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PERSISTENCE, SELF-EFFICACY, AND ACHIEVEMENT IN MATHEMATICS

Erika Mae P. Asoy, LPT[1], Rholey R. Picaza, MAEd[2]
[1]*Instructor, Kapalong College of Agriculture, Sciences and Technology, Davao del Norte, Philippines*
ORCID No. 0009-0008-1987-3780
[2]*Associate Professor II, Davao De Oro State College,Davao de Oro, Philippines*
ORCID No. 0000-0001-6172-5329

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ABSTRACT
This study examined the relationship between persistence, self-efficacy, and mathematical achievement using a descriptive-correlational design. First-year education students from three higher education institutions in Davao del Norte participated as respondents of the study. Data were collected through adapted survey questionnaires on persistence and self-efficacy and a standardized test for achievement in mathematics, specifically on the course Mathematics in the Modern World. Findings revealed that the level of persistence of first-year education students was high, the level of self-efficacy of first-year education students was moderate, and the level of achievement in mathematics of first-year education students was high. Both persistence and self-efficacy showed a strong positive correlation with achievement in mathematics and equally influenced achievement in mathematics.

KEYWORDS: *Education, descriptive-correlational, persistence, self-efficacy, achievement in mathematics, first-year education students, Philippines*

INTRODUCTION
Achievement in mathematics has always been known not only as essential for one's academic success, but also meaningfully contributes as a critical component towards building a competent, functioning individual in the society (Brezavšček et al., 2020). Furthermore, the 4th Sustainable Development Goal (SDG), specifically Target 4.1 clearly points out its goal to ensure all learners acquire foundational skills by 2030, including numeracy, which ultimately leads to effective outcomes and achievement (United Nations, 2015). However, based on assessment across 81 OECD and partner countries from 2018 to 2022, average mathematics achievement dropped significantly by 15 points; and such downward trend had already been evident even before 2015 (United Nations, 2022).

In Ontario, Canada, 24 percent of college students struggle to improve their mathematics achievement and were made to enroll in remedial classes for mathematics, so as to aide them in keeping up with their peers' achievement in mathematics-related courses (Taras et al., 2015). Similarly in Taipei, Taiwan, study conducted to freshmen college students revealed that only 30.90 percent passed the mathematics test, suggesting a poor achievement in general mathematics concepts (Yuang-Tswong, 2015). Additionally in Tehran, Iran, a survey administered to university students showed that their underachievement in mathematics resulted to reluctance and disinterest, caused by theory-based and abstract-based approach in tertiary-level mathematics (Moradi and Amiripour, 2017).

In the Philippines, particularly in Catarman, freshmen students at a certain university only gained an average of 77.16 percent, suggesting a deficiency in solving word problems, special product and factoring, as well as equations and radicals (Unay, 2016). Parallel to this, in Cabanatuan, research conducted to six state universities emphasized most of the 1011 first-year college students shared the same level of misconceptions as elementary students; this is evidenced by their low performance in ratio and proportions, as well as probability concepts (Gamit, 2022). Correspondingly, in Metro Manila, a public university students' final grades in mathematics barely reached a score of 75, indicating low academic achievement (David, 2016).

Meanwhile, in Davao City, a survey conducted at a private higher education institution, focused on the course Mathematics in the Modern World, reflected that the students gained a mean score of 3.93 which indicated a lower achievement in creating level questions as compared to analyzing and evaluating questions (Torrejos, 2024). Likewise, in Kapalong, Davao del Norte, a structural equation model which investigated the factors influencing academic achievement in Mathematics in the Modern World disclosed that the domain of data management gained the lowest mean score of 5.50, as compared to the highest mean score of 6.93 in problem solving and reasoning (Asoy and Dagohoy,

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2023). Based on these empirical evidences, there arises an urgent need to bridge the gap on achievement in mathematics, particularly in the college course Mathematics in the Modern World, as this provides indispensable skills that are not only vital in the academic arena but are also relevant to everyday context, from data management to informed decision-making in one's personal and professional endeavors.

Due to the substantial issues pressing on the achievement in mathematics, many studies, in the elementary and secondary level, had resolved to investigate some variables using descriptive and quasi-experimental research designs, leading to conclusions and recommendations (Ihechukwu, 2020; El-Adl and Alkharusi, 2020; and Zulnaidi et al., 2020). However, there exists a few studies on achievement in mathematics, solely focused on college students in the course Mathematics in the Modern World. Then, this study aims to address the gap by investigating the link among persistence, self-efficacy, and achievement in mathematics, thereby, contributing to in depth research in the understanding of the variables influencing achievement in mathematics among college students.

The findings of this study hold significant social value by contributing to efforts aimed at enhancing college students' mathematics achievement. By identifying key variables influencing achievement in mathematics, this research can inform evidence-based strategies to improve learning outcomes. Additionally, the results may serve as a foundation for developing and implementing targeted programs that support mathematics instructors in higher education institutions, particularly within the research locale, ultimately fostering a more effective and equitable educational environment.

Moreover, the researcher plans to present the study conclusions and recommendations at local and international research conferences, engaging directly with educators and stakeholders to promote practical applications within the community. Additionally, the researcher intends to publish the results in a peer-reviewed and reputable journal, ensuring the findings contribute to academic discourse and inform broader educational practices.

STATEMENT OF THE PROBLEM

The primary aim of this study was to investigate achievement in mathematics as influenced by persistence and self-efficacy. Specifically, this sought to answer the following:

1.What is the level of persistence in mathematics in terms of:
- 1.1 Persistence in classroom mathematics exercise;
- 1.2 Persistence in mathematics take home assignment;
- 1.3 Persistence in group mathematics task; and
- 1.4 Persistence in mathematics examination?

2.What is the level of self-efficacy in mathematics in terms of:
- 2.1 Mastery Experience;
- 2.2 Vicarious Experience;
- 2.3 Social Persuasions; And
- 2.4 Physiological State?

3.What is the level of achievement in mathematics in terms of:
- 3.1 Revised Bloom's Taxonomy – Cognitive Process Dimension; and
- 3.2 topics?

4.Is there a significant relationship between:
- 4.1 Persistence and achievement in mathematics; and
- 4.2 Self-efficacy and achievement in mathematics?

5.Do persistence and self-efficacy significantly influence achievement in mathematics?

METHODS

The study used a descriptive-correlational design to examine relationships among persistence, self-efficacy, and mathematics achievement of first-year college students in the Mathematics in the Modern World course. Conducted in Davao del Norte, Philippines, the study involved three higher education institutions known for their academic programs. A total of 227 first-year college students participated, selected through stratified random sampling using the Raosoft sample size calculator. Only students enrolled in education-related programs and taking the Mathematics in the Modern World course were included, ensuring the relevance of their academic experiences. Ethical considerations were prioritized, including voluntary participation, informed consent, confidentiality, and the right to withdraw from the study at any time. Three research instruments were used: an adapted survey on persistence, a self-efficacy questionnaire, and an adopted standardized test on mathematics achievement. Persistence was measured using a questionnaire by Ogbu and Ugwu (2023), self-efficacy was assessed through a tool by Usher and Pajares (2009), and mathematics achievement was evaluated using an instrument by Baybayan and Lacia (2024). Content validity was ensured through expert review, while reliability was tested using Cronbach's alpha, confirming the consistency of the instruments. Each instrument used a Likert scale or scoring system to assess responses. Persistence and self-efficacy were rated on scales with descriptive levels indicating the extent to which students demonstrated these traits, while mathematics achievement was assessed based on performance in key topics. A pilot test with confirmed the instruments' reliability, yielding a Cronbach's alpha of 0.923 for persistence, 0.872 for self-efficacy, and a reliability score of 0.701 for the achievement test.

RESULTS AND DISCUSSION

Level of Persistence in Mathematics of College Students

Divulged in Table 1 is the overall level of persistence in mathematics with a mean of 2.84, described as high, which means that the persistence in mathematics of college students is oftentimes manifested. This finding aligns with the study of Dinapoli (2023) which posited that persistence in mathematics is reflected in the determination of students to keep trying despite failures. Furthermore, Bahi et al. (2015) supports this in the results of their study which emphasize that education students demonstrate a high level of persistence, staying in their field more consistently than other students, with their commitment growing stronger as they progress in their academic journey. As a result, Amanda et al. (2020) indicated in their study that education students display high persistence in mathematics, as supported by

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diverse learning strategies and a conducive educational environment.

Table 1
Level of Persistence in Mathematics of College Students

	Mean	SD	Description
Persistence in Classroom Mathematics Exercise			
1. not giving up solving difficult mathematical questions/exercises.	2.88	1.07	High
2. keep taking difficult mathematics questions to their teachers/colleagues for assistance.	2.70	1.13	Moderate
3. always taking note of difficult mathematics exercises/questions in their textbooks and keep attempting them until they get the answers.	3.00	1.02	High
4. being not discouraged by the length of the solutions to mathematical problems.	2.69	1.19	Moderate
5. having no limit on number of times they attempt difficult questions in mathematics until they get correct answers.	2.82	1.09	High
6. having more difficult mathematics problems, the greater effort they are putting in solving them.	2.88	1.07	Very High
7. waking up in the night in an attempt to solving some difficult mathematics topics.	2.48	1.24	Moderate
8. knowing that if they do not get the solutions to difficult mathematics questions immediately, they will definitely get the solution if they persevere.	2.74	1.16	Moderate
9. solving mathematics problem and studying the subject for a long time without getting tired easily.	2.50	1.15	Moderate
10. start attempting difficult mathematics topics/exercises in their textbooks even before they are taught in classrooms.	2.56	1.20	Moderate
11. always completing them and submitting on time, no matter the difficulty of their mathematics assignments	3.09	0.98	High
12. never stop attempting to solve difficult mathematics exercises/questions.	2.77	1.12	Moderate
13. not getting easily discouraged if they get wrong answers to questions in mathematics lessons for they are more determined to keep on trying until they get the correct answer.	2.91	1.06	High
Category Mean	**2.77**	**1.00**	**Moderate**
Persistence in Mathematics Take Home Assignment			
1. obtaining correct answers to difficult mathematics questions by students who never stop trying to find solution after initial failed attempts.	2.90	1.08	High
2. considering difficult mathematics questions/ exercises are meant for students like them who are not giving up easily.	2.72	1.12	Moderate
3. always achieving their target grades in mathematics despite challenges.	2.71	1.13	Moderate
4. sleeping late, in an attempt to get solutions to difficult mathematics questions/exercises.	2.53	1.17	Moderate
5. keeping on processing on their mind the possible solution of a difficult mathematics exercise/ question.	2.84	1.10	High
Category Mean	**2.74**	**1.03**	**Moderate**
Persistence in Group Mathematics Task			
1. persisting in solving the difficult mathematics question even when their colleagues have already given up.	2.71	1.16	Moderate
2. sacrificing their time and efforts to understand difficult topics in	2.71	1.16	Moderate

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	mathematics.			
3.	collaborating with their classmates in trying to solve difficult mathematics exercises/ topics.	3.07	0.98	High
4.	having difficulties in learning mathematics cannot make them change their career choice.	2.97	1.04	High
	Category Mean	**2.87**	**1.00**	**High**
Persistence in Mathematics Examination				
1.	believing that every difficult topic or question in mathematics is solvable if given enough attention and efforts.	3.08	0.98	High
2.	having made every good grade in mathematics is a result of having not given up on difficult questions.	2.93	1.05	High
3.	having made every good grade in mathematics was the result of having not given up easily on difficult topics.	2.99	1.02	High
4.	taking seriously. whenever my mathematics teachers advise me to study hard	3.09	0.97	High
5.	being always preoccupied with finding solution to difficult mathematics questions or exercises.	2.78	1.12	Moderate
6.	keep paying serious attention when difficult topics are being taught in their class.	3.09	0.96	High
	Category Mean	**2.99**	**0.94**	**High**
	Overall Mean	**2.84**	**0.97**	**High**

Persistence in Classroom Mathematics Exercise. It indicates that the category mean is 2.77 described as moderate with mean ratings of the items ranges from 2.48 to 3.09. Likewise, the item waking up in the night in an attempt to solving some difficult mathematics topics has a mean of 2.48 while the item always completing them and submitting on time, no matter the difficulty of their mathematics assignments has a mean rating of 3.09. This entails that college students persist in solving difficult mathematics exercises by making repeated attempts, seeking help, and staying determined despite challenges. Consequently, they put in greater effort as problems get harder, study persistently, and complete assignments on time.

Persistence in Mathematics Take Home Assignment. It demonstrates that the category mean is 2.74 described as moderate with mean ratings of the items ranges from 2.53 to 2.90. As a result, the item sleeping late, in an attempt to get solutions to difficult mathematics questions/exercises has a mean of 2.53 while the item obtaining correct answers to difficult mathematics questions by students who never stop trying to find solution after initial failed attempts has a mean rating of 2.90. This proves that the college students continuously attempt to solve difficult problems even after initial failures. Indeed, they embrace challenging exercises, strive to achieve their target grades, stay up late working on solutions, and keep processing possible answers in their minds.

Persistence in Group Mathematics Task. It suggests that the category mean is 2.87 described as high with mean ratings range from 2.71 to 3.07. Without a doubt, the items persisting in solving the difficult mathematics question even when their colleagues have already given up, and sacrificing their time and efforts to understand difficult topics in mathematics have the same mean rating of 2.71, while the items collaborating with their classmates in trying to solve difficult mathematics exercises/topics show a mean rating of 3.07. This highlights that the college students continue to solve difficult problems even when their peers have given up. Notably, they dedicate time and effort to understanding challenging topics, collaborate with classmates to find solutions, and remain committed to their chosen career paths despite difficulties in learning mathematics.

Persistence in Mathematics Examination. It uncovers that the category mean is 2.99 described as high with mean ratings range from 2.78 to 3.09. Furthermore, the item being always preoccupied with finding solution to difficult mathematics questions or exercises has a mean of 2.78 while the items taking seriously. whenever my mathematics teachers advise me to study hard, and keep paying serious attention when difficult topics are being taught in their class have the same mean rating of 3.09. This reveals that the college students believe that every difficult topic or question can be solved with enough effort and attention. Interestingly, their good grades result from not giving up easily, taking their teachers' advice seriously, staying preoccupied with solving complex problems, and focusing intently when difficult topics are taught.

Level of Self-efficacy in Mathematics of College Students

Reflected in Table 2 is the level of self-efficacy in mathematics with an overall mean computed after reversing items with asterisk. Then, it presents that the overall mean for self-efficacy is 3.28 which is described as moderate, highlighting that the self-efficacy in mathematics of college students is sometimes demonstrated. This finding aligns with Sari et al. (2024) who posited that students with low to moderate self-efficacy struggle to stay focused in their studies, often finding it difficult to attain

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mastery of their lessons. Furthermore, Meika et al. (2023) highlighted the fact, through their findings, that education students display a moderate level of self-efficacy, as explained in their slight differences with their confidence in their mathematical abilities. As a result, Paudel and Ghimire (2024) further highlighted that self-efficacy fluctuates throughout academic progression, with some students exhibiting lower to moderate levels depending on their experiences and challenges.

Table 2
Level of Self-efficacy in Mathematics of College Students

	Mean	SD	Description
Mastery Experience			
1. making excellent grades on math tests.	3.89	1.31	Moderate
2. having always been successful with math.	3.58	1.40	Moderate
3. doing poorly in math even when they study very hard	3.61	1.55	Moderate
4. *getting good grades in math on their last report card*.	3.89	1.66	Moderate
5. doing well on math assignments.	3.86	1.56	Moderate
6. doing well on even the most difficult math assignments.	3.61	1.56	Moderate
Category Mean	**3.74**	**0.99**	**Moderate**
Vicarious Experience			
1. seeing adults do well in math pushes them to do better.	4.04	1.80	High
2. seeing how their math teacher solves a problem, they can picture themselves solving the problem in the same way.	3.85	1.62	Moderate
3. seeing kids do better than they are in math pushes them to do better.	3.86	1.80	Moderate
4. seeing how another student solves a math problem, they can see themselves solving the problem in the same way.	4.00	1.56	High
5. imagining themselves working through challenging math problems successfully.	3.82	1.65	Moderate
6. competing with their self in math.	3.77	1.71	Moderate
Category Mean	**3.89**	**1.51**	**Moderate**
Social Persuasions			
1. having been told by their math teacher that they are good at learning math.	3.54	1.57	Moderate
2. being told by people that they have a talent for math.	3.53	1.71	Moderate
3. being told by adults in their family what a good math student they are.	3.60	1.73	Moderate
4. being praised for their ability in math.	3.42	1.73	Moderate
5. being told by other students that they are good at learning math.	3.51	1.66	Moderate
6. having classmates who like to work with them in math because they think they are good at it.	3.56	1.62	Moderate
Category Mean	**3.53**	**1.55**	**Moderate**
Physiological State			
1. just being in math class makes feel stressed and nervous. *	3.94	1.75	Moderate
2. doing math work takes all of my energy. *	3.85	1.75	Moderate
3. starting to feel stressed out as soon as I begin my math work. *	3.78	1.67	Moderate
4. being unable to think clearly when doing math work because their mind goes blank. *	3.76	1.73	Moderate
5. getting depressed when they think about learning math. *	3.42	1.76	Moderate
6. having their whole body becomes tense when they have to do math. *	3.60	1.80	Moderate
Category Mean *	**3.72**	**1.57**	**Moderate**
Overall Mean	**3.28**	**1.57**	**Moderate**

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Mastery Experience. It reflects that the mean rating of the different items ranges from 3.58 to 3.89 with a category mean of 3.74 described as moderate. Correspondingly, the item having always been successful with math reflects a mean rating of 3.58, while the items making excellent grades on math tests, but getting good grades in math on their last report card show a higher mean rating of 3.89. This conveys that mastery experience is sometimes demonstrated by college students through high grades on mathematics tests, good report card results, and success in challenging mathematics assignments. Moreover, it can be seen in students who have consistently done well in mathematics or who remain dedicated to their studies despite challenges.

Vicarious Experience. It shows that this indicator has garnered a moderate category mean rating of 3.89 with mean ratings that range from 3.77 to 4.04. Consequently, the item competing with their self in math reflects a mean rating of 3.77. Meanwhile, the item seeing adults do well in math pushes them to do better shows a mean rating of 4.04. This suggests that vicarious experience is sometimes demonstrated by college students through observing adults or peers excel in mathematics, which motivates them to improve. Furthermore, it can be seen when they visualize themselves solving problems as their teacher or classmates do, imagine tackling difficult mathematics challenges successfully, or strive to compete with their own past performance.

Social Persuasions. It reveals that the mean rating of the different items ranges from 3.42 to 3.60 with a category mean of 3.53 described as moderate. Additionally, the item being praised for their ability in math reflects a mean rating of 3.42, while the item being told by adults in their family what a good math student, they are shows a mean rating of 3.60. This discloses that social persuasions are sometimes demonstrated by college students through encouragement from teachers, peers, and family who recognize their mathematics abilities. In addition, it can be seen when they receive praise for their skills or when classmates seek their help in mathematics, believing in their competence.

Physiological State. It presents a moderate category mean of 3.72 with mean ratings of 3.42 to 3.94. Further, the item getting depressed when they think about learning math has a mean rating of 3.42. In contrast, the item just being in math class makes feel stressed and nervous reflects a mean of 3.94. This divulges that physiological state is sometimes demonstrated by college students through feelings of stress, nervousness, or mental exhaustion when engaging in mathematics. Parallel to this, it can be seen when they experience tension, difficulty thinking clearly, or frustration when faced with mathematics tasks.

Level of Achievement in Mathematics of College Student

As evidenced in Table 3, the overall mean achievement in mathematics is 75.21, which is described as moderate. This indicates that while college students demonstrate a satisfactory achievement in Mathematics in the Modern World, their proficiency does not reach the highest level. In this case, the finding of this study is also explained by Pandey (2017) wherein a satisfactory mathematical achievement reflects a sufficient understanding and application of mathematical principles, as indicated by achievement test scores that show adequate competency. Similarly, this is supported by the study of Shamaki (2015) which showed that students achieved satisfactory levels in mathematics, as reflected in their good test scores, with noticeable improvement compared to other groups. In the same manner, Toropova et al. (2019) presented a similar finding wherein students demonstrated satisfactory success in mathematics through their good performance on assessments, a clear understanding of key concepts, and positive perceptions of instructional quality.

Table 3
Level of Achievement in Mathematics of College Students

	Ave. TG	SD	Description
Revised Bloom's Taxonomy – Cognitive Process Dimension			
Remembering	83.37	9.76	High
Understanding	72.29	11.56	Moderate
Applying	69.69	13.52	Moderate
Analyzing	69.12	10.77	Moderate
Evaluating	66.97	12.02	Moderate
Creating	79.45	15.29	High
Grade Average	**75.21**	**6.55**	**Moderate**
Topics in Mathematics			
Mathematics in Our World	43.74	0.92	Very Low
Mathematical Language and Symbols	77.26	9.36	High
Problem Solving and Reasoning	73.84	9.62	Moderate
Grade Average	**75.21**	**6.55**	**Moderate**
Overall Grade Average	**75.21**	**6.55**	**Moderate**

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Revised Bloom's Taxonomy–Cognitive Process Dimension. The transmuted grade based on Revised Bloom's Taxonomy–Cognitive Process Domain is 75.21, which is described as moderate. In addition, the average transmuted grades across the different cognitive process domains ranges from 66.97 to 83.37. Particularly, the cognitive process evaluating in Table 3 reveals an average transmuted grade of 66.97 while the cognitive process remembering obtains an average transmuted grade of 88.37. In consequence, this means that the college students perform well in lower-order thinking abilities such as remembering but show lower achievement in higher-order thinking abilities such as evaluating.

Topics in Mathematics. The data reveals that the average transmuted grade of college students in mathematics is 75.21, which is described as moderate. Furthermore, Table 3 shows that the average transmuted grades across various mathematics topics range from 43.74 to 77.26. Specifically, the average transmuted grade for the topic Mathematics in Our World is 43.74, whereas the topic Mathematical Language and Symbols has a considerably higher average transmuted grade of 77.26. Then, this suggests that although the college students establish a higher proficiency in the topic Mathematical Language and Symbols, they pointedly struggle with lower proficiency in the topic Mathematics in Our World. Hence, this may indicate that certain areas of the course Mathematics in the Modern World may require additional focus or support.

Significance of the Relationship of Persistence, Self-efficacy, and Achievement in Mathematics of College Students

Displayed in Table 4 is the correlation of the variables: persistence, self-efficacy, and achievement in mathematics of college students. It is shown that persistence in mathematics has a positive strong relationship to achievement in mathematics with r-value of .77. Furthermore, it reflects a p-value of .00 which is less than the alpha set at .05 (two-tailed), thus supporting a significant relationship. This indicates that as the level of persistence in mathematics increases, the level of achievement in mathematics of college students significantly increases.

In a similar manner, self-efficacy in mathematics reveals a significant positive strong relationship with achievement in mathematics, with an r-value of .77 and a p-value of less than the alpha set at .05. This reveals that as the level of self-efficacy increases, the level of achievement in mathematics of college students significantly increases. As a result, the findings of this study indicate that persistence in mathematics is significantly correlated with achievement, suggesting that fostering persistence—in terms of persistence in classroom mathematics exercise, persistence in mathematics take home assignment, persistence in group mathematics task, and persistence in mathematics examination—can lead to improved mathematics achievement among college students. Similarly, self-efficacy is also significantly correlated with achievement, meaning that boosting the self-efficacy of college—in terms of mastery experience, vicarious experience, social persuasions, and physiological state—can notably enhance their confidence and thereby, their achievement in mathematics.

Table 4

Significance of the Relationship of Persistence, Self-efficacy, and Achievement in Mathematics of College Students

	r	p-value	Remarks
Persistence and Achievement in Mathematics	.77	.00	Significant
Self-efficacy and Achievement in Mathematics	.77	.00	Significant

In line with the findings of this study, Davis and Burkholder (2024) highlighted that a strong positive correlation exists between persistence and achievement in mathematics, with students who maintained their efforts in learning math, despite challenges, showing significantly higher achievement scores. Likewise, this is affirmed by the study of Wu et al. (2022) which demonstrates a strong relationship between high levels of persistence and exceptional mathematics performance. Also, this is strongly supported by Johnson and Lee (2023) in their study which posited that persistence in mathematics problem-solving tasks was found to lead to significantly higher levels of conceptual understanding and the effective application of mathematical principles.

Consequently, the result of this study is parallel to that of Schunk and DiBenedetto (2016) which highlighted that a strong positive correlation exists between self-efficacy and achievement in mathematics, indicating that students who have confidence in their ability to succeed are more likely to perform better in mathematics tasks. In the same vein, Bandura et al. (2017) supports this as self-efficacy is found to be key predictor of mathematical achievement, with students who possess higher self-confidence being more likely to overcome difficulty in solving mathematics problems. Moreover, Chung and Lee (2021) evidenced that promoting self-efficacy is essential for improving the success of students in mathematics.

Subsequently, the findings of this study validate The Social Cognitive Theory of Bandura (1986), affirming a strong connection between persistence, self-efficacy, and achievement in mathematics. It reflects that college students who believe in their abilities and remain determined tend to perform better. Further, it aligns with the perspective of Bandura that a strong sense of self-efficacy fosters motivation, resilience, and sustained effort in learning.

Additionally, the results of this study confirm The Expectancy Theory of Motivation by Vroom (1964), supporting the robust link between persistence, self-efficacy, and achievement in

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mathematics. It shows that the belief of college students concerning effort, performance, and outcome determines the impact on their motivation and achievement in mathematics. Moreover, students who think that persistence would lead to success are more likely to make continuous effort, thereby supporting the notion of Vroom that motivation is the result of the expected outcome.

Significance of the Influence of Persistence, and Self-efficacy on Achievement in Mathematics of College Students

Presented in Table 5 are the results of the multiple regression analysis. In terms of singular capacity, persistence in mathematics exhibits a p-value of .001 which is less than the set .05 level of significance (two-tailed), with a positive standardized beta value of 0.40. This implies that persistence in mathematics is a significant predictor of achievement in mathematics of college students. Adding on, it shows that for every unit increase in the value of the level of the persistence in mathematics, there is a corresponding significant increase of 0.40 in the level of achievement in mathematics of college students.

Table 5

Significance of the Influence of Persistence, and Self-efficacy on Achievement in Mathematics of College Students

		Achievement in Mathematics			
Singular Influence of the Predictors		**Standardized Coefficients**	**t**	**p-value**	**Remarks**
Persistence		0.40	3.51	.001	Significant
Self-efficacy		0.40	3.54	.000	Significant
Combined Influence of the Predictors					
R	0.78				
R^2	0.61				
F	175.89				
p	.000				Significant

On the other hand, in terms of singular capacity, self-efficacy in mathematics reflects a p-value of .000 which is also less than the set .05 level of significance (two-tailed), with a positive standardized beta value of 0.40. This suggests that self-efficacy in mathematics is also a significant predictor of achievement in mathematics of college students. Similarly, it follows that for every unit increase in the value of the level of self-efficacy in mathematics, there is a corresponding significant increase of 0.40 in the level of achievement in mathematics of college students.

Concurrently, the combined influence of the two predictors, persistence and self-efficacy towards achievement in mathematics is statistically significant, with a p-value of .000. Meanwhile, the model explains 61 percent of the variance of the achievement in mathematics based on the independent variables as indicated by R^2= 0.61. This means that the remaining 39 percent of the variance in the achievement in mathematics of college students can be attributed to other factors aside from persistence and self-efficacy in mathematics.

Concomitantly, the study of Kim and Park (2022) highlighted that persistence plays a crucial role in driving high achievement in mathematics, especially when students encounter challenging and complex problems. Likewise, Lopez and Martinez (2021) affirm that students who exhibited persistence in problem-solving were more likely to achieve success in applying mathematical concepts to new and real-world scenarios. More importantly, Baker and Larson (2020) concluded that persistence in overcoming obstacles mathematical learning, playing a crucial part in enhancing academic performance.

Alongside, Zimmerman (2016) strongly implied the significant influence of self-efficacy on mathematical achievement, showing that students who have strong confidence in their mathematical abilities tend to attain higher academic success. In consonance, Gutiérrez and López (2018) agreed the confidence of students in their problem-solving skills directly influences their mathematical performance, as higher self-efficacy is associated with improved scores. Additionally, Klusmann et al. (2020) further discussed that early self-efficacy beliefs significantly influence long-term success in mathematics, reinforcing the strong connection between self-efficacy and achievement.

Furthermore, the findings of this study clearly corroborate the significant influence of persistence and self-efficacy on the achievement of college students in mathematics, thereby reinforcing both The Social Cognitive Theory of Bandura (1986) and The Expectancy Theory of Motivation by Vroom (1964). Specifically, students who have strong confidence in their mathematical abilities and remain persistent are more likely to perform better, as self-efficacy consequently fosters motivation, resilience, and sustained effort in learning. Furthermore, the study confirms that the beliefs of students about the relationship between effort, performance, and outcomes directly impact their motivation and achievement. Ultimately, this demonstrates that both persistence and self-efficacy equally play crucial roles in driving the achievement in mathematics of college students.

CONCLUSION AND RECOMMENDATION

Interpreted from the findings, the conclusion of this study is outlined as follows:

1. The high level of persistence in mathematics of college students reveals their unwavering commitment to solving

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challenging mathematical exercises, as they continuously attempt problems without being discouraged by initial mistakes. In addition, they also dedicate significant time to studying, including late-night efforts, and actively seek guidance from teachers or peers to overcome difficulties.

2. The moderate level of self-efficacy in mathematics of college students means that they are capable of performing well on mathematics assignments and tests while continuously striving to improve. Besides, their confidence grows through observing others succeed, receiving encouragement from teachers and peers, and developing a positive mindset toward mathematical challenges.
3. The moderate level of achievement in mathematics of college students reflects their ability to meet the expected competencies in Mathematics in the Modern World. Their performance varies across different cognitive levels and topics, demonstrating a balanced understanding while allowing room for further improvement.
4. As the level of persistence in mathematics increases, the level of achievement in mathematics of college students significantly increases. Likewise, as the level of self-efficacy increases, the level of achievement in mathematics of college students significantly increases.
5. Persistence and self-efficacy each significantly influence achievement in mathematics of college students. When combined, both variables also significantly predict achievement in mathematics of college students.

Gained from the conclusion, the recommendation of this study is presented as follows:

1. Since the level of persistence in mathematics of college students is high, there is potential for it to be further enhanced to a very high level. Colleges may institutionalize peer-assisted study groups led by senior students or high-achieving peers, ensuring regular, structured support for students who encounter difficulties. Furthermore, faculty mentoring programs can be strengthened by assigning faculty members to small student groups, providing guidance on effective study habits, problem-solving techniques, and time management. Moreover, instructors may also sustain engagement by designing real-world, application-based mathematics projects, where students collaborate to solve authentic problems. In addition, recognizing the persistence of students through achievement-based incentives, such as certificates, leadership opportunities, or course incentives, may further reinforce motivation. With active participation from faculty, student mentors, and academic support services, these initiatives may help elevate persistence in mathematics of college students.
2. As the level of self-efficacy in mathematics of college students is moderate, it can still be strengthened to reach a high level. Colleges may offer structured tutorial programs integrated into the curriculum, where students receive weekly guided problem-solving sessions tailored to their skill levels. Additionally, practice-based learning activities, such as gamified assessments, interactive problem-solving exercises, and self-paced learning modules, may help students experience small successes that build their confidence. Likewise, instructors may also foster self-efficacy by breaking down complex concepts into manageable steps, providing consistent, constructive feedback, and encouraging students to track their progress through reflection journals or digital tracking tools. By promoting a supportive learning environment with accessible tutoring, collaborative learning, and faculty engagement, college students may develop a stronger belief in their ability to succeed in mathematics.
3. Given that the level of achievement in mathematics of college students is moderate, it can still be further developed to attain a high level. Since students performed very poorly in the topic Mathematics in Our World, colleges may implement structured remedial programs, hands-on workshops, and contextualized learning activities that highlight the practical uses of mathematics in daily life and various fields. Likewise, instructors may enhance instruction by integrating real-world problem-solving tasks, utilizing interactive technology such as simulations and visual models, and offering step-by-step guided practice to address specific learning gaps. Through close coordination between faculty, academic support services, and student mentors, these targeted strategies may help college students develop a stronger appreciation for mathematics and significantly improve their overall performance.
4. When students demonstrate persistence in learning mathematics, their achievement increases; therefore, colleges may support them by establishing clear learning objectives, incorporating interactive instructional methods, and facilitating study groups or mentorship programs. Similarly, as students develop greater self-efficacy in mathematics, their performance improves; thus, instructors may enhance their confidence by providing structured guidance, acknowledging their progress, and integrating real-world applications into instruction.
5. Since persistence and self-efficacy influence achievement in mathematics but do not account for its entirety, future researchers may explore additional factors that contribute to success in mathematics. Variables such as learning strategies, motivation, classroom environment, and instructional methods may provide deeper insights into other influences on achievement. By examining these aspects, future studies may offer a more comprehensive understanding of the different elements that shape the achievement in mathematics of college students.

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