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SELF-CONCEPT AND SELF-EFFICACY-EFFORT AS PREDICTORS OF MATHEMATICAL ENGAGEMENT AMONG GRADE 10 LEARNERS

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ABSTRACT

This study aspired to examine the impact of self-concept and self-efficacy-effort on students' mathematical engagement. The quantitative study which employs descriptive and correlational approaches was used in the study. The research sample consists of 274 Grade 10 students from four public junior high schools in the New Corella District, Division of Davao del Norte. Respondents were selected using a stratified random sampling technique. Statistical analysis was conducted using mean, standard deviation, Pearson-r correlation, and multiple regression. Findings indicate that learners' self-concept is moderately evident, as reflected in their engagement with math-related tasks, while their self-efficacy-effort is similarly demonstrated through their ability to perform mathematical tasks. Furthermore, students exhibit a high level of mathematical engagement, signifying strong involvement in mathematical activities. Notably, both self-concept and self-efficacy-effort show a moderate positive correlation with mathematical engagement. These results suggest that enhancing students' self-concept and self-efficacy-effort can lead to greater engagement in mathematical tasks. The study holds implications for students, educators, parents, school administrators, policymakers, and future researchers, encouraging further exploration of factors influencing students' mathematical engagement.

KEYWORDS: *Self-efficacy-effort, New Corella District, Davao del Nort*

INTRODUCTION

Mathematical engagement among high school students remains a global issue, as many struggles to stay engaged in mathematical activities. Results from the Program for International Student Assessment (PISA) revealed that the level of mathematical engagement among Filipino students is significantly below the average, at only 20% compared to the 75% average. Research shows that students perceive mathematics as an overly complex and abstract subject in the classroom, leading them to feel disconnected from learning mathematical tasks (Schoenfeld, 2020). The issue of student disengagement is further complicated by the global shift and needs to be addressed immediately, considering the various factors that could affect students' mathematical disengagement (Boaler, 2021). Furthermore, a 2019 PISA study found that 23% of 15-year-olds in participating countries scored below the basic proficiency level in mathematics, which highlights a mathematical engagement problem. The decreasing level of engagement in mathematics remains a pressing global issue for developing a productive workforce that is supposed to prepare students for the future (Norton, 2016).

In the Philippines, particularly in Cagayan De Oro City, a 2019 study by the Southeast Asian Ministers of Education Organization (SEAMEO) noted that many Filipino students perceive mathematics as challenging and lacking real-world application, contributing to poor mathematical engagement (Bacabac et al., 2019). The Trends in International Mathematics and Science Study (TIMSS) revealed that Filipino junior high school students ranked among the lowest in math proficiency, highlighting a significant gap in engagement with mathematics (Cambaya & Tan, 2022). The Department of Education (DepEd) has recognized this as a major concern, as indicated by the 2022 Philippine Institute for Development Studies (PIDS), which suggests that traditional teaching methods and other external factors continue to hamper students' mathematical engagement (Insorio, 2024). Thus, it is a challenge to address how self-concept and self-efficacy impact students' mathematical engagement. The outcome of this study may aid school administrators, staff, and teachers in organizing seminars and orientations to discuss this issue. Hence, this study is timely and essential to determine each variable making a direct positive impact on students, parents, teachers, and the school's success. These findings will also serve as guidelines for future scholars conducting related research.

OBJECTIVES

1. To determine the level of self-concept of students in terms of learned, organized, and dynamic.
2. To describe the the extent of self-efficacy-effort of students in terms of effort and trying hard and involvement and participation.
3. To determine the level of students' mathematical engagement in terms of cognitive, emotional, and behavioral.
4. To investigate the significant relationship between self-concept towards students' mathematical

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engagement and self-efficacy-effort towards students' mathematical engagement.

5. To predict the impact of self-concept and self-efficacy-effort towards students' mathematical engagement.

METHODOLOGY

This study employed a quantitative research design utilizing descriptive and correlational approaches. Quantitative research is a method that thoroughly inspects problem situations and evaluates relations between variables, offering accurate and precise dimensions and arithmetical facts through numerical investigation in a large population (Polit & Beck, 2021).

A descriptive study is an approach used to report analytically and precisely all the truths and evidence of a certain population or field of awareness (Siedlecki, 2020). The aim of a descriptive study is exploration, offering an understanding of the main characteristics, patterns, and trends of a population or phenomenon. The goal of a descriptive study is to set the foundation for further research and provide insights for future inquiry (Sirisilla, 2023). Furthermore, a correlational approach is likely to examine the connections between specified variables, regulate the occurrence and associations among factors, and predict actions based on the presented facts and information (Brodowicz, 2024). In this study, the design was adopted to investigate whether self-concept and self-efficacy-effort significantly predict the students' mathematical engagement.

This study was conducted to selected public schools in New Corella District. There were 186 learners from School A, 44 learners from School B, 34 learners from School C, and 10 learners from School D, a total of 286 grade 10 learners. The questionnaires were distributed in accordance with permission by the school principal and instruction given by the mathematics teacher.

RESULTS

The level of self-concept of the students in terms of all three indicators is high. This indicates that the students are observed with strong confidence and mathematical abilities. The indicator dynamic has the highest mean of 3.57, whereas the indicator organized has the lowest mean of 3.31. The indicator with the highest mean was described as high, while the indicator with a lowest mean was interpreted as moderate.

This defines that the level of students' self-concept is observed with strong confidence and mathematical abilities. The results are supported by the proposition of Garcia and Alvarez (2023) who mentioned that learners' strong self-concept in mathematics portrays an optimistic behavior in pursuing a goal. Accordingly, a high level of self-concept such as putting a clear expectation serves as a learners' pathway to a successful learning (Wang & Degol, 2024).

Furthermore, on the extent of students' self-efficacy-effort, the indicator effort and trying hard has the highest mean of 3.56, whereas the domain involvement and participation got the lowest mean of 3.35. The extensive descriptive equivalent denotes that the extent of self-efficacy-effort of students is fairly observed in the ability to perform a mathematical task; while the self-efficacy-effort in terms of substantial is described as a fair observation in the ability to mathematical performance.

The ideas are aligned with the study findings of Bandura (1977) denoting high level of self-efficacy-effort in successfully completing the assigned mathematical task. Another scholar like Geng et al. (2024) found out that a positive self-efficacy effort of students displays a success in a mathematics class. Linnenbrink-Garcia et al. (2023) also proved that learners with high level of self-efficacy- effort would participate with much enthusiasm in mathematical tasks.

Moreover, on the level of mathematical engagement of the students, the indicator dealing with the emotional aspect has the highest mean of 3.63, whereas the domain in the behavioral aspect got the lowest mean of 3.35. Both indicators have a descriptive equivalent of high. This means that students are strongly engaged in a mathematical task. The outcome further reveals that the high level of mathematical engagement of the students enables them to be strongly engaged in accomplishing a mathematical task.

The result is evident in the study of Boaler (2021), emphasizing mathematical engagement which can be observed through students' exploration and questioning skills. Sullivan et al. (2023) confirmed that engagement of students in mathematics is evident through exposing the how and why questions such as letting the students investigate in an experiment. Conversely, there are mathematical crisis currently experiencing by the student which hinders positive engagement such as poor motivation (Boaler, 2022; Guskey & Brookhart, 2019). Also, Maamin et al. (2022) highlighted that students' mathematical commitment has been evaluated by means of numerous aspects where level of engagement is manifested on how much they strive for learning.

Correspondingly, on the significance of the relationship between self-concept to students' mathematical engagement, self-concept shows a positive correlation towards mathematical engagement with a high degree of association. Hence, the null hypothesis was rejected, since there is significant relationship between self-concept and students' mathematical engagement. The result implies that when the self-concept of the student increases, their mathematical engagement would also increase. The findings were reinforced by the explanation of Eccles & Wigfield (2002) who found out that self-concept is directly connected to mathematical engagement. Accordingly, strong engagement in mathematics which denotes enthusiasm to participate in a mathematics classroom is driven by positive self-concept which symbolizes their self-awareness of expecting towards success and the value they place on a specific task. Students are positively engaged in a mathematical topic when self-concept is being manifested, since they recognize the importance to succeed in a math task (Boaler, 2021).

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On the significance of the relationship between self-efficacy-effort to the mathematical engagement of the students, it reveals that self-efficacy-effort shows a positive correlation towards mathematical engagement with p-value is less than 0.05 ($p<0.05$) and an r- value of 0.674. This implies that self-efficacy-effort shows a moderate positive correlation towards mathematical engagement. Thus, the null hypothesis was rejected, since there is significant relationship between self-efficacy-effort towards mathematical engagement. This infers that when there is strong self-efficacy-effort from the students, their engagement towards mathematical task would also strengthen.

The result was highlighted by Geng et al., (2024) that students' engagement in mathematics class is directly impacted by their level of self-efficacy-effort through a presented intellectual ability, group discussion and proactively tackling obstacles. On the other hand, learners with decreased self-efficacy-effort can question their own skills, which lower their involvement in classroom activities. Wang and Eccles (2022) distinguished self-efficacy-effort remediation at an early schooling age which builds lifetime success in the academe. Further, Linnenbrink-Garcia et al. (2023) proved that learners with increasing self-efficacy-effort who participated with much enthusiasm in mathematical tasks will result to the application of consistent effort and better academic outcomes.

Accordingly, the impact of students' self-concept and self-efficacy-effort to students' mathematical engagement, the result revealed that both self-concept and self-efficacy-effort seems to be a predictor of mathematical engagement ($p<0.05$).

In correspondence with the outcome, Collie et al. (2019) emphasized that students' engagement in learning mathematics is growing fast if they have strong self-concept in academics. Moreover, Emerson et al. (2020) clarified the connection between engagement and strong self-concept which greatly hampers all contradictions made from other people like educators' negative criticism. Further, factors like utilizing effective learning strategies, coping mechanisms, and putting a clear expectation can lead to strong academic self-concept which served as a learners' pathway to a successful academic engagement and positive self-concept (Wang & Degol, 2020).

Jacobs and Reynolds (2019) insisted that when all students are motivated to engage including those who are more introverted, level of self-efficacy-effort will increase. Nguyen & Torres (2023) highlighted the positive impact to students due to extracurricular activities and any school-based competitions which encourage them to participate leading to strengthen their classroom contribution like engaging in a mathematical discussion honing to improve the extent of an individuals' self-efficacy-effort. In addition, Shimizu (2022) stated that self-efficacy-effort as evident in students' engagement and enthusiasm in the class will give them some control over events that links their mathematical capabilities to the level of their self-concept towards accomplishing a math-related concept.

SUGGESTIONS

After concluding some key points in this study, the researcher recommends that students should focus on building a strong self-concept as a foundational element of knowledge to enhance their understanding of mathematical problems that begins at an early age, coupled with an optimistic approach to pursuing goals. Correspondingly, enthusiastic participation in mathematical tasks, leading to consistent effort, is crucial for achieving better academic outcomes.

Furthermore, teachers should implement activities that incorporate practical tasks in the classroom to capture students' interest and improve their self-concept and self-efficacyparticularly in mathematics. Furthermore, teachers who utilize diverse instructional strategies and avoid class disruptions are key to fostering better mathematical engagement.

CONCLUSIONS

Based from the discoveries of the study, the researcher has come up with the conclusion that the level of self-concept from the students is interpreted as strong since they have observable behavior in a mathematics topic. Then, the extent of self-efficacy-effort is extensive which implies that their effort and hard work is manifested as they are academically involved in accomplishing a specific mathematical project. The findings also revealed that mathematical engagement of the students is high which infers that they are willing to participate in a mathematical task with the use of their cognitive, emotional, and behavioral aspects towards achieving the specific objective of the lesson. Self-concept and self-efficacy-effort showed a significant and moderate positive correlation to students' mathematical engagement which implies that these factors significantly affect the students' engagement in tackling mathematical concepts. Self-concept and self-efficacy-effort contributes as to how the students' engagement towards mathematical tasks be strengthen or weaken. If there is a strong self-concept and self-efficacy-effort in every student, his/her mathematical engagement would also increase.

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TABLES AND REFERENCES

Table 1
The level of Self-concept of the Students

Indicators	Mean	SD	Description
Learned	3.40	1.09	High
Organized	3.31	1.10	Moderate
Dynamic	3.57	1.12	High
Overall Mean	3.43	1.11	High

Table 2
The Extent of Self-efficacy-effort of Students

Indicators	Mean	SD	Description
Effort and Trying Hard	3.56	1.16	Extensive
Involvement and Participation	3.35	1.18	Substantial
Overall Mean	**3.51**	**1.17**	**Extensive**

Table 3
The Level of Mathematical Engagement of Students

Indicators	Mean	SD	Description
Cognitive	3.88	0.98	High
Emotional	3.63	1.20	High
Behavioral	3.45	1.23	High
Overall Mean	**3.64**	**1.17**	**High**

Table 4
Significance of the Relationship Between self-concept and students' mathematical engagement

Variables Correlated	r-value	p-value	Remarks
Self-concept and Students' Mathematical Engagement	0.633	0.000	Significant
Self-efficacy-effort and Students' Mathematical Engagement	0.674	0.000	Significant

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Table 5

Significance of the Influence Between Students' Self-concept and Self-efficacy-effort to Students' Mathematical Engagement

Independent Variables	Dependent Variable	Unstandardized Coefficients		Standardized Coefficients	T	p-value	Remarks
		B	Std. Error	Beta			
(Constant)		1.636	.129	-	12.652	.000	
self-concept	mathematical engagement	.248	.054	.296	4.620	.000	Significant
self-efficacy-effort		.338	.047	.456	7.114	.000	Significant
r = .703;	r^2 = .495;			F= 132.667;		p = .000	

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