science Foundation (2015), it showed that more females were obtained baccalaureate degrees, but males completed more initial degrees in science and engineering fields during those same years. There was also a statistically remarkable difference between male and female community college where the male students performed higher than female students in Precollege Algebra remedial mathematics (Isley, 2015).

Mathematics grade in SPM and mathematics achievement in tertiary level

In Malaysia, there are lengthy discussions on students with high score in the national exam, Sijil Pelajaran Malaysia (SPM) entering the universities. Majority of these students are said to lack mastery in the basic mathematics skills, reasoning and proof, and not being able to make connections in other disciplines. Students' performances in their SPM Mathematics paper cannot be used as a benchmark for their ability in mathematics. There is a need for Malaysia Mathematics Curriculum to be revised in order to enable students to have literacy in mathematics and the ability to apply mathematics into other disciplines at higher level (Zarina & Khairil, 2010).

Agnes & Tee (2019) compared the Mathematics result of SPM examination, pre-test and first semester result of one of the mathematics subjects at the college. They found that there is a significant difference in students' performance for these three results. Despite obtaining A grade at SPM level, the results of their mathematics college showed differently. According to the feedback given by the lecturer, the students showed less effort and considered tutorial to be unimportant. Sometimes, students paid less attention during class. In order to improve mathematics results in college, they suggested to conduct remedial mathematics course and invested more time for tutorial questions before sitting for the final exam.

A study done by Fadzilah et.al (2017) concluded that students' performance in mathematics during first year is replicated through the students' mathematical background before entering the university. Based on the result of the Mathematics Competency test which was

carried out upon the students' admittance to the university, most of the first year students did not possess sufficient knowledge in their basic mathematics although majority of the first year students who entered the university have a very good result in Mathematics during their SPM examination. They suggested the use of technology as an improvement strategy in teaching and learning mathematics.

Asiahwati (2018) proved that students with excellent SPM Mathematics grade were in high numeracy level and vice versa. It is shown that there is a moderately strong and positive relationship between SPM Mathematics grade and the numeracy level of the male pre-university students in the field of numbers compared to the female students.

According to Sharifah et.al (2009), there is a very weak positive relationship between mathematics performance of the first semester students and their Mathematics performance at SPM level. They are living proof that the performance is not affected by gender. However, as for the female students, there is a relationship as their Mathematics performance at SPM level was better than their first semester results in university. Besides that, students that have taken Additional Mathematics have shown that they perform better in their mathematics during the first semester. Sharifah et.al proposed that immediate measures such as mathematics workshop, seminars & quizzes have to be conducted at the earliest possible to improve the academic quality of the university.

METHODOLOGY

Instrument

The questionnaire was designed and adapted from three existing scales: Students' attitude (Tahar, 2010), Students' centered learning (Tessema, 2010) and Classroom environment (Shamaki, 2015). There are 5 sections in the questionnaire. Section A covers demographic profile. Section B addresses on factors of students' attitude, section C on factors of students centered learning style and section D is factors on classroom environment. All items in section B, C and D used the Likert scale with five options. Meanwhile section E consists the information on students' achievement regarding their continuous assessment and final examination marks for the subject. As for this paper, the analysis only involved section A and section E.

Data Collection

The population for this study comprised of all students who took Business Mathematics in 2018 at UiTM Terengganu. Eighty-six (86) students were selected at random as a sample based on recommendation from Krejcie & Morgan (1970) and Sekaran & Bougie (2016). The selection of the students is based on the combination of Stratified and Systematic Random Sampling. The number of students from each gender was determined by its proportion and each student was selected at random from the list of registered students for this course. A questionnaire was distributed to the selected students during their common test in class.

Data Analysis

The data was examined using Statistical Package for Social Science (SPSS), a computerized Statistical Software package that is widely used in the natural and social sciences to organize and analyze the data. Descriptive analysis was used to gauge an overview of the students' characteristics. Meanwhile, inferential analysis was carried out to test the following hypotheses using the Independent t-test and Spearman Rank Correlation respectively:

H_1: There is a significant difference in students' achievement in mathematics between male and female students.

H_2: There is a significant positive relationship between students' achievement in mathematics and SPM's Mathematics grade.

RESULT AND FINDING

Profile of the students

Table 1 shows the demographic profile of the students. Majority of the students are female with 87.2% and the rest are male (12.8%). There are 77.9% students from part 1, 18.6% part 2, 2.3% part 3 and 1.2% part 5. Most of the students scored D (48.8%) for Mathematics subject during the SPM. Only 8.1% of students scored A while the others scored B (10.5%), C (15.1%) and E (17.4%). Overall, 70.9% of students passed in the final examination and the failure rate is 29.1%. Most of the students scored A (15.1%) for this course, followed by F (11.6%).

Table 1: Demographic profile of the students

	Category	Frequency	Percentage (%)
Gender	Male	12	14.0
	Female	74	86.0
Part/Semester	1	67	77.9
	2	16	18.6
	3	2	2.3
	5	1	1.2
SPM's Mathematics Grade	A	7	8.1
	B	9	10.5
	C	13	15.1
	D	42	48.8
	E	15	17.4
Final Examination Grade	A+	5	5.8
	A	13	15.1
	A-	7	8.1
	B+	5	5.8
	B	8	9.3
	B-	5	5.8
	C+	9	10.5

C	9	10.5
C-	0	0
D+	2	2.3
D	5	5.8
E	8	9.3
F	10	11.6

Independent t-test

Independent t-test analysis was used to test whether there is a significant difference between the mathematics achievement of male and female students. Table 2 shows that female students obtained higher mean in mathematics achievement (M = 63.19; SD = 20.46) than the male students (M = 59.16; SD = 21.9). However, this difference is not significant (t = 0.629; df = 84; p = 0.531). Thus, hypothesis 1 is rejected. Therefore, it can be concluded that there is no significant difference between the mathematics achievement of male and female students in the university.

Table 2: Independent t-test analysis

Gender	N	Mean	Standard Deviation	df	t	p-value
Female	74	63.19	20.46	84	0.629	0.531
Male	12	59.16	21.59			

Spearman's Rank Correlation

A Spearman's rank-order correlation was applied to determine the relationship between students' achievement in mathematics and SPM's Mathematics grade. Table 3 shows that there is a moderate positive correlation between mathematics achievement and Mathematics SPM grade. This relationship is statistically significant (r_s = 0.497, p = 0.000). Thus, hypothesis 2 is not rejected. Therefore, it is true that there is a significant positive relationship between mathematics achievement and Mathematics SPM grade among the university students.

Table 3: Spearman' rank analysis

		SPM's Mathematics Grade
Students's Achievement in Mathematics	Correlation Coefficient	.495
	Sig. (2-tailed)	.000
	N	86

DISCUSSION

Table 4 presents the hypotheses and outcomes from this study.

Table 4: Summary

	Hypotheses	Outcomes
H_1	There is a significant difference in students' achievement in mathematics between male and female students	Not supported
H_2:	There is a significant positive relationship between students' achievement in mathematics and SPM's Mathematics grade.	Supported

The result suggests that the first hypothesis was not supported since the relationship is not significant. The study found that there is no significant difference in mathematics achievement regardless of students' gender. This is in line with the study done by Ding (2006), Kaleli-Yilmaz and Hanci (2015) and Dalton (2018). As for the relationship between mathematics achievement and SPM's Mathematics grade, it can be concluded that there is a significant positive relationship between the two variables. Therefore, students with higher Mathematics grade in SPM eventually will get higher mathematics achievement in university.

CONCLUSION

As a conclusion, special attention must be given to the students who scored minimum grade in Mathematics at SPM level so that they can perform well at tertiary level. Currently, students with grade E in Mathematics at SPM can still apply Diploma in Office Management and Technology at UiTM. These students are struggling in understanding the subject matter at university as they did not have strong foundation in mathematics. The top management, specifically the student admission department should revise the minimum requirement for the enrolment of these students. Besides that, pre-test before the semester begin should be done so that the lecturers will be able to know the performance of the students and it will make the teaching and learning process more effective.

REFERENCES

Agnes, A.A.K. & Tee, H.W. (2019). FIS student's performance in mathematics: comparison between SPM Additional Mathematics and the first semester examination. *Journal of Social Sciences & Humanities,* 16(3), 1-7.

Asiahwati Awi (2018). Relationship between Numeracy Level and SPM Mathematics Grade for Secondary School Leavers according to Gender. *Journal of International Journal of Education, Islamic Studies and Social Sciences Research.* 3(1).

Birenbaum, M., Tatsuoka, C., & Xin, T. (2005). Large-scale diagnostic assessment: Comparison of eighth graders' mathematics performance in the United States, Singapore, and Israel. *Assessment in Education,* 12(2), 167-181. doi:10.1080/09695940500143852

Cherney, I. D., & Campbell, K. L. (2011). A league of their own: Do single-sex schools increase girls' participation in the physical sciences? *Sex Roles*, 65(9-10), 712-724.

Dalton, R. K. R (2018). Relationships of Gender on Mathematics Achievement in High Achieving Military-Connected Children (Doctoral dissertation). Retrieved from https://search-proquest.com.ezaccess.library.uitm.edu.my/docview/2137630574/fulltextPDF/BB68E28CCF864FC3PQ/3?accountid=42518

Ding, N., & Harskamp, E. (2006). How Partner Gender Influences Female Students' Problem Solving in Physics Education. *Journal of Science Education And Technology*, 15(5-6), 331-343.

Fadzilah Salim, Aminah Ahmad, Iskandar Waini and Nor Hamizah Miswan (2017). FTK Students' Performance in Mathematics: Comparison between SPM and First Year Exam. MATEC Web of Conferences 87, 04002. doi:10.1051/matecconf/20178704002

Hyde, J. S., Fennema, E., & Lamon, S. J. (1990). Gender differences in mathematics performance: A meta-analysis. *Psychological Bulletin*, 107(2), 139-155. doi:10.1037/0033-2909.107.2.139

Isley, S.H. (2015). Differences between male and female community college students in achievement and attitude on college remedial mathematics (Doctoral dissertation). Retrieved fromhttps://searchproquest.com.ezaccess.library.uitm.edu.my/docview/1755935171/fulltextPDF/BB68E28CCF864FC3PQ/18?accountid=42518

Kaleli-Yilmaz, G., & Hanci, A. (2015). Examination of the 8th grade students' TIMSS mathematics success in terms of different variables. *International Journal of Mathematical Education in Science and Technology*, 47(5), 674-695. doi:10.1080/0020739X.2015.1102977

Krejcie, R. V., & Morgan, D. W. (1970). *Determining Sample Size for Research Activities*. John Wiley & Sons.

Lindberg, S. M., Hyde, J. S., Petersen, J. L., & Linn, M. C. (2010). New trends in gender and mathematics performance: A meta-analysis. *Psychological Bulletin*, 136(6), 1123-1135. http://dx.doi.org/10.1037/a0021276

National Science Foundation, National Center for Science and Engineering Statistics. (2015). Women, Minorities, and Persons with Disabilities in Science and Engineering: 2015. Special Report NSF 15-311. Retrieved from http://www.nsf.gov/statistics/wmpd/

Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill building approach*. John Wiley & Sons.

Shamaki, T. A. (2015). Influence of Learning Environment on Students' Academic Achievement in Mathematics: A Case Study of Some Selected Secondary Schools in Yobe State-Nigeria. *Journal of Education and Practice*, 6(34), 40-44.

Sharifah Norhuda Syed Wahid, Zurah Abu, Nazirah Ramli & Herniza Md Tahir (2009). Examining the mathematics performance of the first semester 'Galus' students in Malaysia higher institution. *Gading Business and Management Journal*. 13(1), 33-44.

Tahar, N. F., Ismail, Z., Zamani, N. D., & Adnan, N. (2010). Students' attitude toward mathematics: The

use of factor analysis in determining the criteria. *Procedia-Social and Behavioral Sciences*, 8, 476-481.

Tessema, T. (2010). Classroom Instruction and Students' Attitudes Towards Mathematics (Tesis doctoral). Recuperado de http://search. proquest. com/docview/503283774.

Van, d. g., Pustjens, H., Van Damme, J., & De Munter, A. (2008). Mathematics participation and mathematics achievement across secondary school: The role of gender. *Sex Roles*, 59(7-8), 568-585.

Zarina Bibi Ibrahim & Khairil Iskandar Othman (2010). Comparative Study of Secondary Mathematics Curriculum between Malaysia and Singapore. *Procedia - Social and Behavioral Sciences,* 8, 351-355. doi:10.1016/j.sbspro.2010.12.049