The Influence of Academic Interest on Mathematics Engagement of Bachelor of Early Childhood Education Students

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Abstract

Academic interest is a critical factor in enhancing student engagement and learning outcomes. This study examined the relationship between academic interest and engagement among second-year Early Childhood Education (ECE) students enrolled in Mathematics in the Modern World at one of the Local Colleges in Region XI, Philippines. Using a non-experimental quantitative research design, specifically correlation and regression analysis, data were collected through a census approach from 106 students. Findings revealed a moderate positive correlation between academic interest and engagement ($r = 0.593$, $p < 0.05$), with academic interest accounting for 35.2% of the variance in engagement ($R^2 = 0.352$). These results indicate that students with higher academic interest exhibit significantly greater engagement levels in mathematics. Aligned with the Engagement Theory, this study emphasizes the importance of fostering intrinsic motivation and active participation to improve student engagement. The findings suggest that educators should implement strategies to cultivate academic interest and establish supportive learning environments that enhance student outcomes in mathematics education.

Keywords: *Academic interest, mathematics engagement, engagement theory*

1. INTRODUCTION

Mathematics engagement among early childhood education (ECE) college students remains a significant challenge, as many aspiring educators exhibit low levels of interest, confidence, and participation in mathematics-related coursework. Studies have shown that early childhood educators often harbor negative attitudes toward mathematics, leading to anxiety and reluctance in teaching mathematical concepts effectively (Cohrssen & Tayler, 2016). This issue is further compounded by gaps in their mathematical content knowledge and pedagogical skills, which are essential for fostering a strong foundation in early math education (Godoy et al, 2021). Additionally, many pre-service teachers struggle to connect theoretical mathematical concepts with practical, play-based learning strategies, creating a disconnect between coursework and classroom application (Saad & Abdallah, 2023). Without adequate engagement in mathematics during their academic training, ECE students risk carrying their apprehensions into their future classrooms, perpetuating a cycle of low mathematics confidence among educators and, consequently, young learners (Sheridan & Wen, 2021). Addressing these engagement issues is crucial in preparing competent and confident early childhood educators who can effectively integrate mathematics into early learning environments.

Mathematics engagement among early childhood education students is a persistent challenge observed across different educational settings worldwide. In Germany, Taiwan, and Switzerland, research highlights that early childhood educators' professional knowledge and institutional structures significantly impact students' engagement with mathematics, leading to disparities in mathematical competencies between regions (Gasteiger et. al., 2020). Similarly, in Australia, early childhood educators struggle with confidence and competence in teaching mathematics, limiting the effectiveness of early numeracy education (MacDonald, 2020). In Norway, pre-service early childhood teachers often experience mathematics anxiety, which negatively affects their engagement and ability to teach mathematical concepts (Thiel & Jenßen, 2018). The situation in the Philippines presents similar concerns. The country ranked among the lowest in mathematical literacy based on the 2018 Programme for International Student Assessment (PISA), indicating fundamental gaps in mathematics engagement and proficiency (Dooma et al., 2024). Research on college students in the Philippines further highlights the struggles of math repeaters in a state university, where students face challenges in motivation, comprehension, and academic persistence (Rabuya Jr., 2023). Additionally, studies show that while mathematics teachers in the Philippines demonstrate high engagement in terms of individual attention and consistency, they often fall short in fostering deeper mathematical thinking and enthusiasm among students (Doño & Mangila, 2021). These findings emphasize the critical need for targeted interventions to improve mathematics engagement, both in the Philippines and globally.

The persistent issue of low mathematics engagement among early childhood education students has far-reaching consequences, affecting their future teaching effectiveness and overall mathematical competency. Studies indicate that disengagement in mathematics leads to decreased participation, lower academic achievement, and a lack of confidence in teaching mathematical concepts, particularly among future educators (Laird & Grootenboer, 2018). Despite the importance of mathematics engagement in shaping competent educators, there remains a significant gap in understanding the factors influencing academic interest in mathematics among early childhood education students. While existing studies focus on primary and secondary students, there is limited research that explores how academic interest directly influences mathematics engagement in pre-service teachers. Addressing this gap is critical, as early childhood educators play a foundational role in developing young children's mathematical skills. Without immediate interventions, the cycle of poor mathematics engagement and anxiety among educators may persist, ultimately affecting future generations of learners (Barros & Díaz, 2019). This study, therefore, seeks to examine the influence of academic interest on mathematics engagement among early childhood education students, aiming to provide insights that can inform curriculum development, teacher training programs, and educational policies.

2. METHOD

The study employed a non-experimental quantitative research design using correlation and regression analysis to examine the relationship between academic interest and mathematics engagement among second-year Early Childhood Education (ECE) students at one of the Local Colleges in Region XI, Philippines. A census sampling technique was used to include all 106 students, ensuring comprehensive representation and minimizing sampling bias (Kumar, 2020). To address non-response bias, an adjusted response rate analysis was conducted. Data was collected using two validated questionnaires adapted from McLeod (1992), Schiefele (1991), and Fredricks et al. (2004), measuring academic interest (enjoyment, attitude, perceived importance) and engagement (participation, completion, initiative in seeking assistance). Both instruments underwent expert validation and pilot testing, achieving high reliability (Cronbach's alpha: .871 for interest, .915 for engagement). Data collection was

conducted via Google Forms and printed surveys, ensuring accessibility while controlling for mode-of-response effects. Ethical considerations, including informed consent, confidentiality, and compliance with the Data Privacy Act of 2012, were strictly followed.

For data analysis, descriptive and inferential statistical techniques were applied using SPSS or similar software. Descriptive statistics were used to determine mean levels of academic interest and engagement, while Pearson Product-Moment Correlation Coefficient assessed their relationship, categorized as weak (0.00–0.40), moderate (0.41–0.60), or strong (0.61–1.00) (Field, 2013). Multiple Regression Analysis examined how academic interest predicts engagement, controlling for confounders such as prior mathematics performance and study habits (Tabachnick & Fidell, 2019). A significance level of $\alpha \leq 0.05$ ensured statistical validity. These analyses provided insights into the predictive role of academic interest in engagement levels.

The study prioritized ethical compliance, ensuring participants' rights, privacy, and voluntary participation. Informed consent was obtained, guaranteeing anonymity and data security. Participants could withdraw at any time without consequences. Transparency was maintained, with findings reported objectively and without bias. The study's rigorous methodology enhances its scientific validity, offering valuable insights into the impact of academic interest on mathematics engagement.

3. RESULTS AND DISCUSSION

Table 1 presents the descriptive statistics on the students' academic interest and mathematics engagement, including mean, standard deviation (SD), and descriptive level for each indicator.

Table 1. Descriptive Levels

	SD	Mean	Descriptive Level
Students' Academic Interest	**0.58**	**3.27**	**Moderate**
Enjoyment	0.70	2.93	Moderate
Attitude	0.73	3.05	Moderate
Perceived Importance	0.88	3.83	High
Mathematics Engagement	**0.72**	**3.30**	**Moderate**
Participation	0.78	2.94	Moderate
Completion	0.84	3.21	Moderate
Initiative	0.92	3.74	High

The overall academic interest of students in mathematics has a mean of 3.27 (SD = 0.58), which falls under the moderate level. Among the three indicators, the perceived importance of mathematics scored the highest (M = 3.83, SD = 0.88) and is categorized as high,

indicating that students generally recognize the significance of mathematics in their academic and professional development. However, enjoyment (M = 2.93, SD = 0.70) and attitude (M = 3.05, SD = 0.73) towards mathematics are only at a moderate level, suggesting that while students acknowledge the subject's importance, they do not necessarily find it enjoyable or have a highly positive attitude towards it.

Similarly, mathematics engagement has an overall mean of 3.30 (SD = 0.72), which is also classified as moderate. Among its three components, initiative (M = 3.74, SD = 0.92) is the highest and is classified as high, implying that students are proactive in seeking help or taking additional steps to understand mathematical concepts. However, participation (M = 2.94, SD = 0.78) and completion of tasks (M = 3.21, SD = 0.84) are only at a moderate level, indicating that students are engaged to a certain extent but may not consistently participate actively in class discussions or complete tasks with full dedication.

The study findings suggest that while students recognize the importance of mathematics and take initiative in their learning, their overall engagement and interest remain moderate, particularly in terms of enjoyment, attitude, and participation. This aligns with prior research emphasizing that students' interest in mathematics is influenced by multiple factors, including instructional strategies, student attitudes, and teacher support (Abid & Noori, 2023). Additionally, behavioral engagement, such as participation, is often affected by teacher motivation and communication styles, as effective classroom interactions significantly impact students' willingness to engage in mathematics (Yana & Husnita, 2023).

Similarly, engagement in mathematics is multidimensional, and higher levels of participation, emotional connection, and behavioral involvement contribute to better performance in mathematics (Lee, 2018). Several studies support the idea that students' mathematics engagement is influenced by intrinsic motivation, peer support, and external academic influences (Hidayat et al., 2019). Furthermore, the relationship between student engagement and mathematics achievement is well established, with engagement playing a pivotal role in shaping students' performance and persistence in the subject (Maamin, et al, 2021).

However, some studies contradict the notion that engagement directly improves performance. For example, Alvarez (2023) found no significant relationship between mathematics engagement and creative self-efficacy, suggesting that engagement alone may not always translate into higher mathematics achievement. Moreover, another study by Wen (2023) suggests that mathematics engagement may decline over time, particularly among students transitioning to higher levels of education due to increased academic pressure and changing learning environments. Given these insights, the study highlights the need for targeted interventions to improve students' enjoyment and active participation in mathematics, such as interactive learning strategies, teacher support, and peer collaboration, to foster a more engaging and positive mathematical learning experience.

Table 2. Relationship Between Variables

	Mathematics Engagement			
	r	p-value	Interpretation	Decision on H_o
Students' Academic Interest	.593	.000	Reject	Significant

Table 2 presents the correlation analysis between students' academic interest and mathematics engagement. The correlation coefficient ($r = 0.593$) indicates a moderate to strong positive relationship between the two variables. This suggests that as students' academic interest in mathematics increases, their engagement in mathematics also tends to increase.

The p-value of .000 is less than the significance level ($\alpha < 0.05$), indicating that the relationship between the variables is statistically significant. As a result, the null hypothesis (H_0), which states that there is no significant relationship between students' academic interest and mathematics engagement, is rejected. This confirms that academic interest plays a crucial role in influencing students' engagement in mathematics-related activities.

The findings suggest that students with a positive attitude and strong interest in mathematics are more likely to engage actively, complete tasks, and seek additional learning opportunities. Research supports this, indicating that student engagement significantly influences academic performance in mathematics (Flores et al., 2021). Similarly, Geng et al. (2024) found that teaching styles, academic self-efficacy, and learning interest are key factors that drive student engagement in mathematics.

Furthermore, Hidayat et al. (2019) emphasize the role of motivation, peer support, and parental involvement in improving student engagement, while Maamin et al. (2021) highlight that cognitive, affective, and behavioral engagement strongly predict mathematical achievement. These findings reinforce the importance of active learning strategies, peer collaboration, and interactive teaching methods in fostering a more engaging and productive mathematics learning environment. However, studies suggest that engagement alone does not always translate into academic success. Xu (2024) found no significant correlation between student engagement and achievement in Calculus, indicating that engagement might not always lead to higher academic performance.

Table 3. Predictive Strengths of Independent Variable

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	0.910	0.322		2.823	.006
Students' Academic Interest	0.730	0.097	0.593	7.520	.000

R =.593, R2 = .352, F-ratio = 56.553, p-value = .000

Table 3 presents the results of the regression analysis, which examines the predictive power of students' academic interest in mathematics engagement. The unstandardized coefficient ($B = 0.730$, $p = .000$) suggests that for every one-unit increase in students' academic interest, mathematics engagement increases by 0.730 units, holding other factors constant. The constant value ($B = 0.910$, $p = .006$) represents the baseline level of mathematics engagement when academic interest is at zero.

The standardized beta coefficient ($\beta = 0.593$) indicates a moderate to strong predictive relationship between academic interest and mathematics engagement. The coefficient of determination ($R^2 = .352$) suggests that their academic interest explains 35.2% of the variance in students' mathematics engagement, while the remaining variance is attributed to other factors. The F-ratio ($F = 56.553$, $p = .000$) confirms that the overall regression model is statistically significant, indicating that academic interest is a meaningful predictor of

mathematics engagement. These results highlight the importance of fostering students' interest in mathematics to enhance their engagement, potentially through interactive teaching strategies, real-world applications, and motivational interventions.

The regression analysis in Table 3 indicates that students' academic interest significantly predicts mathematics engagement, with an R^2 value of .352, meaning 35.2% of the variance in mathematics engagement is explained by academic interest. The standardized beta coefficient ($\beta = 0.593$, $p = .000$) suggests a moderate to strong predictive relationship between the two variables. These findings align with Unachukwu, et al. (2022), who found that academic engagement is a strong predictor of mathematics achievement, emphasizing that students who exhibit high engagement perform better in mathematical tasks. Additionally, Maamin, et al. (2021) demonstrated that behavioral and affective engagement positively influence mathematical achievement, reinforcing that students who take an active role in learning mathematics tend to perform better. Furthermore, Asanre, et al. (2024) found that cognitive and emotional engagement significantly contribute to students' mathematics success, highlighting that fostering interest in mathematics can lead to higher engagement and improved academic outcomes. Similarly, Wang et al. (2021) suggested that metacognitive skills and self-control also play a crucial role in sustaining engagement in mathematics over time, supporting the argument that academic interest leads to long-term learning engagement.

However, some studies challenge the direct predictive strength of academic interest on engagement. Dominguez Núñez et al. (2020) found that while agential and cognitive engagement predict academic performance, behavioral and emotional engagement do not significantly contribute to mathematical success, suggesting that interest alone may not be sufficient. Similarly, Song, et al. (2019) argued that effort cost perception and effort avoidance mediate the relationship between interest and engagement, indicating that students may still avoid engaging in mathematics even if they find it interesting. These contrasting findings suggest that while academic interest is a significant factor in mathematics engagement, it should be complemented by other strategies such as teacher support, structured interventions, and self-regulation techniques to maximize student participation and learning outcomes.

4. CONCLUSION

Based on the findings of the study, it is concluded that academic interest significantly predicts mathematics engagement among Early Childhood Education (ECE) students. The results indicate that while students recognize the importance of mathematics, their engagement remains moderate, particularly in enjoyment, attitude, and participation. The study confirms a moderate to strong positive correlation between academic interest and mathematics engagement. These findings align with Engagement Theory (Kearsley & Shneiderman, 1998), which emphasizes that meaningful learning occurs when students are actively involved through interaction, collaboration, and real-world problem-solving. The results suggest that while students acknowledge the relevance of mathematics, their engagement remains limited due to a lack of interactive and student-centered learning experiences. This highlights the need for targeted interventions, such as collaborative learning, technology-enhanced instruction, and real-world applications, to foster deeper mathematics engagement and create more meaningful learning experiences for ECE students.

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NOVELTY

This study introduces new insights into how academic interest influences mathematics engagement among Early Childhood Education (ECE) students, a group often overlooked in previous research. Grounded in Engagement Theory (Kearsley & Shneiderman, 1998), it highlights the role of intrinsic motivation in fostering student participation. By exploring this relationship, the study contributes to discovering new problem-solving concepts that can address engagement challenges and improve curriculum design and teacher training programs in mathematics education.

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