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INTEREST IN MATHEMATICS AND ACADEMIC PERFORMANCE OF PRE-SERVICE TEACHERS IN A PUBLIC HIGHER EDUCATION INSTITUTION

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Abstract:
This study assessed the relationship between math interest and academic performance of the first-year pre-service teachers enrolled in the Bachelor of Secondary Education Major in Mathematics at Talisay City College, Cebu, Philippines, for the school year 2022-2023 using a descriptive-correlational design. The respondents were identified using simple random sampling. They were asked to answer the questionnaire assessing their math interest, while their performance in math was assessed using their grades in History of Mathematics (MM1) and Fundamentals of Mathematics (Math 1). The research tool was validated using content and face validity. The data gathered were treated using frequency count, percentage, weighted mean, standard deviation, and Pearson Product-Moment Correlation Coefficient. The results revealed that the respondents had a high interest in math. Moreover, they exhibited good performance in MM1 and Math 1. However, no significant relationship was found between math interest and the respondents' MM1 and Math 1 performance. Thus, it is recommended that instructors utilize strategies that enhance students' interest in math and provide math-related activities that could improve students' engagement and performance.

Keywords: interest, academic performance, pre-service teachers, higher education institution

1. Introduction

In education, a student's aptitude for learning is one of the requirements for success and for improving grades in a certain topic, particularly mathematics. Student performance

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varies, and their approach to involvement in an activity is often referred to as their interest in learning mathematics (Bernacki & Walkington, 2018; Harefa, 2023). This interest reflects a student's needs and motivation to improve by actively participating, understanding concepts, and learning from the teacher's methods. Approaches influence how students learn. It can make learning arithmetic both challenging and engaging (Huang *et al.*, 2020; Yeh *et al.*, 2019).

Teachers' role in building students' interest in improving their academic performance was crucial in this new way of learning brought on by the pandemic (Sutarto *et al.*, 2020). Academic success was largely influenced by both the time and effort students invest in learning arithmetic concepts and the teaching techniques employed by the instructor. Math education can involve problem-solving and gamification in addition to traditional paper-and-pencil testing (Ambussaidi *et al.*, 2019; Jacob *et al.*, 2020; Yu & Singh, 2018). Additionally, it can encourage critical thinking and problem-solving skills and make learning dynamic. It undoubtedly enhances mathematical concepts and learners' abilities (Al Ghozali *et al.*, 2024; Machmud *et al.*, 2023; Poonsawad *et al.*, 2022).

The decision to explore this topic arises from the pressing need to address global challenges related to students' disinterest in mathematics. Negative attitudes and low mathematics achievement levels have been observed in various regions, such as Western countries, Sub-Saharan African nations (like Rwanda), and Taiwan (Haynes, 2015; Lee & Kung, 2018; Lee *et al.*, 2021). In the Philippines, at Talisay City College, students often exhibit little interest in mathematics due to past negative experiences. The researchers hypothesize a significant connection between students' interest in mathematics and their academic performance, prompting this investigation into the factors underlying this relationship.

2. Literature Review

Interest in Mathematics can provide insight as a factor contributing to a student's success. Having a high interest in learning results in good performance when a student is motivated and well-grounded in their action.

As stated by Fisher *et al.* (2012), math competence and attitudes may develop in a mutually reinforcing manner over time. According to the study's findings, there may be a connection between mathematics proficiency and interest even in preschool. Also, the current study investigated the relationship between math interest and skill, both concurrently and over time, in a preschool sample. Analysis of simultaneous interactions revealed a correlation between high levels of interest and proficient math abilities. This study was highly correlational to the study at hand, as it also talks about the interest of a student in learning mathematics to achieve high performance in learning. Though the result is based on preschool students, it was important to college students as well. A student's willingness enhances their mathematical capabilities. It implied that the lower the interest the student had in mathematics, the less he cooperated and engaged himself in an activity. In the same token, the higher the interest the student had, the greater the

opportunity they had in studying mathematics. Furthermore, successfully learning mathematics depended on both the teacher and the student. The strategy that the teacher was using also plays a vital role in gaining the interest of the student, and the lack of motivation and courage to learn mathematics also affected the performance of the student, not the teacher factor, but the student's matter.

The Interest-Driven Creator theory suggests that students are more likely to be interested in mathematics when exposed to relevant and engaging tasks. The integration of technology can provide students with opportunities to engage in interactive and personal learning experiences that are aligned with their interests and abilities (Wong & Hughes 2022).

The "*psychological state of engaging or having an inclination to reengage in a specific content over time*" is defined as interest (Hidi & Renninger, 2006). Cheung (2017) defines interest as a distinct psychological state that occurs during interactions between people and their objects of interest. Interest denotes a distinct relationship between a person and an object. According to Anigbo (2016), interest is related to a student's readiness or mastery of background knowledge that can help a learner handle the subject or a related learning task's next higher level of learning. Furthermore, as numerous empirical studies have shown, interest is an influential factor in learning, being closely related to, for example, the student's use of deep learning strategies, effort, and learning outcomes (Smarandache *et al.*, 2022)

As it is widely assumed, interest plays an important role in mathematics learning (Yu *et al.* 2018). In his study, Obodo (2012) stated that interest is a powerful factor in mathematics teaching and learning. The degree and direction of students' attitudes toward mathematics are heavily influenced by their level of interest in the subject. However, different factors influence students' desire to learn mathematics. Many factors have been identified in the literature as reasons associated with students' lack of interest in learning mathematics, according to the study of Anigbo's (2016). These include the student factor, the teacher factor, mathematics anxiety, class size, the government factor, the infrastructure problem, and the instructional strategy. These factors may have a significant impact on the student's interest in mathematics. These independent variables were effective in predicting students' interest in mathematics.

According to Gouws and Dicker (2011), in their study "Teaching mathematics that addresses learners' multiple intelligences, Africa Education Review", the challenge of enhancing student performance in mathematics is currently being faced by the South African education system. The Theory of Multiple Intelligences by Howard Gardner can be used in the classroom as a solution to this predicament. Incorporating multiple intelligences into mathematics teaching can be done in various ways. Moreover, students are motivated if the learning style is suited to their types of intelligence. In a classroom setup, one strategy is not enough in dealing with diverse students; that's why teachers should implement and use multiple intelligences to cope with all the learning styles of the students to achieve a successful and productive learning environment. In addition,

students gained more interest in mathematics if it was properly addressed to the needs of the learner.

This was to correlate the study to the study at hand, as the student has a different and unique capacity in learning mathematics, multiple intelligences are the best thing to consider by the teacher to make the student stay interested in studying mathematics. In addition, students' intelligence grows, enabling them to become effective learners and appreciate the beauty of mathematics. Multiple intelligences refers to a theory describing the different ways students learn and acquire information, according to Howard Gardner. The hypothesis of multiple intelligences allows us to recognize various forms of mental capabilities. You might be able to detect your own preferences if you understand more about the forms of intellect you tend to favor. Based on the study "Discussion of Teaching with Multiple Intelligences to Corporate Employees' Learning Achievement and Learning Motivation" by Lie *et al.* (2021) such research results demonstrated that using multiple intelligences in teaching activities might greatly improve students' academic performance, encourage their desire to learn, improve their reading comprehension, and even improve their capacity for cooperating in group learning. Thus, teaching mathematics should employ multiple intelligences to keep students motivated. It also stated in the study that "*the application of multiple intelligences and the creation of diverse classrooms to develop students' speciality allowed students to maintain learning motivation with active participation, building self-confidence, and developing self-motivation*.". The success of students was influenced by their intelligence. Because they typically possess the traits and abilities to employ logic, students with mathematical logic intelligence can acquire mathematics in great abundance. On the other hand, students who have visual spatial intelligence can recognize the use of spatial patterns and capture space that was needed in geometry subjects, so that they have the best learning achievement (Ndia *et al.* 2020).

The current study aims to investigate the impact of different types of multiple intelligences on student success in learning mathematics. The study conducted a literature review of twenty articles that met certain criteria, including empirical evidence of the impact of multiple intelligences on students' mathematics learning outcomes, and the articles were published between 2011 and 2020. The review's findings indicate that each type of multiple intelligence positively affects students' cognitive, emotional, and psychomotor outcomes in mathematics learning. However, the study did not find any empirical evidence of an impact of existentialist intelligence on student success in mathematics. The study suggests that teachers should leverage each type of intelligence that students have to optimise their mathematics learning outcomes (Mayu & Widjajanti, 2022).

Yavich and Rotnitsky (2020) conducted a study on the effectiveness of strategies involving multiple intelligences theory on higher-level mathematics achievement. The study's goal was to compare the effectiveness of strategies involving multiple intelligence theory on secondary level mathematics with reference to instructional objectives. For the current study, the researcher used an experimental method and chose a non-equivalent

group design with a pre-test and a post-test. The study found that multiple intelligences theory was more effective than current methods of teaching on math achievement, and strategies involving multiple intelligences theory were more effective than current methods under instructional objectives.

The study by Rowan-Kenyon *et al.* (2012) reinforces the main hypothesis that students' early perceptions of support and sense of engagement in math classes and math activities greatly influence the broadening or narrowing of their math interest. The study also noted that because peer classroom conduct was frequently a deterrent to math interest, the findings emphasize the need for combining group work and extrinsic motivation in middle school math classes to broaden interest. According to this study, it simply means that learning mathematics should be done as early as possible to engage students in various activities and develop an interest. However, the findings show that extrinsic motivation was somehow being criticized for students' interest in mathematics.

Additionally, Bilbrey (2017) states that "*the intrinsically motivated students have always been found to have a better success rate compared to the students who do not possess this kind of motivation*." It has also been demonstrated that a rewards-based system can boost skill and motivation, though not necessarily over the long term. This study addressed the idea that rewards and other external variables lower long-term motivation and autonomy. Thus, in a college algebra classroom, the relationships that were examined were those between the lower motivated students and the mid-level and highly intrinsically motivated students; as a result, students who learned in an intrinsic way were more successful than those who learned in an extrinsic motivation, which does not lead to long-term learning. The study related to the researcher's study as the student's interest should come from intrinsic motivation to be eager to learn for their own sake of and not to be hungry for appraisal but rather to do it for their own sake. And getting an achievement for building self-confidence.

The research study conducted by Adamma *et al.* (2018) showed that students' academic performance was enhanced by motivation. According to this study, students are more likely to be driven to learn when teachers are kind and encouraging, place an emphasis on the teaching and learning process rather than performance outcomes, and provide feedback (Shu & Gu, 2023). Additionally, there are differences in academic achievement and motivating style between genders. The results imply that teachers should investigate and employ this tactic to increase students' motivation and efficacy in learning mathematics. To make learning more interesting and relevant, teachers can also try to connect mathematical concepts to students' experiences. This helps students understand the relevance of what they learn to their daily lives.

Educators are presently greatly concerned with the issue of student motivation, and one of the biggest difficulties of the twenty-first century is motivating students so that they can achieve academic success (Awan *et al.,* 2011). Consequently, teachers' primary objective in the classroom should be to motivate students to learn and keep their interest in what they are learning. For academic learning and success, motivation is a vitally important factor (Seven, 2020)

The results of this research study, Relationship Interest and Mathematics Performance in a Technology-Enhanced Learning Context in Malaysia, revealed that the students' interest was not significantly correlated with their mathematics proficiency. However, among students who performed poorly in mathematics, there was a substantial relationship between interest and performance. The findings of this research showed the significance of igniting students' interest in mathematics, given the strong link between low mathematics performance and lack of interest. The theoretical framework of the study is built on the Interest-Driven Creator Theory, which is then reviewed in relation to learning mathematics. Although some students show a preference for mathematics, they do not always recognize its advantages. In other words, despite being aware of the value and real-world applications of the mathematics curriculum, students seem to believe that knowing mathematics is not necessary. It is likely that the students' dissatisfaction and sense of powerlessness as they tried to comprehend the complex test questions contributed to their relatively low mathematics test scores. Furthermore, this research indicates that, particularly among individuals with greater mathematics performance, interest is not significantly correlated with mathematical ability. However, among people who score poorly in mathematics, interest in learning the subject had a large and significant relationship with math performance. These findings were in accordance with those of Köller and Baumert (2010), who found that when learning activities are motivated by extrinsic values like wanting to perform well on exams or avoiding negative outcomes from underperforming, the relationship between academic interest and mathematics achievement was weaker. When the instruction was not highly structured, it is proposed that interest is a better indicator of mathematics achievement.

According to Piaget, individuals aged 18 to 20 have the ability to think abstractly and comprehend the formation and structure of mathematical concepts. In addition, the current study examined students' math performance and self-efficacy in Central Mindanao University Laboratory High School in a rich assessment task environment (RATE). With Grade 8 students participating as respondents, a quasi-experimental research method was adopted. According to the findings, students from both groups performed poorly on their pretests but significantly better on their posttests and retention tests following the intervention. Both before and after the intervention, students had positive self-efficacy beliefs. It potentially increased the performance and improved the self-efficacy beliefs of the low-performing students, as shown in the comparable results (Koponen *et al.*, 2021).

It was stated that students who had prior knowledge would be successful in performing basic mathematical concepts and would be better at defining problems, developing strategies, and minimizing computational errors. Also, prior knowledge and problem definition were necessary for success (Von *et al.*, 2021)

Studies have indicated that teachers need to equip themselves with more flexible approaches to teaching mathematics. Teachers are encouraged to adopt progressive teaching styles to accommodate the varied abilities of students, to help these students

excel in their learning (Sulaiman *et al.*, 2010). However, (Bringaula *et al.*, 2021) argue that the implementation of modular and blended learning during times of pandemic and calamities could result in a learning loss. This learning loss was attributed to the assertion that online mathematics education poses greater challenges compared to traditional face-to-face instruction.

This conceptual article explores a variety of concepts related to motivation and action learning in mathematics education. It describes the strategy employed by the authors to provide advice and insights for mathematics practitioners. The study demonstrates the effectiveness of a mathematics education strategy based on action learning and natural motivation informed by practical experience. Additionally, action-learning frameworks benefit greatly from intriguing questions, computer analysis (including internet searches), and classic famous problems as key mathematical motivating tools. The authors contend that when motivational concepts and action learning are implemented over that broad spectrum, it **is** feasible to encompass the entire K–20 mathematics curriculum under a single framework. Numerous examples useful for teachers and university instructors in their daily practice are provided to reinforce this argument. The authors discovered a rationale for action learning in mathematics education at almost any stage of a student's school pursuit (Abramovich *et al.*, 2019).

3. Materials and Methods

This study utilized a descriptive-correlational design to test the significant relationship between math interest and pre-service teachers' academic performance in Mathematics 1 at Talisay City College, Cebu, Philippines. The study's respondents were 87 first-year pre-service teachers enrolled in the Bachelor of Secondary Education program, majoring in Mathematics, for the school year 2022-2023. The researchers personally administered the data collection process. Informed consent was secured before the respondents were asked to answer the questionnaires. Moreover, the respondents were informed of their right to withdraw from participating in the data collection if they felt uncomfortable with the activity.

The research instruments used in this study include a survey questionnaire, which was conducted through an in-person survey. This survey questionnaire gathered the demographic profile and math interest of the respondents. The survey questionnaire for math interest was categorized in terms of math problems, with five items: gamification, cooperative learning, and technology integration. The data collected through this survey were analyzed using frequency counts, percentages, weighted means, standard deviations, and the Pearson Product-Moment Correlation Coefficient. Reliability was checked using Cronbach's Alpha, which yielded a value of 0.82, indicating that the instrument has high internal consistency.

4. Results and Discussion

This section presents the results of the data gathered regarding the profile, math interest, and academic performance of the respondents in Mathematics Module 1 and Math 1. Furthermore, the results of the tests of relationships are also presented.

Table 1: Profile of the respondents (n=87)

Profile		**f**	**%**
Age	18-20	52	59.77
	21-23	30	34.48
	24-26	3	3.45
	27-29	1	1.15
	30 – 32	1	1.15
	Total	**87**	**100.00**
Gender	Male	34	39.08
	Female	50	57.47
	LGBTQIA+	2	2.30
	Gender Neutral	1	1.15
	Total	**87**	**100.00**

Table 1 presents the data on the personal profile of the students in terms of their gender, age, and section. From the survey, it was revealed that fifty (50) were female, and most of the students were aged 18-20 years old, which comprised 59.77% of the respondents.

The respondents' profile demonstrates a substantial number of enrollments in the first-year math program, particularly among students aged 18-20, with a noteworthy majority being female. This suggests that individuals within this age bracket have the necessary cognitive abilities and interest to excel in math courses. It also challenges the stereotype that math is a male-dominated field, highlighting the significant participation of women. This data underscores the principle that education should be accessible to all, regardless of gender, as both men and women have the right to pursue mathematics. These findings align with Piaget's theory of cognitive development, specifically the formal operational thinking stage, which suggests that individuals aged 18-20 have the capacity for abstract thinking and understanding complex mathematical concepts. Moreover, this aligns with the Philippine K-12 Basic Education Curriculum, which indicates that first-year college students are typically around 18 years old, suggesting that students are prepared for advanced mathematical studies at this age.

Furthermore, the recognition by the Philippine Commission on Women of women's equal rights to education, including math, reinforces the idea that women are equally capable of excelling in the field of mathematics. In summary, these insights from student profiles emphasize the importance of promoting diversity and inclusivity in mathematics education, breaking down gender-related barriers, and ensuring equitable access to mathematical studies for all.

Table 2: Level of math interest of the respondents

Components	WM	SD	Verbal Description
Math Problem	3.14	1.77	High
Gamification	3.14	1.77	High
Cooperative Learning	3.22	1.80	High
Technology Integration	2.93	1.71	High
Aggregate Weighted Mean	**3.12**		**High**
Aggregate Standard Deviation		**1.76**	

Table 2 reflects the students' level of interest across math problems, gamification, cooperative learning, and technology integration. The survey revealed that cooperative learning had the highest aggregate mean of 3.10, which was interpreted as high.

The study assesses students' interest in mathematics through various categories. Cooperative learning is highly productive and fosters collaboration, though students do not enjoy it as much as other methods. Gamification enhances interest and critical thinking but has a limited impact on motivating students to improve math proficiency. Math problems engage students, but many lack confidence in problem-solving. Technology integration aids comprehension and does not negatively affect concentration. These findings highlight the importance of collaborative teaching, boosting problem-solving confidence, and leveraging technology for interactive math learning in the 21st century.

The Interest-Driven Creator Theory, developed by Asian researchers, hypothesizes that students who are motivated by interest may engage in knowledge creation (generating ideas and artifacts). They excel in their learning performance when they repeat this creation process in their daily routines. Engaging students in relevant learning activities maintains their interest in continuing to learn. As it was widely assumed, interest plays an important role in mathematics learning (Martin, 2013). The study's findings align with well-established educational theories, underlining the crucial role of motivation and interest in mathematics education. Deci and Ryan's Self-Determination Theory (2012) emphasizes that intrinsic motivation thrives when individuals experience competence, autonomy, and relatedness in their activities. Intrinsic engagement leads to higher-quality education. In the category of math problems, the results support the National Council of Teachers of Mathematics (NCTM) standards, advocating for diverse problem-solving tasks. These tasks, including open-ended and exploratory problems, promote interest in math by fostering creativity, critical thinking, and a sense of intellectual challenge.

In the category of gamification, the findings resonate with the Self-Determination Theory, suggesting that gamification effectively cultivates intrinsic motivation in mathematics. This theory posits that students are more inclined to participate in activities aligned with their personal learning goals, making math more engaging and meaningful. Cooperative learning, as revealed by the study, aligns with the research of Sitopu, J. W. *et al.* (2014), highlighting its benefits, particularly in mastering mathematics skills. This learning technique, shown to positively impact both teachers and students, is

recommended for implementation among mathematics educators. The integration of technology, with findings supporting the Interest-Driven Creator Theory, emphasizes that students are more likely to be interested in mathematics when exposed to relevant and engaging tasks. Technology facilitates interactive and personalized learning experiences, that align with students' interests and abilities, as suggested by Walking, C., and Bernacki (2020).

Furthermore, the study underscores the essential role of interest in mathematics education, as it motivates students, enhances engagement, enhances comprehension, and improves performance. Teachers are encouraged to integrate various strategies, including a range of math problems, gamification, cooperative learning, and technology integration, to create meaningful and engaging learning experiences that align with students' interests and mathematical skills. By doing so, educators can foster a deeper appreciation and understanding of mathematics among their students, leading to improved outcomes in math education.

Table 3: Academic performance of the respondents

Grading Range	**Math 1**		**MM 1**		**Performance Level**
	f	**%**	**f**	**%**	
1.0 – 1.3	6	6.90	0	0.00	Excellent
1.4 – 1.9	59	67.82	33	37.93	Very Good
2.0 – 2.5	22	25.29	49	56.32	Good
2.6 – 3.0	0	0.00	5	5.75	Fair
3.1 – 5.0	0	0.00	0	0.00	Failed
Total	87	100.00	87	100.00	
Mean	**2.05**	**Good**	**1.76**	**Very Good**	
Standard Deviation	**0.30**		**0.30**		

Legend: 1.0-1.3 (Excellent); 1.4-1.9 (Very Good); 2.0-2.5 (Good); 2.6-3.0 (Fair); 5.0 (Failed)

Table 3 shows the students' average academic grade in MM 1 (History of Mathematics) and Math 1 (Fundamentals of Mathematics). The results revealed that in MM 1 (History of Mathematics), the weighted mean was 2.05, interpreted as "Good", while in Math 1 (Fundamentals of Mathematics), the weighted mean was 1.76 and interpreted as "Very Good". The aggregate mean was 1.90 and interpreted as "Very Good".

The table shows that the students performed exceptionally well in Math 1: Fundamentals of Mathematics and achieved a consistent level of understanding and performance; the majority of the students got a very good grade. The student excels in Math 1: Fundamentals of Mathematics since this subject covers only the basic concepts of mathematics. Also, they have a scholarship that requires them to study diligently in every subject. The higher mean grade of 2.05 in MM1 (History of Mathematics) compared to Math 1: Fundamentals of Mathematics. The majority of the students, 49 out of 87 students, got a grade of 2.0-2.5 (good). Suggests a relatively lower level of performance in this course. The standard deviation of 0.3 indicates a similar level of consistency and variability in the grades. This implies that interest may not significantly impact academic performance. It may not guarantee high performance in Mathematics. The student's high

academic performance does not always associate with high grades. MM 1: History of Mathematics got a higher mean but a lower level of performance. Some of the students don't like history even though they have an interest in mathematics. According to the research of Assem, H. D. *et al.* (2023), the result revealed that there are several factors that contribute to the students' academic performance regardless of their interest in the subject.

Table 4: Correlation analysis

Variables	r-value	Strength of Correlation	p - value	Decision	Remarks
Math Interest and Performance in MM 1	-0.10	Negligible Negative	0.37	Do not reject Ho	Not Significant
Math Interest and Performance in Math 1	0.02	Negligible Positive	0.83	Do not reject Ho	Not Significant

*significant at p<0.05 (two-tailed); n=87

Table 4 presents the test of the relationship between the respondents' interest in math and their performance in two subjects. Regarding the relationship between math interest and performance in MM1, the computed r-value of -0.10 indicates a negligible negative correlation between these variables. With a p-value of 0.37, which is greater than the 0.05 level of significance, the null hypothesis is not rejected. Similarly, the computed r-value of 0.02 indicates a negligible positive correlation between math interest and performance in Math 1. Furthermore, the p-value of 0.83 is greater than the 0.05 level of significance, suggesting that the null hypothesis is not rejected.

The results indicated that there was no significant relationship between the level of interest in mathematics and academic performance in Math 1: Fundamentals of Mathematics. This suggests that students demonstrate both high interest and high academic performance, as mathematics majors are expected to excel in Math 1, which covers only basic mathematical concepts and requires more memorization. However, students may find subjects like MM1: History of Mathematics boring. Students at Talisay City College are required to study mathematics due to their scholarship status, which includes free tuition and limited enrollment time. As a result, many students excel in Math 1, regardless of their interest, because this course covers basic concepts and draws on prior knowledge. Most first-year college students perform well in this subject, and their level of interest may not significantly impact their performance. This underscores the importance of prior knowledge and the relative ease of certain subjects in determining students' success.

There was no significant relationship between the level of interest in mathematics and academic performance in MM1: History of Mathematics. This suggests that some students face challenges in connecting their understanding of mathematics with its historical foundations. The study contradicts the findings of Tembe *et al.*, (2020) which suggested a significant link between math interest and academic achievement. Our

research revealed no such correlation, with data showing a wide distribution. Some students demonstrated high interest but lower performance in MM1: History of Mathematics, while others with lower interest excelled. The challenge lay in connecting mathematical understanding with its historical context. MM1 was predominantly focused on memorization, which many students found unengaging, leading to difficulties in maintaining high grades. (Bringaula *et al.*, 2021) highlighted that online math education during crises could result in learning loss, emphasizing the need for activity-oriented teaching and counseling to boost students' confidence. To improve performance, teachers should foster intellectual proficiency in mathematics (Arhin & Yanney, 2020). In summary, strong interest does not guarantee academic success, and conversely, some students with lower interest may excel.

5. Recommendations

Based on the study findings that emphasize the connection between interest in mathematics and academic performance among pre-service teachers in a public higher education institution, it is strongly recommended to organize a Math Exploration Day to foster enthusiasm and deepen understanding of the subject.

This campus-wide event should feature interactive games, puzzles, and real-world problem-solving challenges designed to engage students and demonstrate the practical applications of mathematics. Additionally, mini seminars by guest speakers from various fields can showcase the relevance of mathematics in diverse careers, inspiring students to see its value beyond the classroom. The event should integrate technology, such as math-based apps, software, and interactive platforms, to modernize learning and encourage digital literacy. Collaborative activity stations can promote teamwork, allowing students to solve challenges together while enhancing their critical thinking and problem-solving skills. To conclude the event, a competition or showcase can celebrate student creativity, innovation, and accomplishments in mathematics, fostering a sense of achievement and motivating further interest in the subject. This initiative not only enhances academic performance but also cultivates a vibrant mathematical culture within the institution.

6. Conclusion

This study explored the relationship between math interest and performance of pre-service teachers taking up BSED-Math at a public higher education institution in the Philippines, which offers significant findings.

The results indicate that these pre-service teachers have a strong interest in learning mathematics in all aspects and demonstrate very good performance in their math courses. However, the absence of a significant relationship between these variables suggests that high interest in the subject does not guarantee academic success in mathematics. The finding challenges the common assumption about the math interest's

on one's performance. Further, it points to other factors that could potentially play more pivotal roles in shaping academic success. The results highlight the complexity of academic performance, suggesting that although fostering math interest is important, this needs to be reinforced with targeted interventions that address skills development and the learning environment. Furthermore, future research might explore these additional factors to better understand how to bridge the gap between students' interest and their academic performance. These insights are crucial for educators and policymakers aiming to enhance the preparation of future mathematics teachers in the Philippine context.

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Conflict of Interest Statement
The authors declare no conflicts of interest.

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References

Abramovich, S., Grinshpan, A. Z., & Milligan, D. L. (2019). Teaching Mathematics through Concept Motivation and Action Learning. *Education Research International*, 2019, 1–13. https://doi.org/10.1155/2019/3745406

Adamma, O. N., Ekwutosim, O. P., & Unamba, E. C. (2018). Influence of Extrinsic and Intrinsic Motivation on Pupils' Academic Performance in Mathematics. Zenodo (CERN European Organization for Nuclear Research). https://doi.org/10.5281/zenodo.1405857

Al Ghozali, M. I., Mustoip, S., & Sulkhah, S. (2024). The Role of Gamification Methods in Increasing Creativity and Innovation of Elementary School Students in the Digital Era. *JPS: Journal of Primary School, 1*(2), 21-27. Retrieved from https://journal.pusmedia.com/index.php/JPS/article/view/104/48

Ambussaidi, I., & Yang, Y. F. (2019). The impact of mathematics teacher quality on student achievement in Oman and Taiwan. *International Journal of Education and Learning, 1*(2), 50-62. Retrieved from https://pubs2.ascee.org/index.php/ijele/article/view/39

Arhin, D., & Yanney, E. G. (2020). Relationship between Students' Interest and Academic Performance in Mathematics: A Study of Agogo State. ResearchGate. Retrieved from https://www.researchgate.net/publication/342453651

Awan, R.-U.-N., Noureen, G., & Naz, A. (2011). A Study of the Relationship between Achievement Motivation, Self-Concept and Achievement in English and Mathematics at Secondary Level. *International Education Studies, 4*(3), 72–79. Retrieved from https://eric.ed.gov/?id=ej1066527&fbclid

Bernacki, M. L., & Walkington, C. (2018). The role of situational interest in personalized learning. *Journal of Educational Psychology, 110*(6), 864-881. https://doi.org/10.1037/edu0000250

Bilbrey, J. (2017). The Positive Effects Extrinsic Motivation Can Have on Intrinsic Motivation in a Math Classroom. In ERIC. ProQuest LLC. Retrieved from https://eric.ed.gov/?q=intrinsic+motivation+in+math&id=ED580068

Bringula, R. P., Reguyal, J. J., Tan, D., & Ulfa, S. (2021). Mathematics self-concept and challenges of learners in an online learning environment during the COVID-19 pandemic. *Smart Learning Environments,* 8(1). https://doi.org/10.1186/s40561-021-00168-5

Deci, E. L., & Ryan, R. M. (2012). *Self-Determination Theory.* In SAGE Publications Ltd eBooks (pp. 416–437). https://doi.org/10.4135/9781446249215.n21

Fisher, P. L., Dobbs-Oates, J., Doctoroff, G. L., & Arnold, D. (2012). Early math interest and the development of math skills. *Journal of Educational Psychology, 104*(3), 673–681. https://doi.org/10.1037/a0027756

Gouws, E., & Dicker, A. (2011). Teaching mathematics that addresses learners' multiple intelligences. *Africa Education Review, 8*(3), 568–587. https://doi.org/10.1080/18146627.2011.618721

Harefa, D. (2023). The relationship between students' interest in learning and mathematics learning outcomes. *AFORE: Jurnal Pendidikan Matematika, 2*(2), 1-11. https://doi.org/10.57094/afore.v2i2.1054

Huang, M. C. L., Chou, C. Y., Wu, Y. T., Shih, J. L., Yeh, C. Y., Lao, A. C., ... & Chan, T. W. (2020). Interest-driven video creation for learning mathematics. *Journal of Computers in Education, 7*, 395-433. Retrieved from https://link.springer.com/article/10.1007/s40692-020-00161-w

Hwang, S., & Son, T. (2021). Students' Attitude toward Mathematics and Its Relationship with Mathematics Achievement. *Journal of Education and E-learning Research, 8(*3), 272–280. https://doi.org/10.20448/journal.509.2021.83.272.280

Haynes, P. (2015). Examining educational multi-correlates at a primary school in Rwanda and their effects on student academic achievement (Doctoral dissertation, University of Georgia). Retrieved from https://getd.libs.uga.edu/pdfs/haynes_phillip_201512_edd.pdf

Ilçin, N., Tomruk, M., Yeşilyaprak, S. S., Karadibak, D., & Savci, S. (2018). The relationship between learning styles and academic performance in Turkish physiotherapy students. *BMC Medical Education, 18*(1). https://doi.org/10.1186/s12909-018-1400-2

Illiyas, M. (2017). Interest in Mathematics and Academic Achievement of High School Students in Chennai District. ResearchGate. https://doi.org/10.13140/RG.2.2.19850.98240

Jacob, Filgona, John, Sakiyo, & Gwany, D. M. (2020). Teachers' pedagogical content knowledge and students' academic achievement: A theoretical overview. *Journal of Global Research in Education and Social Science,* 14(2), 14-44. Retrieved from https://www.researchgate.net/publication/344199882_TEACHERS'_PEDAGOGICAL_CONTENT_KNOWLEDGE_AND_STUDENTS'_ACADEMIC_ACHIEVEMENT_A_THEORETICAL_OVERVIEW

Köller, O., Schnabel, K., & Baumert, J. (2001b). Does Interest Matter? The Relationship between Academic Interest and Achievement in Mathematics. *Journal for Research in Mathematics Education, 32*(5), 448. https://doi.org/10.2307/749801

Lee, C. Y., & Kung, H. Y. (2018). Math self-concept and mathematics achievement: Examining gender variation and reciprocal relations among junior high school students in Taiwan. *Eurasia Journal of Mathematics, Science and Technology Education, 14*(4), 1239-1252. Retrieved from https://www.ejmste.com/article/math-self-concept-and-mathematics-achievement-examining-gender-variation-and-reciprocal-relations-5340

Lee, S. S., Wotipka, C. M., & Ramirez, F. O. (2021). *A cross-national analysis of women graduates with tertiary degrees in science, technology, engineering, and math, 1998–2018: Commonalities and variations*. In *Gender equity in STEM in higher education* (pp. 13-26). Routledge.

Lei, D., Cheng, J., Chen, C., Huang, K., & Chou, C. J. (2021). Discussion of Teaching With Multiple Intelligences to Corporate Employees' Learning Achievement and Learning Motivation. *Frontiers in Psychology, 12*. https://doi.org/10.3389/fpsyg.2021.770473

Leyva, E., Walkington, C., Perera, H., & Bernacki, M. (2022). Making Mathematics Relevant: An Examination of Student Interest in Mathematics, Interest in STEM Careers, and Perceived Relevance. *International Journal of Research in Undergraduate Mathematics Education*. https://doi.org/10.1007/s40753-021-00159-4

Machmud, M. T., Wattanachai, S., & Samat, C. (2023). Constructivist gamification environment model designing framework to improve ill-structured problem solving in learning sciences. *Educational technology research and development*, 71(6), 2413-2429. Retrieved from https://link.springer.com/article/10.1007/s11423-023-10279-0

Magsambol, B. (2020, December 12). PH lowest among 58 countries in math, science – global assessment. Rappler. Retrieved from https://www.rappler.com/nation/filipino-students-lagging-behind-math-science-timms-international-results-2019/

Mayu, T. U., & Widjajanti, D. B. (2022). The impact of multiple intelligences on students' mathematics learning outcomes: A review. In AIP Conference Proceedings. American Institute of Physics. https://doi.org/10.1063/5.0109002

Nortje, A. (2023). Piaget's Stages: 4 Stages of Cognitive Development & Theory. PositivePsychology.com. https://positivepsychology.com/piaget-stages-theory/

Otoo, D., Iddrisu, W. A., Kessie, J. A., & Larbi, E. (2018). Structural Model of Students' Interest and Self-Motivation to Learning Mathematics. Education Research International, 2018, 1–10. https://doi.org/10.1155/2018/9417109

Philippine Commission on Women. (2020, April 29). Summary of articles and provisions - Philippine Commission on Women. Retrieved from https://pcw.gov.ph/

Poonsawad, A., Srisomphan, J., & Sanrach, C. (2022). Synthesis of a problem-based interactive digital storytelling learning model under a gamification environment promotes students' problem-solving skills. *International Journal of Emerging Technologies in Learning (iJET), 17*(5), 103-119. https://doi.org/10.3991/ijet.v17i05.28181

Rajabalee, Y., & Santally, M. I. (2020). Learner satisfaction, engagement and performance in an online module: Implications for institutional e-learning policy. *Education and Information Technologies, 26*(3), 2623–2656. https://doi.org/10.1007/s10639-020-10375-1

Rani, K. (2016). Relationship of Perceptual Learning Styles and Academic Achievement among High School Students. *Journal on School Educational Technology, 11*(3), 10. https://doi.org/10.26634/jsch.11.3.4786

Rowan-Kenyon, H. T., Swan, A. K., & Creager, M. F. (2012). Social Cognitive Factors, Support, and Engagement: Early Adolescents' Math Interests as Precursors to Choice of Career. *Career Development Quarterly, 60*(1), 2–15. https://doi.org/10.1002/j.2161-0045.2012.00001.x

Saunders, L. (2020, August 1). Learning Theories: Understanding How People Learn. Pressbooks. https://iopn.library.illinois.edu/pressbooks/instructioninlibraries/chapter/learning-theories-understanding-how-people-learn/

Sulaiman, S., & Sulaiman, T. (2010). Enhancing Language Teaching and Learning by Keeping Individual Differences in Perspective. *International Education Studies, 3*(2). https://doi.org/10.5539/ies.v3n2p134

Sutarto, S., Sari, D. P., & Fathurrochman, I. (2020). Teacher strategies in online learning to increase students' interest in learning during the COVID-19 pandemic. *Jurnal Konseling dan Pendidikan (JKP), 8*(3), 129-137. http://dx.doi.org/10.29210/147800

Tan, D. A., & Pagtulon-An, E. (2018). Students' Mathematics Performance and Self-Efficacy Beliefs in a Rich Assessment Tasks Environment. ResearchGate. https://www.researchgate.net/publication/326653311

Tembe, N., Anyagh, P. I., & Abakpa, B. O. (2020). Students' Mathematics Interest as Correlate of Achievement in Mathematics: Evidence from a Sub-Saharan Student Sample. ScienceOpen Preprints. https://doi.org/10.14293/s2199-1006.1.sor-.pplypgg.v1

Ukobizaba, F., Ndihokubwayo, K., Mukuka, A., & Uwamahoro, J. (2021). From what Makes Students Dislike Mathematics towards its Effective Teaching Practices. *Bolema, 35*(70), 1200–1216. https://doi.org/10.1590/1980-4415v35n70a30

Varaidzaimakondo, P., & Makondo, D. (2020). Causes of Poor Academic Performance in Mathematics at Ordinary Level: A Case of Mavuzani High School, Zimbabwe. *Research Gate*. https://doi.org/10.35629/7722-0906011018

Wong, S. F., & 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

Yeh, C. S., Cheng, H. N., Chen, Z., Liao, C. C., & Chan, T. (2019). Enhancing achievement and interest in mathematics learning through Math-Island. *Research and Practice in Technology Enhanced Learning, 14*(1). https://doi.org/10.1186/s41039-019-0100-9

Yu, R., & Singh, K. (2018). Teacher support, instructional practices, student motivation, and mathematics achievement in high school. *The Journal of Educational Research, 111*(1), 81-94. https://doi.org/10.1080/00220671.2016.1204260