

Pre-University Students' Perceptions towards Mathematics in the Post-pandemic Era

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ABSTRACT

The Covid-19 pandemic that had begun in December 2019 had made all students in Malaysia being thrown into the online learning environment. After the prolonged home schooling, the post pandemic era that was declared in the year 2022 forced the students to attend physical classes again. This may have caused confusion among the students as they had to readapt with their old learning style once more after being comfortable with the online environment. In this research, students' perceptions towards mathematics concerning their self-concept and achievement were explored. Participants of this study were a group of pre-university students who experienced the shift from online to physical classes in the post pandemic era. A set of questionnaires regarding the students' perceptions was distributed to the students of the pre-university program at Universiti Kebangsaan Malaysia. The results show that 61.3% students discovered mathematics as scary despite they perceived positively on their achievement in mathematics. In conclusion, the students had moderate level of self-concept and achievement. Furthermore, there was a positive correlation between self-concept and achievement in mathematics, and there was no significant gender difference on the students' self-concept.

Contribution/Originality: This study contributes to the existing literature on adolescents' perceptions towards mathematics in the post-pandemic era.

1. Introduction

Due to the rise of covid-19 cases in all countries, many governments all over the world took "lockdown" measures to reduce the spread of the virus (Aarntzen et al, 2023). Thus, everything needs to be done online including learning so that students don't miss out on their studies. The sudden shift from face-to-face to online learning platforms posed challenges to students (Bringula et al, 2021). "Current online learning in schools substantially reduces student-teacher and student-learning media interactions" (Maryani et

al., 2023). However, it was revealed in the study of Bringula et al. (2021) that physical learning space for online learners have limitations which make online learning inconvenient. This is the disadvantages of online learning that some students face and this made them not able to learn mathematics and further lower their mathematics self-concept (Bringula et al., 2021).

In Malaysia, the post pandemic era began in April 2022 when the pandemic was declared as endemic (Atan et al., 2024). In the transition phase, universities blended dual teaching and learning approaches which was online and in-person. This made the students who had to live through the online environment from 2020 until early of 2022 had to go back to their normal lives before 2020 including had to attend physical classes. The shift to physical classes may influence students' perception on their beliefs and attitude towards academic courses as they have to adapt themselves with their old learning style after being accustomed to the online environment brought by the pandemic.

1.1. Research Objectives

The aim of this research is to explore pre-university students' perceptions towards mathematics in the post-pandemic era. In particular, the research questions are

- i. How the students perceive mathematics in terms of their self-concept and achievement?
- ii. What is the level of students' perceived self-concept and achievement?
- iii. Is there a significant difference in perceived self-concept between male and female students?
- iv. Is there a significant relationship between perceived self-concept and achievement?

2. Literature Review

Mathematics education can be defined as an encounter between education and mathematics, in dialogue with other areas of knowledge such as anthropology, sociology, psychology, and philosophy (Silvino De Lima et al., 2022). The study regarding mathematics have been going on for a long time and have continued to expand following the modernization of the world. This type of education mostly tests students on their way of problem solving (Leite, 2019). In Malaysia, mathematics is taught as a subject individually to students of all ages. Both the primary and secondary mathematics curricula emphasize the integration of mathematical processes, i.e., problem solving, reasoning, communication, connections, and representations (Mullis et al., 2016). According to Mullis et al. (2016), Mathematics curriculum for lower secondary level is organized into three interrelated learning domains which are numbers, shapes and space, and relationships. For each domain, topics are listed from the most basic to the most abstract. Contrary from the United States, The Common Core State Standards for Mathematics (CCSSM) were developed in order to bring greater focus and coherence to the teaching of mathematics (Mullis et al., 2016).

Perceived self-concept has been defined multiple times all from different people. This is due to interpretations of one's environment and are influenced by reinforcements, evaluations of significant others, and one's attributions for one's own behavior (Ramazan et al., 2023). Perceived self-concept towards mathematics has *"to do with how sure a person is of being able to learn new topics in mathematics, perform well in mathematics class, and do well on mathematics tests"* (Reyes, 1984 p. 560). These definitions relate on how one perceived mathematics within themselves. Students with low will when learning

will have lower personality when it comes to their mathematics abilities (Bringula et al., 2021).

Poor perceived self-concept matters as it may impact the students' perception on their achievement. Meanwhile, poor perception on mathematics achievement may lead to poor mathematics performance. Chaman et al. (2014) stated that mathematics performance is influenced by a range of factors including perceived self-concept, mathematics anxiety, attitude towards mathematics, mathematics self-efficacy, parental involvement, teachers and gender. Low mathematics performance may further lead to avoidance of mathematics-related learning, higher drop-out rate from mathematics courses, and may eventually lead to job placement with lower incomes (Wen & Dube, 2022).

3. Research Methods

This quantitative research was conducted from March 2024 until April 2024 in the Universiti Kebangsaan Malaysia Bangi campus. The instrument of this research is a survey which was distributed in two ways which was online through the distribution of GoogleForm, and physical during one class session. Student samples were selected by convenient random sampling method. The participants were asked in advance for their consent before answering the survey. The participants' responses are confidential as they will only be used for this research's purposes. The questionnaire was composed of 10 statements with Likert scale of 1(strongly disagree) to 5(strongly agree). Also included are items on the students' age, gender and students' group. Two weeks after the GoogleForm was distributed, a physical form of questionnaires composed of the same items were distributed among the participants who attended the class session excluding those who have responded to the survey earlier. The physical questionnaire was checked manually one by one to ensure that the data obtained is useful. A number of 8 students responded through online platform while 125 responded physically. Hence, a total of 133 students, out of 254 students, participated in this research. No pilot study had been done for this research as the set of questionnaires used was adopted from Fosu et al. (2023). Table 1 shows the value of Cronbach's alpha obtained by Fosu et al. (2023). The reliability coefficient of more than 0.60 is considered quite respectable for establishing the appropriateness of an instrument (DeVellis & Thorpe, 1991).

Table 1: Cronbach's Alpha Reliability Test on The Variables

Variable	Cronbach's alpha reliability test
Self-Concept	0.924
Mathematics Achievement	0.931

Source: Fosu et al. (2023)

4. Results

The data was computed and analyzed using the Statistical Package for Social Sciences (SPSS). Table 2 shows the frequency and percentage of students' responses on each item of the questionnaires. Items 1 to 5 are statements on perceived self-concept while items 6 to 10 are statements on mathematics achievement. It can be seen that most participants agreed with all the statements. For the self-concept, most of them agreed that they have discovered numerous mathematics issues very interesting and testing as well as appreciate attempting to tackle new mathematics issues. For the mathematics achievement, most students thought learning mathematics will help them in their daily

life and they agreed that they need to do well in mathematics to get the job that they wanted. However, 61.3% students discovered mathematics as scary and 43.6% students have never been extremely amped up for mathematics.

Table 2: Frequency and percentage of students' responses

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I experience less difficulty in learning mathematics than other subjects	6 (4.5%)	32 (24.1%)	43 (32.3%)	37 (27.8%)	15 (11.3%)
I have discovered numerous mathematics issues very interesting and testing.	3 (2.3%)	10 (7.5%)	31 (23.3%)	63 (47.4%)	26 (19.5%)
I appreciate attempting to tackle new mathematics issues.	2 (1.5%)	18 (13.5%)	27 (20.3%)	63 (47.4%)	23 (17.3%)
I have never been extremely amped up for mathematics.	6 (4.5%)	22 (16.5%)	47 (35.3%)	48 (36.1%)	10 (7.5%)
I have discovered mathematics as scary.	7 (5.3%)	25 (18.8%)	28 (21.1%)	47 (35.3%)	26 (19.5%)
I learn things quickly in mathematics.	1 (0.8%)	16 (12.0%)	55 (41.4%)	51 (38.3%)	10 (7.5%)
Mathematics is one of my strengths.	2 (1.5%)	31 (23.3%)	50 (37.6%)	41 (30.8%)	9 (6.8%)
I think learning mathematics will help me in my daily life.	3 (2.3%)	13 (9.8%)	24 (18.0%)	63 (47.4%)	30 (22.6%)
I need to do well in mathematics to get the job I want.	0 (0.0%)	15 (11.3%)	31 (23.3%)	54 (40.6%)	33 (24.8%)
I typically perform well in mathematics.	2 (1.5%)	13 (9.8%)	55 (41.4%)	47 (35.3%)	16 (12.0%)

Table 3 shows the descriptive statistics of perceived self-concept and mathematics achievement. Based on Table 3 and Table 4, the level of both perceived self-concept and mathematics achievement is moderate.

Table 3: Descriptive statistics

	N	Mean	Std. Deviation
Perceived self-concept	133	3.4556	.64824
Mathematics achievement	133	3.5233	.67677

Table 4: Level of students' perceived self-concept and achievement

Mean range	Level
1.00 – 2.33	Low
2.34 – 3.66	Moderate
3.67 – 5.00	High

Based on Table 5, perceived self-concept for female is higher than that for male. However, there is no significant difference between the perceived self-concept between male and female (p-value greater than 0.05).

Table 5: t-test for perceived self-concept based on gender

Variable	Gender	N	Mean	t	p-value
Perceived self-concept	Male	43	3.3535	-1.259	0.210
	Female	90	3.5044		

Based on Table 6, there is a significant relationship between perceived self-concept and mathematics achievement. This indicates that perceived self-concept influences mathematics achievement. If the students have positive perceived self-concept, their perception for mathematics achievement will also be positive.

Table 6: Spearman's correlation coefficient

		Mathematics achievement
Perceived self-concept	Spearman rho	.610**
	p-value	.000
	N	133

**. Correlation is significant at the 0.01 level (2-tailed)

5. Conclusion

In this research, a survey was conducted among a group of pre-university students of academic session 2023/2024 to explore on how the students perceive their self-concept and achievement in mathematics. The results indicate that most students had positive perception towards mathematics in terms of self-concept and achievement. The level of perceived self-concept and mathematics achievement was moderate while there exist a positive relationship between the variables. This result is consistent with the research done by Ean et al. (2023). In addition, perceived self-concept did not differ significantly by gender. This result contradicts the research done by Marcic and Grum (2011) who highlighted the significant difference of self-concept between males and females. The self-concept as in Marcic and Grum (2011) was categorized into two: independent self-concept and inter-dependent self-concept while the significant difference between genders existed in inter-dependent self-concept. The research on the growth of self-concept towards mathematics that was done by Nagy et. al. (2010) across students of grades 7-12 indicated gender differences in favor of boys of grade 7. However, gender was not a factor of the change of students' self-concept towards mathematics across time. In conclusion, the pre-university students had moderate level of self-concept and mathematics achievement, and this result might be due to their negative perception towards mathematics. Adapting to the new normal is tough as the students struggled to connect the content of mathematics, they learned in schools during the pandemic with the new content of mathematics that they needed to focus on in the post pandemic era. Therefore, it is suggested for the lecturers to convey the content of mathematics in an interesting way so that mathematics will not be perceived as a stiff and scary course.

Ethics Approval and Consent to Participate

The researchers adhered to the research ethics guidelines of Universiti Kebangsaan Malaysia. All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional research committee.

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Conflict of Interest

The authors reported no conflicts of interest for this work and declare that there is no potential conflict of interest with respect to the research, authorship, or publication of this article.

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