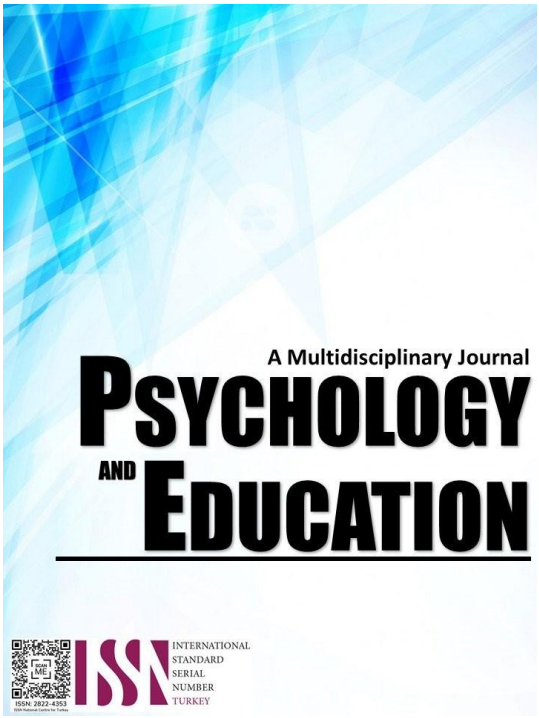
BELIEVE-2-ACHIEVE: SELF-EFFICACY AND MATHEMATICS PERFORMANCE OF CALCULUS STUDENTS IN A STATE UNIVERSITY IN CAVITE, PHILIPPINES



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Research Article

Believe-2-Achieve: Self-Efficacy and Mathematics Performance of Calculus Students in a State University in Cavite, Philippines

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Abstract

Calculus plays a significant role in succeeding in various fields. In line with this, the researchers should identify the relationship between a factor that drives success in the mentioned subject, self-belief, and Calculus performance. This study aimed to determine the level of sources of self-efficacy presented by Albert Bandura, specifically mastery experience, vicarious experience, social persuasion, and physiological state, in the context of students' calculus performance. The relationship between the four sources and the academic performance of the learners in the mentioned subject was also determined. The study was conducted from October 2023 to February 2024 at Cavite State University–Carmona. The participants were one hundred twenty-seven students from the programs BS Computer Engineering, BS Computer Science, and BSE-Mathematics who qualified for the limitations of this study. Descriptive and correlational research designs were utilized to attain the study's objectives. In addition, the researchers adapted and modified a mathematics self-efficacy questionnaire. Both Spearman's rho and Pearson's r were used to determine if there was a correlation between mastery experience, vicarious experience, social persuasion, and physiological state, and Calculus performance. The results showed that students have low confidence or belief in their ability to perform well in Calculus when mastery experiences, vicarious experiences, social or verbal persuasions, and physiological or emotional states are taken into consideration. In addition, it was found that there is a significant negative relationship between the first three mentioned sources of self-efficacy and Calculus performance. On the other hand, the physiological state has a significant positive relationship.

Keywords: *self-efficacy, calculus, Albert Bandura, mathematics performance, mastery experiences*

Introduction

"People's belief about their abilities have a profound effect on those abilities." – Albert Bandura on Self-Efficacy: The Exercise of Control

In 1977, Albert Bandura, a Canadian-American psychologist, presented the Social Learning Theory, which states that learning occurs through imitation and observation of other people (Koutroubas & Galanakis, 2022). However, in 1986, this theory evolved into Social Cognitive Theory and pointed out that 'observational learning is not the same as imitational learning'. Instead, agents such as behavior, environment, and personal factors influence one's learning. With that being said, a key element of this theory that drives self-regulation was introduced, namely, self-efficacy. (Minnesota State University).

Self-efficacy refers to a person's belief in and confidence in their ability to carry out a specific performance. It also affects the student's motivation in ways such as putting more effort into activities they are confident in completing, facing difficulties efficiently, and developing resilience towards failures (Bandura, 1994). In the context of this study, mathematics self-efficacy refers to a student's ability to solve a specific mathematical problem, which also drives their internal motivation to complete the task successfully (Zakariya, 2022).

In line with this, Bandura presented four sources of self-efficacy. The first factor that influences one's self-efficacy is one's mastery experience. It is known to be the most influential among the four because of past exposure to the task. Successes develop high self-efficacy, and failures lower it. If the student has developed their thinking that they can finish the task successfully as a result of past experience, the higher their belief in themselves that they can still do it in the future.

On the other hand, lower self-efficacy or negative encounters with the task push a student to avoid it or lower their commitment to attaining a valued goal. The second source of self-efficacy is vicarious experience. With the presence of social models, one can develop high self-efficacy by thinking they are capable of doing a specific task, too. Social models such as influencers, teachers, or classmates could be a reason for someone's level of self-efficacy by observing them perform a specific task. Seeing them succeed helps a person develop high self-efficacy by thinking that if others can do it, they can also accomplish it. The third factor that influences a person's self-efficacy is verbal persuasion. Evaluative feedback and verbal persuasion from people who are found to be reliable by the student help them build a higher belief in themselves to accomplish a task. Lastly, the emotional and physiological state of a person affects their self-efficacy by managing and interpreting the negative or positive emotions they feel. Positive arousal, such as excitement, can be used as an energizer to achieve the desired performance outcome. On the other hand, negative emotions such as self-doubt and anxiety weaken one's belief in succeeding.

According to a study by Meng and Zhang (2023), self-efficacy has a direct impact on the academic performance of university students. This is in line with the research of Affuso et al. (2023), which suggests that social factors, such as parental and teacher influence, affect

the learning performance of learners. Furthermore, a study related to this research, conducted by Wang et al. (2024), concluded that students' mathematics performance is positively influenced by their self-efficacy.

Calculus is a branch of mathematics that deals with the study of rates of change. Hence, it is mostly studied in college programs such as education and computer-related programs. The researchers also focused on this course, as it is where the integration of different branches of mathematics, such as algebra, trigonometry, and even geometry, is evident. Thence, it is known to be a complicated subject, but calculus is a gateway course that enables students to successfully complete their programs (Apiag et al., 2023).

Despite numerous studies on self-efficacy, researchers have found a lack of knowledge regarding the sources of self-efficacy and their relationship to academic attainment in calculus. Specifically, the relationship between the sources of self-efficacy, introduced by Albert Bandura, and math performance. With this, the study aimed to describe the level of self-efficacy among the respondents and their performance in Calculus. Furthermore, the relationship between each of the self-efficacy sources: mastery experience, vicarious experience, verbal persuasion, and physiological state, and academic performance.

Research Questions

This study focused on determining the relationship between the sources of self-efficacy and students' math performance in Calculus. The researchers aimed to answer the following questions:

1. What is the level of self-efficacy of the students in terms of:
    1.1. mastery experience;
    1.2. vicarious experience;
    1.3. verbal persuasion; and
    1.4. physiological state?
2. What is the mathematics performance of the students in terms of their grade in Calculus?
3. Is there a significant relationship between self-efficacy and mathematics performance of the students in Calculus in terms of:
    3.1. mastery experience;
    3.2. vicarious experience;
    3.3. verbal persuasion; and
    3.4. physiological state?

Literature Review

"Self-efficacy has a powerful effect on motivation leading to academic fulfillment" (Maraghi et al., 2018). In relation to this, a study by Yapo et al. (2021) was conducted among graduating college students in the context of online learning during the COVID-19 pandemic. Through a descriptive-correlational research design, the study revealed a strong positive relationship between academic self-efficacy and motivation. In addition, the researcher concluded that high academic performance is caused primarily by self-efficacy and academic motivation.

Along with this, a study by Enriquez et al. (2021) also revealed that self-efficacy significantly affects academic motivation. Both variables then encourage students to make better decisions and develop determination, ultimately leading to academic success.

Aligned with the study of De la Hera et al. (2023) and as found in Czocher's (2020) research, a positive correlation was evident between students' levels of self-efficacy and motivation. Moreover, this self-efficacy influences the learners' motivation, which then affects their persistence in studying.

To add more knowledge on studies related to self-perceptions influencing students' academic achievement in the local context of Egypt and Saudi Arabia, Al-Abyadh & Azeem (2022) conducted a study with university students as their participants. The researchers had focused on the learning-process success of students as influenced by their self-management and as mediated by self-efficacy. It was found that self-management has a significant impact on self-efficacy and leads to excellent academic performance. However, on the other hand, beyond the scope of this research paper, the study conducted by Al-Abyadh & Azeem (2022) showed that even without self-efficacy, self-management still has a significant impact on students' academic performance.

Mastery Experience

A study conducted by Dagdag (2021), exhibited that the mastery experience of students in mathematics influences their anxiety towards it, specifically the focus of this study, which is problem-solving. The researcher also discussed that, contrary to other studies, the most influential source of mathematical self-efficacy is verbal or social persuasion, not mastery experience.

Verbal Persuasion/Vicarious Experience

Seeing other people succeed at a task raises the person's belief that they could also succeed at it (Bandura, 1998). In a study by Nikoceviq-Kurti (2021) with student-teachers as participants, the result showed that the students' self-efficacy develops more when exposed to an actual school environment with mentor teachers. Furthermore, the research showed that the student-teachers had

enhanced their self-efficacy beliefs in teaching and professional identity after a positive experience and encounter with mentor teachers.

Physiological/Emotional State

A localized descriptive-correlational study on time management and self-efficacy and their relation to the mathematics performance of working students was conducted by Peteros et al. (2021). A hypothesis of no relationship between self-efficacy and math performance was stated. However, utilizing a Self-Efficacy Survey, the study showed a correlation between the two variables. It was revealed that students' self-belief affects their academic performance in mathematics.

Methodology

Research Design

This study aimed to investigate the relationship between self-efficacy and the mathematics performance of students enrolled in calculus at Cavite State University's Carmona Campus. In line with this, the researchers utilized non-experimental research designs, specifically descriptive and correlational. Descriptive-survey research is employed to describe a sample or population (Thomas and Zubkov, 2023). Hence, it was used to identify the level of self-efficacy of the participants. On the other hand, a correlational research design is used to examine the relationship between variables (Devi et al., 2022). Therefore, the correlational method was utilized to attain the main objective of this study, which was to determine the relationship between the variables: sources of self-efficacy and mathematics performance.

Respondents

The researchers sought to determine the relationship between sources of self-efficacy and the mathematics performance of the students. Correspondingly, the respondents in this study were current third-year and fourth-year Bachelor of Secondary Education Major in Mathematics, third-year Computer Science students, and second-year Computer Engineering students. The said respondents qualified for the limitations of this study, which were the students who took calculus in the second semester of the academic year 2022-2023 at Cavite State University-Carmona Campus.

With a total population of two hundred twenty-five (225) students, the researchers utilized the sample size formula of Krejcie and Morgan (1970). This study also used both probability and non-probability sampling techniques, specifically stratified-proportional allocation methods and quota sampling. The target participants, who were students from programs with the course Calculus at Cavite State University-Carmona during the second semester of the academic year 2022-2023, were divided and identified through their sections. This also meets the standard of at least 30 participants for a correlational study (Creswell, 2012).

Table 1. *Respondents' Population*

Program and Section	*Population*	*Percentage per Stratum*	*No. of Respondents*
2nd Year Computer Engineering	97		
2A	32	17	22
2B	33	17	22
2C	32	17	21
3rd Year Computer Science	49		
3A	28	15	19
3B	21	11	14
BSE-Math	42		
3rd Year	18	10	13
4th Year	24	13	16
Total	188	100	N = 127

Instrument

This study aimed to determine the relationship between the sources of self-efficacy and the math performance of the students who took calculus in the second semester of A.Y. 2022-2023. In line with this, a study by Kandemir and Perkmen (2017) to examine the validity and reliability of a mathematical self-efficacy scale constructed by Usher and Pajares (2009) was conducted.

The questionnaire has four (4) subscales for the sources of self-efficacy presented by Bandura (1986), namely, Mastery Experience, Vicarious Experience, Social Persuasion, and Physiological State. Six (6) items were stated in each subscale. After asking permission from the author of the Mathematics Self-Efficacy Scale, the researchers adapted the questionnaire to align it with this study's variable, which is Calculus. In addition, the 5-point scale was modified to a 4-point Likert-type scale.

A pilot test was conducted to test and measure the reliability and validity of the adapted questionnaire. The study was done with the participation of thirty (30) students from another school who met the same limitations of the characteristics of this study's participants. The calculated Cronbach Alpha was 0.76, which qualifies for the validity and reliability of a questionnaire.

Procedure

A permission letter was submitted to each department chairperson for the data collection process. After approval, the researchers then

reached out to the class representatives of each target class. They were asked to forward a message within their section containing the purpose of the survey, the total number of target students in each section, the time and place of the data collection, reminder to bring a copy of their Certificate of Grades on the second semester of the academic year 2022-2023 containing their grade in Calculus, and ensuring the confidentiality of their personal information in accordance with RA 10173, or the Data Privacy Act of 2012. The data collection was conducted face-to-face and lasted three (3) days. During the respondents' free time, the survey took place in a classroom, and on the day(s) of data collection, the researchers provided clear instructions for the survey to the volunteer respondents. The questionnaire was composed of a 24-item Likert-type scale ranging from 1 to 4 and a section where they filled in their grade in calculus. The researchers then ensured that the grades in the form and their Certificate of Grades were identical. After the survey, the researchers then analyzed and interpreted the data with the help of statistical tools.

Data Analysis

Statistical tools that were applied to interpret the collected data are Mean, Standard Deviation, and Pearson's r.

To determine the level of self-efficacy of the students towards Calculus in terms of mastery experience, vicarious experience, verbal persuasion, and physiological state, the following formula was used:

Weighted Mean

Table 2. *Interpretation for the level of self-efficacy*

Interval	*Descriptive Level*	*Interpretation*
1.00-1.99	Very Low	With very poor confidence and assurance to find a solution with difficult Calculus problems
2.00-2.99	Low	With poor confidence and assurance to find a solution with difficult Calculus problems
3.00-3.99	High	With confidence and assurance to find a solution with difficult Calculus problems
4.00-5.00	Very high	With high confidence and assurance to find a solution with difficult Calculus problems

To determine the academic performance of the students in calculus, the following statistical tools were utilized:

Mean

Table 3. *Interpretation of Calculus Performance*

Range	*Interpretation*
1.00	Excellent
1.25	
1.50	Very Good
1.75	
2.00	Good
2.25	
2.50	Satisfactory
2.75	
3.00	Passing
4.00	Conditional Failure
5.00	Failed

Pearson Product-Moment Correlation – This statistical tool was used to determine whether there is a significant relationship between each source of self-efficacy (specifically, mastery experience, vicarious experience, verbal persuasion, and physiological state) and the mathematics performance of students in Calculus.

Spearman (Rho) Rank Correlation – a non-parametric statistical tool to determine the relationship between two variables.

Table 4. *Interpretation for Correlation*

r	*Interpretation*
0.00	No correlation
± 0.01 to ± 0.20	Slight correlation
± 0.21 to ± 0.40	Low correlation
± 0.41 to ± 0.70	Moderate correlation
± 0.71 to ± 0.80	High correlation
± 0.81 to ± 0.99	Very high correlation
± 1.00	Perfect correlation

The Pearson Product-Moment Correlation and Spearman (rho) Rank Correlation were both utilized to analyze research question 3.

Ethical Considerations

In accordance with Republic Act 10173, also known as the Data Privacy Act, all information gathered was strictly confidential and used solely for this research. Along with the research questionnaire was the consent letter stating the conditions of the study. The participants were informed of the anonymity and confidentiality of their details and responses. Moreover, the participation of the

respondents was voluntary.

Results and Discussion

In line with the statement of the problem, individual presentations and results of data are shown in this section.

Levels of Sources of Self-Efficacy

Table 5. *Level of self-efficacy regarding Mastery Experience*

Source of Self-Efficacy	*Computed Mean*	*Interpretation*
Mastery Experience	2.69	Low Confidence

Legend: 1.00-1.99, Very Low; 2.00-2.99, Low; 3.00-3.99, High; 4.00-5.00, Very High Standard Deviation: .49

Table 5 shows the computed mean from the respondents' answers in the mastery experience factor of self-efficacy. With an average of 2.6 and an SD of 0.49, this reveals that the students have low and poor confidence when it comes to Calculus in relation to their past experiences and encounters related to the subject.

Table 6. *Level of self-efficacy regarding Vicarious Experience*

Source of Self-Efficacy	*Computed Mean*	*Interpretation*
Vicarious Experience	2.83	Low Confidence

Legend: 1.00-1.99, Very Low; 2.00-2.99, Low; 3.00-3.99, High; 4.00-5.00, Very High Standard Deviation: .60

Table 6 presents the tabulation of the summary of the participants' responses with regard to vicarious experience. As stated above, with an SD of 0.60 and a computed mean of 2.83, the students who took Calculus have low and poor confidence in the subject, influenced by factors such as peer pressure and social models.

Table 7. *Level of self-efficacy regarding Social Persuasion*

Source of Self-Efficacy	*Computed Mean*	*Interpretation*
Social Persuasion	2.53	Low Confidence

Legend: 1.00-1.99, Very Low; 2.00-2.99, Low; 3.00-3.99, High; 4.00-5.00, Very High Standard Deviation: .68

Table 7 presents the average of the participants' responses to scenarios related to social persuasion as a source of self-belief. In line with the interpretation shown in Table 2, with an SD of 0.68 and a computed mean of 2.53, students still have low confidence in Calculus about social or verbal persuasion.

Table 8. *Level of self-efficacy regarding Physiological State*

Source of Self-Efficacy	*Computed Mean*	*Interpretation*
Physiological State	2.53	Low Confidence

Legend: 1.00-1.99, Very Low; 2.00-2.99, Low; 3.00-3.99, High; 4.00-5.00, Very High Standard Deviation: .72

Table 8 presents the computed mean from the respondents' answers regarding their physiological or emotional state. Among the one hundred twenty-seven (127) respondents, the computed mean was 2.53 with an SD of 0.72. In line with the interpretation presented in Table 2, it is revealed that students have low confidence in Calculus regarding their physiological state.

Grades of students in Calculus

Table 9. *Calculus performance of the students*

Grades	*Frequency*	*Mean*
1.00	6	
1.25	14	
1.50	38	
1.75	21	
2.00	14	
2.25	5	1.87
2.50	9	
2.75	7	
3.00	13	
4.00	0	
5.00	0	
TOTAL	127	

Standard Deviation: 0.58

Table 9 shows the Calculus performance of the students in terms of their grade. Among the 127 respondents, most, specifically thirty-eight (38) students, obtained a score of 1.50. In line with this, as shown in the transmutation of grades in Table 3, the majority got a very good grade.

On the other hand, no one acquired marks of 4.00, or conditional failure, and 5.00, or failing grade. The table above also shows the computed average of the participants' Calculus performance, which is 1.87 with a standard deviation of 0.58, indicating less scattered data from the mean.

Relationship between sources of self-efficacy and Calculus performance

Table 10. *Spearman's rho for finding the relationship between Mastery Experience and Calculus Performance*

Variables	*Correlation Value*	*Interpretation*	*Significance Value*	*Interpretation*
Mastery Experience and Calculus Performance	-0.43	Moderate Negative Correlation	0.000	Significant

Level of significance = 0.01

Table 10 answered research question 3.1. It shows that mastery experience has a moderately negative correlation with the participants' performance in Calculus in terms of their grades. With a p-value of less than 0.05, the data were found to be not normally distributed, so the researchers proceeded with using a non-parametric test, Spearman's rho. With a level of significance of 0.01, it was revealed that the relationship between the two variables is significant. Therefore, the null hypothesis (H01) is rejected. As the correlation shows a negative value, it is found that as the mastery experience of students increases or decreases, an opposite effect may occur on their performance in the said subject.

In line with the study of Moores and Chang (2009), the relation between prior judgments of self-efficacy and performance was examined. A student's belief in oneself in performing well does not mean achieving a high score on a test. Over- and under-confidence have a negative relationship to later performance.

Table 11. *Pearson Correlation for finding the relationship between Vicarious Experience and Calculus Performance*

Variables	*Correlation Value*	*Interpretation*	*Significance Value*	*Interpretation*
Vicarious Experience and Calculus Performance	-0.24	Low Negative Correlation	0.008	Significant

Level of significance = 0.01

Table 11 presents the computed correlation between the variables: vicarious experience and Calculus performance, which answered research question 3.2. With a significance value of 0.008 and a level of significance of 0.01, a statistical relationship was found. In summary, the null hypothesis (H02) is rejected. However, a negative correlation was also shown. It was revealed that the higher or lower the presence of social models is, the lower the chance of the opposite effect occurring on the student's performance in Calculus.

This finding contradicts the results of a study by Lee and Ertmer, which found no statistically significant relationship between vicarious experiences and students' academic performance. On the other hand, as cited in the same paper, the study conducted by Wang (2004) showed a positive correlation between the two variables. It is still shown to be in contrast to this study's results.

In addition, compared to the study conducted by Yoon and Leem (2021), a significant positive relationship was found between the two variables shown in Table 11. Through an experimental method, it was concluded that as exposure to social groups increases, self-efficacy also increases. Also, it was shown that it positively affects a person's performance towards achieving something.

Table 12. *Spearman's rho for finding the relationship between Social Persuasion and Calculus Performance*

Variables	*Correlation Value*	*Interpretation*	*Significance Value*	*Interpretation*
Social Persuasion and Calculus Performance	-0.44	Moderate Negative Correlation	0.000	Significant

Level of significance = 0.01

The non-parametric correlation tool, Spearman's rho, was utilized, as the dependent variable did not pass the normality test. Table 12 answered research question 3.3. The table reveals the significant relationship between the variables social persuasion and Calculus performance. Therefore, the null hypothesis (H03) is rejected. It was found that an increase or decrease in social persuasion has an effect on the students' achievement in the mentioned subject. However, as the correlation result states, a negative relationship was determined. It is concluded that there is a moderately opposite effect that occurs on the Calculus performance of the students as exposure to social persuasion changes.

The result of this correlation is in contrast to the study of Dagdag (2021). Along with his results showing that social persuasion is the highest source of students' self-efficacy and the only factor to predict achievement in math, it was also disclosed to have a significant positive relationship with learners' mathematics performance. It was concluded that the voices of encouragement from other people improve students' learning progress.

However, the results of this study align with those of Miller (2020). A significant negative relationship was found between the two variables: social persuasion and academic performance. It was concluded that it may be a cause of triadic reciprocal causation where differences in each student's environmental factors and affective characteristics, stated and quoted, "alters the verbal persuasion source in a manner that it inversely affects the students' performance."

As indicated in Table 13, the physiological state and Calculus performance of the students showed a significant relationship. This answered the research question 3.4. With a significance level of 0.05 and a significance value of 0.018, the null hypothesis (H04) is

rejected. The computed Pearson Correlation value resulted in 0.21, which interprets to a low positive correlation between the variables.

Table 13. *Pearson Correlation for finding the relationship between Physiological State and Calculus Performance*

Variables	*Correlation Value*	*Interpretation*	*Significance Value*	*Interpretation*
Physiological State and Calculus Performance	0.21	Low Positive Correlation	0.018	Significant

Level of significance = 0.05

The results shown in Table 13 agree with the study conducted by Estrada et. al (2021). With 550 participants, it was found that an emotional state has a positive effect on the level of commitment, resulting in improved academic performance.

Furthermore, a meta-analysis by Alvarez et al. (2020) tested the relationship between the same variables. After a thorough data analysis, it was found that emotional states have a moderately positive relationship with academic performance.

Conclusions

The results revealed that among the one hundred twenty-seven (127) participants who qualified for the limitations of this study, they had low confidence and self-belief in performing well in Calculus based on their mastery experience. Furthermore, poor assurance in overcoming the subject was shown in relation to vicarious experience or the presence of social models. There was also a low level of confidence among the students in performing well in Calculus in terms of social or verbal persuasions. Lastly, low and poor self-belief in doing well in the course mentioned was revealed when the physiological or emotional state was taken into consideration.

The majority of the participants, specifically thirty-eight (38) students, obtained a very good grade of 1.50 in Calculus in the second semester of the academic year 2022-2023. On the other hand, no one acquired a conditional failing grade of 4.00 or a failing grade of 5.00. Moreover, the average Calculus performance of the students in the programs BS Computer Science, BS Computer Engineering, and BSE-Math was revealed to be 1.87.

The study concluded that the sources of self-efficacy: mastery experience and social persuasions, have both moderate negative correlations in Calculus performance, with values of -0.43 and -0.44, respectively. The null hypotheses (H01 and H03) were both rejected as a significant relationship was found with both values of 0.000. Additionally, a moderate negative correlation was determined between social persuasion and Calculus performance. The correlation value was -0.24, with a significance value of 0.008, supporting the rejection of the null hypothesis (H02). Unlike the negative correlations from the mentioned sources of self-efficacy, the last variable, physiological or emotional state, was revealed to have a positive correlation with academic performance in Calculus. With a p-value of 0.018, the null hypothesis (H04) was rejected. In addition, by the Pearson correlation value of 0.21, the stated dependent variable has a low positive correlation to the independent factor.

The four sources of self-efficacy showed a significant relationship with Calculus performance. However, three of them have a negative correlation with the independent variable. The mastery experience was revealed to have a moderate inverse relationship with academic performance in the stated course. As students have an increased belief that they have done well in past experiences related to Calculus topics, there is a modest decrease in their actual performance. The researchers conclude that this may be a cause of increased belief and lower-quality work. After all, learners' good past encounters in relation to the subject do not necessarily predict a good outcome. Some tend to be complacent and/or do not pull off quality performance in the current subject. In contrast, students who have not-so-good experiences with Calculus do better now. There was also a low and moderate negative correlation with vicarious experience and social persuasion towards Calculus performance, respectively. The researchers observe this phenomenon as students see others successfully complete the same task; they feel pressured to do the same and lower their self-confidence. In addition, verbal encouragement tends to be taken by most students as a form of pressure. Lastly, the only source of self-efficacy that had a positive correlation with academic performance in Calculus was the physiological and emotional state. Students' level of emotions while doing activities related to the stated subject has a direct proportional impact on the outcome. Therefore, the researchers conclude that negative emotions, such as stress, boredom, and nervousness, decrease students' performance. Otherwise, positive feelings drive better performance. Overall, this research concludes that among the four sources of self-efficacy presented by Albert Bandura, the emotional state of the students has the greatest positive impact on their academic performance in Calculus.

With the results of this study, teachers and future educators can utilize the findings to enhance learners' academic performance. Linking previous encounters related to the present topic or subject is of help not only to maintain or improve the students' belief in themselves but also to continue performing well. As one of the learners' social models, teachers can also inspire their students to do well by encouraging them to try, motivating them that they could also do the same task successfully, and pushing them to their best effort.

Students, in general, and especially those who will take Calculus, must always incorporate their past experiences related to this branch of mathematics to improve their performance in the subject. Sole self-belief in one's abilities, based solely on mastery experiences, does not always lead to positive outcomes. Instead, it must always be paired with quality work. Also, social influences and verbal persuasions should be taken positively and serve as inspiration to finish a task successfully. Lastly, good management of self-emotions is important to be able to function well and achieve one's desired goals.

This study could also be a basis for future researchers who will conduct research related to self-efficacy. The results can serve as motivation and inspiration for them to study further the connection between the variables. In line with Dagdag's (2021) recommendation, qualitative research can be employed to delve deeper and establish a more nuanced relationship between the effects of sources of self-belief and academic performance. Future researchers may also explore other factors that influence the impact of self-efficacy and its sources on academic achievement.

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