Mathematics Interest, Self-Esteem and Mathematics Achievement Among Physical Module Students at IIUM's Foundation Studies

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ABSTRACT

Interest is a significant factor that stimulates learning. Therefore, a student's passion for mathematics is important for inspiring them to do well in any mathematics subject. Self-esteem is an attitude toward oneself. It is another crucial factor for a successful journey in seeking knowledge. This study investigates the interrelationship between gender differences in mathematics interest, self-esteem, and mathematics achievement among the Physical module students. The sampling technique used was purposive sampling. A sample of 238 Physical module students who are taking Mathematics II (MAT0124) in the Centre for Foundation Studies, International Islamic University Malaysia, session 20222023 was taken from them. The instrument used was Academic Interest Scale for Adolescents (AISA) to measure mathematics interest while the Rosenberg Self-Esteem Scale, which measures self-esteem. According to the findings, there was a significant difference between male and female students' mathematics interest. On the other side, the self-esteem between male and female students revealed similarities which meant no significant difference. Correlation coefficient analysis revealed a significant correlation between mathematics interest and self-esteem among students. Further analysis showed that among different genders, there was a positive relationship between mathematics interest and their achievement. Moreover, there was a direct relationship between students' self-esteem and their achievement. For future study, we can apply gamification technique during the next level of mathematics subject and study how the game will influence their interest in mathematics, self-esteem and their achievement.

1. INTRODUCTION

Mathematics is employed all around the world since it is an important subject in many disciplines such as natural science, medicine, engineering, and social science. For those reasons, learning mathematics is required, starting in primary school and continuing through university. Interest in mathematics has a significant role in determining involvement and performance, which indirectly affects the student's self-esteem. According to Rosenberg (1965), the meaning of self-esteem is one's behaviour towards themselves, either positive or negative. Unfortunately, not all students have a higher interest in mathematics subjects, which will affect their self-esteem. Thus, educators are constantly finding ways to develop learning styles that are participatory and pleasurable to sustain students' interest and involvement (Halamy, Kamarudin, & Mohsin, 2022).

Several studies have been performed to study the effect of mathematics interest on performance, gender, and also self-esteem. Based on Musbahu et al. (2021), mathematics interest has a significant relationship with student achievement and gender. Other than that, Wong & Wong (2019) highlighted the significance of sparking interest in students with lower mathematics performance due to its strong correlation with improved mathematical achievement. Nabila & Widjajanti, 2020) emphasized the importance of self-esteem in mathematics by developing self-esteem through a contextual teaching and learning approach that links mathematical concepts to real-life situations. Meanwhile, according to Nawi et. al. (2023), there is a nearly moderate, direct, and favourable relationship between mathematical curiosity and self-esteem. In addition, the study revealed that males scored better on self-esteem compared to female adolescents, which demonstrates that there are significant gender differences in this area (Mikkelsen et al., 2022).

1.1 Problem Statement

Mathematics is known as one of the most challenging subjects, which undoubtedly impacts students' interest levels and self-esteem. Several studies on students' interest in mathematics have been conducted, comparing interest across genders and gathering data based on students' achievement (Ganley & Vasilyeva, 2011; Musbahu et al., 2021). Also, some research has been done about the relationship between self-esteem and mathematics (Moneva & Valle, 2020; Nabila & Widjajanti, 2020). However, there are few studies on the relationship between gender differences in mathematics interest, self-esteem, and mathematics achievement and their interrelationships.

1.2 Objectives

There are five main objectives, which are:

1. To determine the differences in mathematics interest based on gender.
2. To investigate the differences in self-esteem based on gender.
3. To determine the correlation between mathematical interest and self-esteem across genders.
4. To determine the correlation between mathematics interest and students' achievement across genders.
5. To determine the correlation between self-esteem and students' achievement across genders.

1.3 Research Questions

This research embarks on these research questions:

1. What are the differences in mathematics interests among genders?
2. What are the differences in self-esteem among genders?
3. What is the correlation between mathematics interest and self-esteem among students?
4. What is the correlation between mathematics interest and students' achievement by gender?
5. What is the correlation between self-esteem and students' achievement by gender?

1.4 Research Hypotheses

These hypotheses will be tested at the 0.05 level of significance:

HO_1: There is no significant difference in mathematics interest across genders.
HO_2: There is no significant difference in self-esteem across genders.
HO_3: There is no correlation between mathematics interest and self-esteem among students.
HO_4: There is no correlation between mathematics interest and achievement across genders.
HO_5: There is no correlation between self-esteem and achievement across genders.

2. LITERATURE REVIEW

According to (Zhang & Wang, 2020), mathematics interest, self-esteem and mathematics achievement are all related. According to previous research, mathematics achievement is directly and favorably impacted by a student's enthusiasm in the subject. Based on Summer, 2020), students' lacking interest in mathematics is due to its abstraction and anxiety related to the subject has also led to a dislike of it. It is shown that poor performance is the outcome of a decrease of enthusiasm in learning mathematics. Research has showed a world trend of low mathematics performance in various areas of the world (Kisanga, 2020; Mazana et al., 2020). Students' enthusiasm in studying mathematics is greatly impacted by a pleasant learning environment, which also enhances their performance (Mazana et al., 2018). Different factors may have an impact on students' mathematics interest and achievement. The success of students is influenced by their teachers' performance, which has a big impact on how interested and motivated students become in mathematics (Tambunan et al., 2021).

Self-esteem is essential to be evolved in learning mathematics subject. This study shows that self-esteem is one of the elements that contribute to the students' academic results, (Abdulghani et al., 2020; Kärchner et al., 2021; Noorollahi, 2021; Okoye & Oghenekaro, 2020). The student's performance in mathematics is mainly influenced by their emotional health and self-esteem (Chen, 2022). Furthermore, based on Ugwuanyi et al. (2020), self-efficacy influences the association between mathematics achievement and interest to a certain extent. The students' behavior towards mathematics is strongly correlated with the individual and class-level mathematics achievement. Besides, for the class-level achievement is negatively correlated with the attitudes (Xiao & Sun, 2021).

Some studies show a positive relationship between self-esteem and mathematics learning achievement. Lecturers usually have an important role in helping students to instill their self-esteem through contextual teaching and learning techniques where these are a method of learning that ties the subject matter to everyday life. This is because students are going to consider mathematics seriously if it has an impact on their future careers. On the other hand,

college leadership should maximize its effectiveness by organizing career coaching and counseling for students to understand the value of mathematics in their future careers (Asiedu-Addo et al., 2016).

3. METHODOLOGY

3.1 Population and Sample

The population of the study includes all Physical module students in Centre for Foundation Studies, International Islamic University Malaysia, in Semester 3 for session 2022/2023. Purposive sampling technique was used and a sample of 238 students was chosen from this student's population which consist of 124 male and 114 female students. The chosen sample was then evaluated using the Rosenberg Self-Esteem Scale (Rosenberg, 1965) and Academic Interest Scale for Adolescents (AISA).

3.2 Instrument and Reliability of the Instruments

Academic Interest Scale for Adolescents (AISA) was used to measure the mathematics interest among Physical module students. There are four main constructs used which are emotion (7 items), value (6 items), knowledge (7 items) and engagement (6 items) where total of 26 questions needed to be answered by the respondents. Rosernbeg Self-Esteem Scale was used to measure the self-esteem among Physical module students. It includes a total of 10 items. All items were assessed using a four-point likert scale which are from 1 (strongly disagree), 2 (disagree), 3 (agree) and 4 (strongly agree).

Table 1**:** Reliability of Items for Internal Consistency of the Items in Scale

Scale	N	Number of Items	Cronbach's Alpha
Emotion	238	7	0.895
Value	238	6	0.843
Knowledge	238	7	0.832
Engagement	238	6	0.754
Self-Esteem	238	10	0.853

The internal consistency of the item was tested using Cronbach's alpha for all four constructs under mathematics interest and self-esteem. The results in Table 1 showed that the value of the Cronbach's alpha ranged from 0.754 to 0.895 which indicates the items were reliable and consistent to be applied on the respondents.

3.3 Method of Data Collection

The questionnaire was constructed online using Google Forms and distributed to students via WhatsApp or Telegram by lecturers teaching Mathematics in Semester 3, 20222023. All CFSIIUM Physical module students completed the survey from 26th May 2023 until 1st June 2023 that included questions about students' interest in mathematics and self-esteem. Based on the data collection, using Shapiro-Wilk Normality test it was found that the data of mathematics interest and self-esteem were normally distributed. Moreover, by Kolmogorov-Smirnov Test, it revealed that the mathematics achievement (MAT0124) of the students follows a Normal Distribution.

3.4 Conceptual Framework

Figure 1 shows the framework of this research. Taking the idea from Zhang & Wang (2020), this study independent variables consist of mathematics interest, self-esteem and personal background. In mathematics interests, this study includes four important constructs which are emotion, value, knowledge and engagement. While for self-esteem, it is about studying the reflections of the self-worthiness of students towards themselves either positive or negative. The students' study year, gender and course are three demographic constructs which have a relationship in their mathematics interest, self-esteem and affects their mathematics achievement which is the dependent variable.
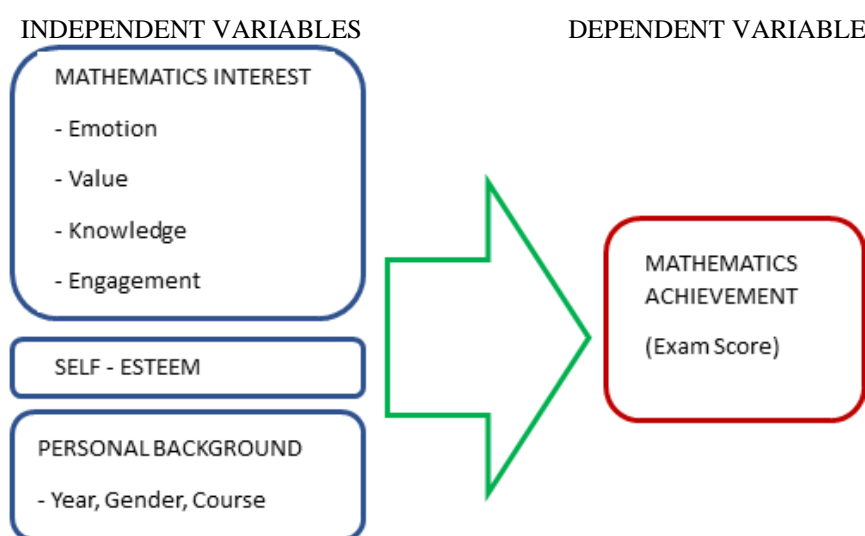

Figure 1: Conceptual Framework for Study on Mathematics Interest, Self-Esteem and Mathematics Achievement

4. RESULTS, DISCUSSIONS AND IMPLICATIONS

4.1 Results and Discussions

HO$_1$: There is no significant difference in mathematics interest across genders.

Table 2: Descriptive Statistics and T-Test Statistics for Mathematics Interests among Gender

	Gender	N	Mean	Std. Deviation	df	t-test	p
Emotion	Female	114	3.1391	0.53129	236	2.655	0.008*
	Male	124	2.9666	0.47086			
Value	Female	114	3.5775	0.40896	236	1.762	0.079
	Male	124	3.4812	0.43201			
Knowledge	Female	114	2.4762	0.42356	236	2.491	0.013*
	Male	124	2.3353	0.44734			
Engagement	Female	114	2.7135	0.50343	236	0.302	0.763
	Male	124	2.6949	0.44312			
Total Mathematics Interest (MI)	Female	114	2.9766	0.30217	236	2.801	0.006*
	Male	124	2.8695	0.28752			

*Significant at 0.05 level (two-tailed)

Table 2 shows the descriptive statistics for mathematics interest between male and female students. It has been shown that for the construct emotion the mean for female is 3.1391 while mean for male is 2.9666. For the construct value, the mean for female and male is 3.5775 and 3.4812 respectively. Next, the mean for construct knowledge for female is 2.4762 while for male is 2.3353. Lastly, the construct engagement showed that the mean for female is 2.7135 while mean for male is 2.6949. Additionally, gender differences in mathematics interest have low standard deviations, which suggests that the data is tightly clustered.

According to the t-test statistics, it shows that there is a significant difference between male and female students for the construct emotion ($p = 0.008$), construct knowledge ($p = 0.013$), and the total mean of mathematics interest ($p = 0.006$). Since all the p-values are less than 0.05, so it leads the study to reject the null hypothesis.

Otherwise, for the construct value and engagement, there are no significant difference between male and female students. Thus, emotion and knowledge between male and female students are two constructs that contribute to the significant difference in the total of their mathematics interest.

HO_2: There is no significant difference in self-esteem across genders.

Table 3: Descriptive Statistics and T-Test Statistics on Self-Esteem among Gender

	Gender	N	Mean	Std. Deviation	df	t	p
Self-Esteem	Female	114	26.4561	5.92600	236	0.558	0.577
	Male	124	26.0726	4.64718			

Table 3 shows that the descriptive statistics on self-esteem between male and female students. The mean score of female students' self-esteem (26.4561) is higher than the male students' self-esteem (26.0726) towards Mathematics learning. The t-test statistics shows that the p-value is greater than 0.05 which indicates that there is no significant difference on self-esteem between male and female students, which leads the null hypothesis is not to be rejected. This result was supported with the findings done by Subon et al. (2020) which their independent t-test demonstrated absence of significant difference on self-esteem between male and female students among Malaysian university students. Therefore, the level of self-esteem among the students regardless of their gender showed similarities and the factors surrounding them should be focused on in future research.

HO_3: There is no correlation between mathematics interest and self-esteem among students.

Table 4: Pearson's Correlation Coefficient between MI and SE Among Students

	n	Self-esteem	p-value
Mathematics Interest	238	0.155*	0.017

*Correlation is significant at 0.05 level (two-tailed)

Table 4 shows that there is significant correlation at 0.05 level between mathematics interest and self-esteem since the p-value is 0.017 which is less than 0.05. The Pearson's Correlation coefficient, $r = 0.155$ indicates direct, positive and less moderate relationship between mathematics interest and self-esteem among the students. Based on past study by Nabila & Widjajanti (2020), to increase the self-esteem among university students, the contextual teaching and learning approach were implemented among the students. It resulted in enhancement of the students' motivation, thinking skills, students' abilities and their mastery

in mathematics which led to boost their interest in mathematics. Hence, self-esteem is one of the key components which is positive and directly related to mathematics interest.

HO$_4$: There is no correlation between mathematics interest and achievement across genders.

Table 5: Pearson's Correlation Coefficient between MI and Achievement Across Gender

Correlation Coefficient, r	Result MAT0124 (Achievement)	
	Male N = 124	Female N = 114
Mathematics Interest	0.179[*]	0.207[*]

*Correlation is significant at the 0.05 level (2-tailed)

Table 5 shows that the correlation between mathematics interest and achievement (result MAT0124) for male and female students is significant at the 0.05 level with 2-tailed test. The Pearson's correlation coefficient for male is r = 0.179 while for female is r = 0.207. The correlation for female students is higher compared to male students which indicates that mathematics interests among female students affected a little bit higher to their achievement compared to male students. Besides, both correlations show that there are direct, positive relationships and less moderate between mathematics interests and their achievement in MAT0124, which leads to reject the null hypothesis. Even though the correlation is quite low, but it shows that mathematics interests still contribute to their achievement. According to Ili et al. (2021), one of the factors is mathematics interest, which has been shown to have a positive impact on mathematics achievement. Therefore, it is a good indication for students to be aware and to increase their mathematics interests to help them in achieving good results in their mathematics subjects.

HO$_5$: There is no correlation between self-esteem and achievement across genders.

Table 6. Pearson's Correlation Coefficient between SE and Achievement Across Gender

Correlation Coefficient, r	Result MAT0124 (Achievement)	
	Male N = 124	Female N = 114
Self-esteem	0.242[**]	0.278[**]

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

Table 6 shows the significant correlations between self-esteem and achievement for male and female students. The Pearson's correlation coefficient for male is r=0.242 while for female is r=0.278. Both correlations are significant at the 0.01 level using 2-tailed test and they have direct, positive and less moderate relationships between self-esteem and achievement. According to Subon et al. (2020), there is significant relationship between self-esteem and students' achievement for both genders. The correlation for female students between self-esteem and achievement is higher compared to male students. This shows that the relationship of self-esteem and their achievement is more meaningful compared to the lower correlation by male students. The positive attitude towards themselves indicates higher self-esteem which will somehow motivate them to achieve success in their mathematics learning.

4.2 Study Implications

This study investigates gender differences in mathematics interest, self-esteem, and mathematics achievement among Physical module students. The findings show significant differences in mathematics interest and achievement based on gender. The positive correlation

between mathematics interest and self-esteem shows the importance of nurturing students' passion in mathematics to positively influence academic outcomes.

5. STUDY LIMITATION AND SUGGESTION FOR FUTURE RESEARCH

5.1 Study Limitation

The study has a few limitations that can be improved for future investigations. The sample size could encompass a more robust and resilient sample, thereby facilitating the attainment of generalizing conclusions. The other variables and factors that are not incorporated in the analysis could potentially influence the relationships and findings.

5.2 Suggestion for Future Research

There are several suggestions for future research which may be implemented to generalize the conclusions on difference populations. Factors that can be considered in the future analysis that could have been impactful in this area are the students' educational background, family background, previous mathematics learning experience which can contribute to students' mathematics interest and self-esteem. In addition, samples taken for further research could be students from Biological module, then the researcher can conduct analysis of comparison between Physical module students and Biological module students. The sample size can be increased and avoid the outliers which may affect the results. Lastly, multiple linear regression involving several independent variables could be done so that the researcher can have a model to propose for the student's development and enhancement unit at the institution to upgrade the capabilities of their students in Mathematics achievement.

6. CONCLUSION

The Rosenberg Self-Esteem Scale was used in this study to assess self-esteem, while the Academic Interest Scale for Adolescents (AISA) was used to assess mathematics interest. The current study's findings for the t-test demonstrate that there is a significant difference in total mathematics interest between male and female at the 5% significance level. Because the p-value is less than 0.05, the null hypothesis is rejected, and two constructs, emotion (p=0.008) and knowledge (p=0.013), contribute to the significant difference between these genders. However, there is no significant difference between male and female students in terms of construct value and engagement in mathematics interest.

The t-test, on the other hand, shows that there is no significant difference in self-esteem between male and female students at the 0.05 significance level, even though female students' mean score is higher than male students. Furthermore, the p-value of 0.017 indicates that there is a significant correlation between mathematics interest and self-esteem at the 0.05 level. Pearson's Correlation coefficient, r=0.155, suggests a positive correlation between student mathematics interest and self-esteem. This study also demonstrates that the correlation between male and female mathematics interest and achievement (result MAT0124) is significant at the 0.05 level, with r=0.179 and r=0.207, respectively. Both correlations are positive, indicating that mathematics interest continues to contribute to their achievements.

Moreover, this study found important relationships between male (r=0.242) and female (r=0.278) students' self-esteem and achievement. Both correlations are significant at the 0.01 level when tested with a two-tailed test, indicating that there are direct, positive, and less moderate links between self-esteem and achievement.

As a conclusion, mathematics interest, self-esteem and student achievement are related to each other that significantly contribute toward student success. Students need to develop their interest in learning mathematics that led them to understand better and improve their performance. It will indirectly boost their motivation and self-esteem towards mathematics subject.

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AUTHORS' CONTRIBUTION

MNMN and SH carried out the introduction section. SH and JH found previous research papers for the literature review section. NMS and MNMN collected, refined, and performed the data analysis using SPSS. BH and NFMH wrote the data methodology section. NFMH and NMS wrote the discussion and implication sections. BH and JH are proofreading and offering significant insights to enhance the clarity and coherence of the content. All authors read and approved the final manuscript.

CONFLICT OF INTEREST

None declared.

7. APPENDIX

Survey Instrument (quantitative study)

CONSTRUCT: EMOTION

1. I understand the fun of mathematics
2. Studying mathematics makes me happy
3. I am interested in mathematics.
4. The content I learn from mathematics course is interesting.
5. I enjoy studying mathematics.
6. I really like mathematics course.
7. I enjoy when I study mathematics.

CONSTRUCT: VALUE

1. The knowledge of mathematics is important.
2. A good mark in mathematics course means a lot to me.
3. I think that mathematics is helpful for my career in future.
4. The knowledge of mathematics promotes my growth.
5. The knowledge of mathematics is valuable for my future development.
6. I think that learning mathematics is significant for my growth.

CONSTRUCT: KNOWLEDGE

1. I know all kinds of things about mathematics.
2. I am expert in mathematics
3. I can answer all kinds of questions that teachers ask in the mathematics class.
4. I am familiar with the knowledge and skills required in mathematics.
5. I do well in mathematics.
6. I have a lot of things to say about mathematics topics.
7. I have a lot of knowledge about mathematics.

CONSTRUCT: ENGAGEMENT

1. I want to learn things that are not included in mathematics textbooks or workbooks.
2. I hope to explore things about mathematics.
3. I will read more books about mathematics if I have the chance.
4. I will take part in an extracurricular training class for mathematics if I have the opportunity.
5. I want to find various ways to complete the assignment.
6. I am willing to spend time on the skills or methods learned from mathematics lessons.

SELF-ESTEEM

1. On the whole, I am satisfied with myself
2. At times I think I am no good at all.
3. I feel that I have a number of good qualities.
4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of.
6. I certainly feel useless at times.
7. I feel that I'm a person of worth.
8. I wish I could have more respect for myself
9. All in all, I am inclined to think that I am a failure.
10. I take a positive attitude toward myself.

8. REFERENCES

Abdulghani, A. H., Almelhem, M., Basmaih, G., Alhumud, A., Alotaibi, R., Wali, A., & Abdulghani, H. M. (2020). Does self-esteem lead to high achievement of the science college's students? A study from the six health science colleges. *Saudi Journal of Biological Sciences*, *27*(2). https://doi.org/10.1016/j.sjbs.2019.11.026

Asiedu-Addo, S., Assuah, C., & Arthur, Y. (2016). Compulsion in Studying Mathematics and Career Influence by Mathematics on Student Interest in Mathematics. *Asian Research Journal of Arts & Social Sciences*, *1*(2). https://doi.org/10.9734/arjass/2016/27543

Chen, X. (2022). The effects of individual- and class-level achievement on attitudes towards mathematics: An analysis of Hong Kong students using TIMSS 2019. *Studies in Educational Evaluation*, *72*. https://doi.org/10.1016/j.stueduc.2021.101113

Ganley, C. M., & Vasilyeva, M. (2011). Sex differences in the relation between math performance, spatial skills, and attitudes. *Journal of Applied Developmental Psychology*, *32*(4). https://doi.org/10.1016/j.appdev.2011.04.001

Halamy, S., Kamarudin, N., & Mohsin, M. (2022). Developing an interactive games of information management education for online distance learning. ESTEEM Journal of Social Sciences and Humanities, 6(1), 47-62. https://ejssh.uitm.edu.my

Ili, L., Rumasoreng, M. I., Prabowo, A., & Setiana, D. S. (2021). Relationship between student learning interest and mathematics learning achievement: A meta-analysis. *Al-Jabar : Jurnal Pendidikan Matematika*, *12*(2). https://doi.org/10.24042/ajpm.v12i2.9715

Kärchner, H., Schöne, C., & Schwinger, M. (2021). Beyond level of self-esteem: exploring the interplay of level, stability, and contingency of self-esteem, mediating factors, and academic achievement. *Social Psychology of Education*, *24*(2). https://doi.org/10.1007/s11218-021-09610-5

Kisanga, D. H. (2020). Enriching performance of Mathematics in secondary schools using mobile learning. *International Journal of Education and Development Using Information and Communication Technology (IJEDICT)*, *16*(2).

Mazana, M. Y., Montero, C. S., & Casmir, R. O. (2018). Investigating Students' Attitude towards Learning Mathematics. *International Electronic Journal of Mathematics Education*, *14*(1). https://doi.org/10.29333/iejme/3997

Mazana, M. Y., Montero, C. S., & Casmir, R. O. (2020). Assessing Students' Performance in Mathematics in Tanzania: The Teacher's Perspective. *International Electronic Journal of Mathematics Education*, *15*(3). https://doi.org/10.29333/iejme/7994

Mikkelsen, H. T., Småstuen, M. C., Haraldstad, K., Helseth, S., Skarstein, S., & Rohde, G. (2022). Changes in health-related quality of life in adolescents and the impact of gender and selected variables: a two-year longitudinal study. *Health and Quality of Life Outcomes*, *20*(1). https://doi.org/10.1186/s12955-022-02035-4

Moneva, Dr. J. C., & Valle, A. F. S. (2020). Difficulty in Mathematics: Close Assistance and Self-Confidence. *Journal of Studies in Education*, *10*(1). https://doi.org/10.5296/jse.v10i1.16460

Musbahu, A., Oluyemo, A. A., Amos, Dr. I., & Safo, A. D. (2021). Interest towards Learning and Mathematics Achievement among Students in Selected Junior Secondary Schools, Niger State, Nigeria. *International Journal of Research and Innovation in Social Science*, *v*(1).

Nabila, L. A., & Widjajanti, D. B. (2020). Self-esteem in mathematics learning: How to develop it through contextual teaching and learning approach? *Journal of Physics: Conference Series*, *1581*(1). https://doi.org/10.1088/1742-6596/1581/1/012049

Nawi, M. N. M., Saad, N. M., Hassan, S., & Hanafi, N. M. (2023). *A study on mathematics interest and self-esteem by gender and module among CFS IIUM students*. In *Proceedings of the Conference on Future & Sustainable Education (CFSE 2022)* (pp. 8-14).

Noorollahi, N. (2021). On the relationship between iranian english language teaching students-self-efficacy, self-esteem, and their academic achievement. *Language Teaching Research Quarterly*, *21*. https://doi.org/10.32038/ltrq.2021.21.06

Okoye, K. R. E., & Oghenekaro, M. (2020). Relationship between Self-Esteem, Academic Procrastination and Test Anxiety with Academic Achievement of Post Graduate Diploma in Education (PGDE) Students in Delta State University, Abraka. In *International Scholars Journal of Arts and Social Science Research* (Vol. 3, Issue 1).

Rosenberg, M. (1965). Society and the Adolescent Self-Image. Morris Rosenberg. Princeton University Press, Princeton, N.J., 1965. *Princeton*, *148*(3671).

Subon, F., Unin, N., & Sulaiman, N. H. B. (2020). Self-Esteem and Academic Achievement: The Relationship and Gender Differences of Malaysian University Undergraduates. *IAFOR Journal of Psychology & the Behavioral Sciences*, *6*(1). https://doi.org/10.22492/ijpbs.6.1.03

Summer, A. (2020). A Sustainable Way of Teaching Basic Mathematics. *Discourse and Communication for Sustainable Education*, *11*(2). https://doi.org/10.2478/dcse-2020-0021

Tambunan, H., Sinaga, B., & Widada, W. (2021). Analysis of teacher performance to build student interest and motivation towards mathematics achievement. *International Journal of Evaluation and Research in Education*, *10*(1). https://doi.org/10.11591/ijere.v10i1.20711

Ugwuanyi, C. S., Okeke, C. I. O., & Asomugha, C. G. (2020). Prediction of learners' mathematics performance by their emotional intelligence, self-esteem and self-efficacy. *Cypriot Journal of Educational Sciences*, *15*(3). https://doi.org/10.18844/cjes.v15i3.4916

Wong, S. L., & Wong, S. L. (2019). Relationship between interest and mathematics performance in a technology-enhanced learning context in Malaysia. *Research and Practice in Technology Enhanced Learning*, *14*(1). https://doi.org/10.1186/s41039-019-0114-3

Xiao, F., & Sun, L. (2021). Students' Motivation and Affection Profiles and Their Relation to Mathematics Achievement, Persistence, and Behaviors. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.533593

Zhang, D., & Wang, C. (2020). The relationship between mathematics interest and mathematics achievement: mediating roles of self-efficacy and mathematics anxiety. *International Journal of Educational Research*, *104*. https://doi.org/10.1016/j.ijer.2020.101648

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