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TEACHING MODALITIES, STUDENTS' ATTITUDES AND MATHEMATICS PERFORMANCE OF FIRST YEAR STUDENTS: A PATH ANALYSIS

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Abstract

This study determined the teaching modalities, students' attitudes, and the Mathematics performance of the first year students of ISPSC-Main Campus for the school year 2022-2023 using the Path Analysis.

The respondents were the 250 selected first year students of ISPSC-Main Campus who are officially enrolled for the S.Y. 2022-2023. This study utilized the quantitative research design, specifically the descriptive-correlational research design to determine the relationship that exists between the teaching modalities, students' attitudes, and Mathematics performance of the ISPSC-Main Campus first year students. The research instrument which was used in this study was the survey questionnaire.

Finding shows that Both face-to-face and modular teaching modalities are perceived positively by students. In addition, students exhibit a low level of confidence, negative perception, lack of enjoyment, and lack of motivation in Mathematics. Furthermore, the performance suggests varying levels of achievement among students. Moreover, there is a moderately strong positive correlation between students' attitudes towards mathematics and their perception of teaching modalities. Additionally, the correlation between teaching modalities and students' mathematics performance is relatively weak. Also, There is a very weak inverse relationship between students' attitudes towards mathematics and their performance.

Keywords: *Teaching Modalities, face-to-face, modular, motivation, assessment, instruction, attitude, self-confidence, value, enjoyment, performance, Path analysis*

INTRODUCTION

Mathematics is considered a vital foundation for technological and scientific knowledge that is considered essential towards the socio-economic development of the world. In order for one nation to survive the millennial challenge, it is important that the citizens be equipped with mathematical knowledge in order to become scientific thinkers and cope with the challenge of the era where technology mandates everything. However, the Philippines lags behind other countries as far as mathematics performance of students is concerned. In 1999 and 2003, the Philippines subjected itself for evaluation by the Trends in International Mathematics and Science Study (TIMSS). This resulted in

the findings that the mathematics performance of Filipino students is significantly below the average and even placed third from the bottom of the abovementioned study.

Considering the importance of mathematics in the success of the era battle that the country is trying to get through, there is a need to design a tool that could help in the improvement of the students' performance in mathematics. To do so, educators must become active and sensitive to their students' needs in order to provide the necessary assistance and guidance. Looking into the challenges of this era could help in elevating the status of the country's profile when it comes to mathematics performance.

The global outbreak of the highly contagious coronavirus known as COVID-19 posed unprecedented challenges. The biggest impact of COVID-19 arose from the need to practice stringent social or physical distancing to prevent and/or mitigate its spread.

Higher education worldwide was affected due to the COVID-19 pandemic and thousands of school closures followed in a very limited span of time to enforce social distancing measures. Educational institutions particularly in the Philippines, were presented with surmounting challenges in their system of planning, implementation, and assessment. On a light note, however, the global pandemic opened up opportunities for the country to upgrade its educational mode of delivery and transfer its attention to emerging technologies. (Toquero, 2020).

To respond to the needs of learners, especially of the 3.5 million tertiary-level students enrolled in approximately 2,400 HEIs, certain HEIs in the country have implemented proactive policies for the continuance of education despite the closure. These policies include modified forms of online learning that aim to facilitate student learning activities. Online learning might be in terms of synchronous, real-time lectures and time-based outcomes assessments, or asynchronous, delayed-time activities, like pre-recorded video lectures and time-independent assessments (Oztok et al., 2013).

The teaching and learning environment is embracing a number of innovations and some of these involve the use of technology through online learning. This innovative pedagogical approach has been embraced rapidly though it goes through a process. The introduction of online learning initiatives is part of these innovations but its uptake, especially in the developing world faces challenges for it to be an effective innovation in teaching and learning. Online learning effectiveness has quite a number of underlying factors that pose challenges. One big challenge is about how users can successfully use the technology and ensuring participants' commitment given the individual learner characteristics and encounters with technology (Hofmann, 2014).

In Ilocos Sur Polytechnic State College, various modalities were implemented in order to respond to the needs of the students. The college had implemented modalities such as Distance Modality – Modular and Printed, Online Learning through various platforms, and had guided students through calls, chats, and texts.

On the other hand, the attitudes towards mathematics played a great role in the mathematics performance of the students. In a study conducted by Mata, et al (2012) it was found out that students can develop mathematical competence through their attitude towards mathematics since they learn to associate positive experiences.

As stressed by Vintere and Zeidmane (2014), a high mathematics performance required in order to perform successfully professional task. However, the consequences of poor mathematics performance are serious for daily functioning and for profession development. In spite of such continuing problem, many empirical studies are carried out to explore factors that affect the poor performance in mathematics. Although there are substantial research which as investigated the attitude towards mathematics (Farooq and Shah, 2008; Hemmings et al, 2011), learning style (Awang et al, 2017;Yildirim et al, 2008) and teaching strategies (Tulbure, 2012; Sariçoban and Saricaoğlu, 2008), on the mathematical performance. In general, these studies have looked at the separate effects of these components. Hence, we consider its impact on mathematics performance when attitude towards mathematics and teaching strategies taken together and how much each can predict the mathematical performance in an integrated model.

Some factors affecting the mathematics performance had been studied in the past. However, researchers of this study aimed to create a model that would best predict to enhance the mathematics performance of the students and to establish the specific cause-and-effect among the motivation, attitude towards mathematics, and teaching strategies on their mathematics performance, causal modeling specifically the path analysis will be sufficient enough to address this concern because it sole purpose is provide estimates of the magnitude and significance of hypothesized.

The relationship of the use of teaching modalities, students' attitudes, and mathematics performance of the students can be established through a Structural Equation Model (SEM). This equation will be used to predict the mathematics performance of the students through their attitude towards Mathematics and the teaching modalities as the independent variables or predictors. This model also explains the patterns of correlation between the three variables through Path Analysis, hence this study was conceived.

Given the above background of the study, the researcher was then driven to conduct this study focusing on the teaching modalities and their effects on the Mathematics performance of the first year students of the Ilocos Sur Polytechnic State College- Main Campus significant in developing a more thorough and a better critical analysis of how

teaching strategies and modalities shape the performance of these students, especially in the midst of a health crisis. The results of the study will be deemed necessary for the researcher to create Conclusions and Proposed Recommendations to address identified Learning Gaps in Mathematics in ISPSC.

Objectives

Generally, this study aimed to assess the teaching modalities during the pandemic and their effects on the Mathematics' performance of the First year students of the Ilocos Sur Polytechnic State College.

Specifically, it sought to answer the following questions.

1. What is the level of implementation of the teaching modalities along:
    a. Face-to-Face
        a.1 Motivation
        a.2 Instruction
        a.3 Assessment
    b. Modular
        b.1 Motivation
        b.2 Instruction
        b.3 Assessment
2. What is the level of the students' attitudes towards mathematics along:
    a. Self Confidence
    b. Value
    c. Enjoyment
    d. Motivation
3. What is the level of mathematics performance of the students?
4. Is there a significant relationship between the teaching modalities used by the teacher and:
    a. the level of students' attitude towards mathematics, and
    b. the students' level of mathematics performance?
5. Is there a significant relationship between the level of the students' attitude towards mathematics and their level of mathematics performance?
6. What Path Model can be made to explain the pattern of correlation between the three variables used in this study?

Hypothesis

The following are the null hypotheses tested in the study:

1. There is no significant relationship between the teaching modalities used by the teacher and the level of students' attitude towards mathematics, and the students' level of mathematics performance
2. There is no significant relationship between the level of the students' attitude towards mathematics and their level of mathematics performance

METHODS

Research Design

This research study made use of descriptive-correlational research design to determine the relationship between three variables: the teaching modalities, students' attitudes, and their Mathematics performance.

Population and Locale of the Study

This study involved First year Mathematics students at the Ilocos Sur Polytechnic State College located at Brgy. San Nicolas, Candon City, Ilocos Sur. The students are those who are enrolled in First Semester for Academic Year 2022-2023. Gpower was used to compute the minimum number of respondents f or the study which is a total of 250.

Research Instrument

Since the study was under the descriptive-correlational-quantitative research approach, the most appropriate instrument then to use is the survey questionnaire. In the context of this study, two adapted survey questionnaires will be used.

And for the assessment of the students' attitudes towards Mathematics, the survey questionnaire of Tapia (1996) as used on her study "The Attitude Towards Mathematics Instruments" will be used.

Some of the pronouns used in the content of these questionnaires were modified to suit the objectives being met by the researcher.

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Data Collection

The data were gathered, read, and analyzed following the objective of the study and in adherence to all protocols in the coduct of research.

Treatment of Data/Data Analysis

1. For the assessment of the level of implementation of the teaching modalities, Mean and Standard Deviation was used.
2. For the significant relationship between the level of implementation of the teaching modalities, the level of students' attitude towards mathematics, and the students' level of mathematics performance, Pearson Product Moment of Correlation (rxy) will be used.
3. Students attitude towards mathematics will be determined using the ATMI developed by Martha Tapia (1996).
4. Documentary Analysis was employed in determining the level of mathematics performance of the students. These level were evaluated using the grading system used by the three State Universities and Colleges of Ilocos Sur as follows:

97-100%	- 1.00	Excellent	
94-96%	- 1.25	}	
91-93%	- 1.50	Very Good	
88-90%	- 1.75	}	
85-87%	- 2.00	Good	
82-84%	- 2.25	}	
79-81%	- 2.50	Fair	
76-78%	- 2.75	}	
75%	- 3.00	Passing	
72-74%	- 4.00	Conditional	71% & below - 5.00 Failure
Inc.	- Incomplete		
D	- Dropped		

Ethical Considarations

The researcher ensured that all research protocols involving ethics in research were complied with for the protection of all people and institutions involved in the conduct of the study.

RESULTS and DISCUSSION

PROBLEM 1. What is the level of implementation of the teaching modalities?

Table 1. The level of implementation of the teaching modalities.

Level of implementation of the teaching modalities	**Face-to-Face**				**Modular**			
	Mean	DR	Sd	EL	Mean	DR	sd	EL

1. Motivation	4.54	SA	0.48	VHEM	4.43	SA	0.60	VHEM
2. Instruction	4.51	SA	0.49	VHII	4.34	SA	0.64	VHII
3. Assessment	4.50	SA	0.52	VHIA	4.35	SA	0.62	VHIA
Overall Mean	**4.52**	**SA**			**4.37**	**SA**		

Table shows the level of implementation of the teaching modalities with an overall mean of 4.52 with a descriptive rating of strongly agree under face-to-face modality and for modular modality with a computed mean of 4.37 with a descriptive rating of strongly agree.

The data under motivation, instruction, and assessment reveals consistently high ratings across the face-to-face modality. With a mean rating of 4.54 for motivation, 4.51 for instruction, and 4.50 for assessment, all with a descriptive rating of strongly agree, it indicates that students perceive these modalities as highly effective in motivating them to learn, providing clear and engaging instruction, and evaluating their understanding. The minor standard deviations of 0.48 for motivation, 0.49 for instruction, and 0.52 for assessment, suggest a minimal variability in student responses, indicating a high level of agreement among them.

On Modular teaching modality indicates that students perceive it positively across all learning styles. With mean ratings of 4.43 for motivation, 4.34 for instruction, and 4.35 for assessment, all with descriptive rating of strongly agree, it suggests that students find this teaching approach effective in motivating them to learn, delivering clear instruction, and assessing their understanding. Although slightly lower than the Face-to-Face modality, the ratings still indicate a high level of agreement among students regarding the effectiveness of Modular teaching. The standard deviations of 0.60 for motivation, 0.64 for instruction, and 0.62 for assessment, indicate some variability in student responses but remain within a moderate range

Results further reveals a success of these modalities in engaging learners and facilitating their understanding. The overall mean ratings, further solidify the effectiveness of these teaching strategies. These results imply that regardless of whether instruction is conducted face-to-face or through modular methods, students are equally motivated, instructed, and assessed, indicating a versatile and robust educational approach that accommodates different learning styles and preferences. This suggests that educators can confidently utilize either modality based on specific needs and circumstances without compromising the quality of education provided.

PROBLEM 2. What is the level of the students' attitudes towards mathematics?

Table 2a. The level of the students' attitudes towards mathematics along self confidence

Self Confidence	Mean	DR	sd	EL
1. Mathematics is one of my most fun subjects.	3.92	D	1.03	LN
2. I am able to think clearly when working with mathematics.	3.88	D	0.99	LN
3. Studying mathematics makes me feel excited.	3.86	D	1.04	LN
4. Mathematics makes me feel comfortable.	3.82	D	0.99	LN
5. I am not under a terrible strain in a math class.	3.93	D	0.85	LN
6. When I hear the word mathematics, I have a feeling of excitement.	3.74	D	1.03	LN
7. It makes me excited to think about having to do a mathematics problem.	3.78	D	1.05	LN
8. Mathematics does not scare me at all.	3.53	D	1.09	LN
9. I have a lot of self-confidence when it comes to mathematics.	3.56	D	1.09	LN
10. I am able to solve mathematics problems without too much difficulty.	3.55	D	1.06	LN
11. I expect to do fairly well in any math class I take.	3.89	D	0.93	LN
12. I am not confused in my mathematics class.	3.66	D	1.04	LN
13. I feel a sense of security when attempting mathematics.	3.71	D	0.99	LN
14. I learn mathematics easily.	3.54	D	1.06	LN
15. I am confident that I could learn advanced mathematics.	3.69	D	1.03	LN
16. I am comfortable expressing my own ideas on how to look for solutions to a difficult problem in math.	3.84	D	0.90	LN
17. I am comfortable answering questions in math class.	3.78	D	0.95	LN
18. I believe I am good at solving math problems.	3.82	D	0.99	LN
OVERALL MEAN	**3.69**	**D**		LN

Legend: Scale	Description	Equivalent Level
4.21-5.0	Strongly Disagree	Strong negative
3.41 – 4.20	Disagree	low negative
2.61 – 3.40	Neutral/No Opinion	Neutral
1.81 – 2.60	Agree	low positive
1.0 – 1.80	Strongly Agree	Strong positive

Table shows the level of the students' attitudes towards mathematics along self-confidence got an overall computed mean of 3.69 with a descriptive level of disagree interpreted as low negative. I am not under a terrible strain in a math class got the highest computed mean of 3.93 with a descriptive level of disagree interpreted as low negative while, mathematics does not scare me at all got the lowest computed mean of 3.53 with a descriptive level of disagree interpreted as low negative.

It further implies that while students may not feel severely stressed in mathematics classes, there is a pervasive lack of confidence and a considerable amount of anxiety towards the subject, which can negatively affect their engagement and performance in mathematics.

The result of the finding affirmed by Smith, 2022 that while students might not feel extremely stressed in the classroom environment, a significant lack of confidence and underlying fear of mathematics persist, which can be detrimental to their overall academic performance and attitude towards the subject.

Table 2b. The level of the students' attitudes towards mathematics along value.

B. Value	Mean	DR	Sd	EL
1. Mathematics is a very worthwhile and necessary subject.	4.41	SD	0.68	SN
2. I want to develop my mathematical skills.	4.61	SD	0.63	SN
3. Mathematics helps develop the mind and teaches a person to think.	4.49	SD	0.71	SN
4. Mathematics is important in everyday life.	4.55	SD	0.72	SN
5. Mathematics is one of the most important subjects for people to study.	4.49	SD	0.71	SN
6. High school math courses would be very helpful no matter what I decide to study.	4.44	SD	0.72	SN
7. I can think of many ways that I use math outside of school.	4.31	SD	0.76	SN
8. Mathematics is a very interesting subject.	4.08	D	0.93	LN
9. I think studying advanced mathematics is useful.	4.24	SD	0.83	SN
10. I believe studying math helps me with problem solving in other areas.	4.27	SD	0.84	SN
11. A strong math background could help me in my professional life.	4.24	SD	0.87	SN
OVERALL MEAN	4.33	SD		SN

Legend: Scale	Description	Equivalent Level
4.21-5.0	Strongly Disagree	Strong negative
3.41 – 4.20	Disagree	low negative
2.61 – 3.40	Neutral/No Opinion	Neutral
1.81 – 2.60	Agree	low positive
1.0 – 1.80	Strongly Agree	Strong positive

Table shows that level of the students' attitudes towards mathematics along value got an overall computed mean of 4.33 with a descriptive level of strongly disagree interpreted as strongly negative. I want to develop my mathematical skills got the highest computed mean of 4.61 with a descriptive level of strongly disagree interpreted as strongly negative while, mathematics is a very interesting subject got the lowest computed mean of 4.08 with a descriptive level of disagree interpreted as low negative.

The result further implies that a critical challenge: the strong negativity towards valuing mathematics can hinder students' motivation to engage with and learn the subject, potentially impacting their overall academic growth and future opportunities in fields requiring mathematical competence.

As Brown (2022) highlights, addressing these negative perceptions early on is crucial for educators. Interventions could include making math more relevant to students' lives, incorporating engaging teaching methods,

and providing support to build confidence in their mathematical abilities. By shifting students' attitudes towards a more positive outlook, we can help foster a generation that is not only proficient in mathematics but also sees its value and application in real-world contexts.

Table 2c. The level of the students' attitudes towards mathematics along enjoyment.

C. Enjoyment	Mean	DR	Sd	EL
1. I get a great deal of satisfaction out of solving mathematics problem.	4.24	SD	0.85	SN
2. I have usually enjoyed studying mathematics in school.	3.88	D	1.01	LN
3. Mathematics is not dull and boring.	4.02	D	0.99	LN
4. I like to solve new problems in mathematics.	3.91	D	0.93	LN
5. I would prefer to do an assignment in math than to write an essay.	3.76	D	1.21	LN
6. I really like mathematics.	3.76	D	1.09	LN
7. I am happier in a math class than in any other class.	3.57	D	1.12	LN
8. The challenge of math appeals to me.	3.94	D	0.93	LN
OVERALL MEAN	3.80	D		LN

Legend: Scale	Description	Equivalent Level
4.21-5.0	Strongly Disagree	Strong negative
3.41 – 4.20	Disagree	low negative
2.61 – 3.40	Neutral/No Opinion	Neutral
1.81 – 2.60	Agree	low positive
1.0 – 1.80	Strongly Agree	Strong positive

Table shows that level of the students' attitudes towards mathematics along enjoyment got an overall computed mean of 3.80 with a descriptive level of disagree interpreted as low negative. I get a great deal of satisfaction out of solving mathematics problem got the highest computed mean of 4.24 with a descriptive level of strongly disagree interpreted as strongly negative while, I am happier in a math class than in any other class got the lowest computed mean of 3.57 with a descriptive level of disagree interpreted as low negative.

It further implies that a substantial challenge: the low enjoyment and satisfaction derived from mathematics can decrease students' intrinsic motivation and engagement, which are crucial for effective learning and long-term interest in the subject. Addressing this issue is essential to improve students' mathematical experiences and outcomes.

In the study conducted by Middleton & Jansen, (2011). Research indicates that enhancing the affective dimensions of mathematics learning, such as by incorporating more engaging and relevant content, can significantly boost students' motivation and achievement. For instance, creating a more supportive classroom environment that fosters a positive emotional connection to mathematics can lead to improved attitudes and greater persistence in

learning. Thus, educational strategies that focus on increasing enjoyment and satisfaction in mathematics are vital for fostering sustained engagement and higher achievement in the subject.

Table 2d. The level of the students' attitudes towards mathematics along motivation.

D. Motivation	Mean	DR	sd	EL
1. I would like to have mathematics in college.	3.86	D	1.04	LN
2. I am willing to take more than the required amount of mathematics.	3.73	D	1.03	LN
3. I plan to take as much mathematics as I can during my education.	3.67	D	1.06	LN
OVERALL MEAN	3.64	D		LN

Legend: Scale	Description	Equivalent Level
4.21-5.0	Strongly Disagree	Strong negative
3.41 – 4.20	Disagree	low negative
2.61 – 3.40	Neutral/No Opinion	Neutral
1.81 – 2.60	Agree	low positive
1.0 – 1.80	Strongly Agree	Strong positive

Table shows that level of the students' attitudes towards mathematics along motivation got a computed overall mean of 3.64 with a descriptive rating of disagree interpreted as low negative. I would like to have mathematics in college. I am willing to take more than the required amount of mathematics got the highest computed mean of 3.86 with a descriptive rating of disagree interpreted as low negative while, I plan to take as much mathematics as I can during my education got the lowest computed mean of 3.67 with a descriptive rating of disagree interpreted as low negative.

It further implies that a significant challenge in fostering enthusiasm and commitment to mathematics, which could have long-term implications for students' academic choices and career paths, necessitating targeted interventions to enhance their engagement and motivation in the subject.

The result supports in the study conducted by Lazarides & Rubach, (2017) highlights the need for targeted interventions to enhance student engagement and motivation in mathematics. Research supports the importance of addressing these affective dimensions; for example, creating a more supportive and engaging classroom environment can significantly improve students' attitudes and persistence in mathematics.

Table 2e. Summary table of the level of the students' attitudes towards mathematics.

	Mean	DR	ER
A. Self Confidence	3.69	D	LN
B. Value	4.33	SD	SN

C. Enjoyment	3.80	D	LN
D. Motivation	3.64	D	LN
OVERALL MEAN	3.87	D	LN

Table shows that the level of students' attitudes towards mathematics reveals a mean rating of 3.90, categorized as agree. It further discussed that students generally hold a positive attitude towards mathematics. The standard deviation of 0.72 indicates some variability in students' attitudes, suggesting that while many students may have a favorable view of mathematics, there are also some who may have a more neutral or slightly negative attitude.

Furthermore, the findings show a moderately positive outlook among students towards mathematics, highlighting the importance of further efforts to foster a more positive attitude and engagement with the subject.

Result affirms in the study conducted by Lazarides & Rubach, (2017), that enhancing the learning environment and making mathematics more engaging and relevant can further improve students' attitudes and motivation. Such interventions are crucial for maximizing students' long-term interest and success in mathematics.

PROBLEM 3. What is the level of mathematics performance of the students?

Table 3. The level of mathematics performance of the students.

	Grade in Mathematics		**Level of Performance**
	Frequency	%	
1.00	7	2.8	Excellent
1.25	33	13.2	
1.50	55	22.0	Very Good
1.75	35	14.0	
2.00	40	16.0	Good
2.25	42	16.8	
2.50	22	8.8	Fair
2.75	9	3.6	
3.00	7	2.8	Passing
TOTAL	**250**	**100.0**	

The table above shows the level of mathematics performance of the respondents based on their grade in Mathematics in the Modern World subject as well as their corresponding percentages. The data indicates a varied distribution across the performance of the first-year students of ISPSC Main Campus. Among the respondents, the

majority were got a grade of 1.50 in Mathematics, comprising 22% of the sample with a frequency of 55. This suggests that a majority of students are very good in Mathematics. Meanwhile 2.8% of the students or a frequency of 7 got a grade of 1.0 in their Mathematics subject. This suggests that a portion of the students made an excellent job in Mathematics. Also, 2.8% of the students or a frequency of 7 got a grade of 3.0 in their Mathematics subject. This, also, suggests that a portion of the students got a passing grade in Mathematics.

PROBLEM 4 Is there a significant relationship between the teaching modalities used by the teacher and (a)the level of students' attitude towards mathematics, and (b)the students' level of mathematics performance?

Table 4a. Significant relationship between the teaching modalities used by the teacher and the level of students' attitude towards mathematics.

	Students' attitude towards mathematics			
	A. Self Confidence	B. Value	C. Enjoy-ment	D. Motivation
Face-to-Face				
A. Motivation	.260**	.524**	.258**	.207**
B. Instruction	.278**	.570**	.274**	.247**
C. Assessment	.307**	.577**	.287**	.247**
Modular				
A. Motivation	.299**	.452**	.289**	.269**
B. Instruction	.309**	.476**	.291**	.260**
C. Assessment	.313**	.527**	.299**	.254**

Legend:

**. Correlation is significant at the 0.01 level (2-tailed).

Table shows the correlation coefficients indicating a significant relationship between students' attitude towards mathematics and the teaching modalities of Face-to-Face and Modular, both with correlation coefficients of .437**, significant at the 0.01 level (2-tailed). It suggests that there is a moderately strong positive correlation between students' attitudes towards mathematics and their experiences with both Face-to-Face and Modular teaching methods. In other words, students who have a more positive attitude towards mathematics tend to also perceive both teaching modalities, whether Face-to-Face or Modular, more favorably.

This finding highlights the importance of considering students' attitudes towards mathematics when implementing teaching strategies, as positive attitudes can potentially enhance the effectiveness of instructional approaches and contribute to overall student engagement and success in learning mathematics.

Table 4b. Significant relationship between the teaching modalities used by the teacher and the students' level of mathematics performance.

	Students' level of mathematics performance
Face-to-Face	
A. Motivation	.002
B. Instruction	-.030
C. Assessment	.043
Modular	
A. Motivation	.087
B. Instruction	.025
C. Assessment	.065

Legend:

**. Correlation is significant at the 0.01 level (2-tailed).

Result shows the correlation coefficients between students' level of mathematics performance and the teaching modalities of Face-to-Face and Modular indicates relatively low correlations. The correlation coefficient for Face-to-Face is .064, and for Modular, it is .104. Although both correlations are positive, they are relatively weak. It further suggests that there is a slight tendency for students' mathematics performance to be positively associated with both Face-to-Face and Modular teaching modalities, but the relationship is not very strong. Other factors beyond the teaching modality, such as individual student characteristics, teaching quality, and external influences, likely play significant roles in determining students' mathematics performance. Therefore, while teaching modalities may have some influence, they are not the sole determinants of students' performance in mathematics.

PROBLEM 5. Is there a significant relationship between the level of the students' attitude towards mathematics and their level of mathematics performance?

Table 5. Significant relationship between the level of the students' attitude towards mathematics and their level of mathematics performance

Students' attitude towards mathematics	**Students' level of mathematics performance**
A. Self Confidence	-.013
B. Value	-.082

C. Enjoyment	-.050
D. Motivation	-.020

Legend:

**. Correlation is significant at the 0.01 level (2-tailed).

Result shows the correlation coefficient between students' level of mathematics performance and their attitude towards mathematics reveals a inverse correlation of -.041. This indicates a very weak inverse relationship between students' mathematics performance and their attitude towards the subject. In other words, there is a slight tendency for students with more positive attitudes towards mathematics to have slightly lower levels of performance, and vice versa. However, the correlation is close to zero, suggesting that there is little to no practical relationship between students' attitudes towards mathematics and their actual performance in the subject. Other factors, such as teaching methods, individual aptitude, and external influences, likely have a greater impact on students' mathematics performance than their attitudes towards the subject.

PROBLEM 6. What Path Model can be made to explain the pattern of correlation between the three variables used in this study?

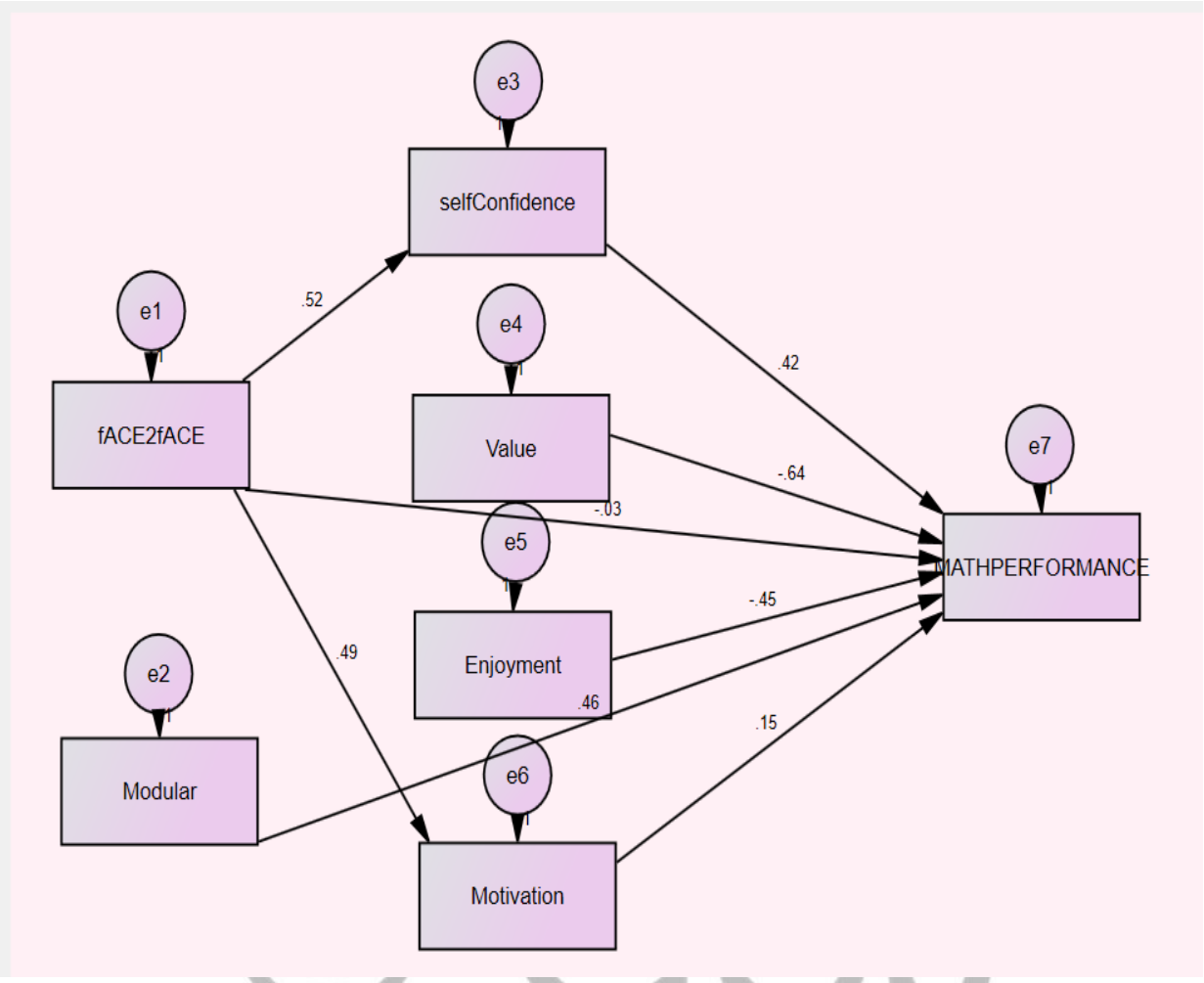

Figure 1.

Path Analysis Between the Direct and Indirect Relationship Between the Teaching Modalities Used by Teacher, Students' Attitudes Towards Mathematics and Their Mathematics Performance

Figure 1 shows the direct and indirect effect of the teaching modalities and Student's attitudes towards Mathematics to their level of Mathematics Performance. The figure shows that the teaching modality has a significant effect to the attitudes of the students towards mathematics but is not significantly correlated to their mathematics performance. This is shown on the following data taken from the AMOS result for the analysis of the given Path Model.

			Estimate	S.E.	C.R.	P	Label
selfConfidence	<---	TeachingModality	.571	.102	5.588	***	par_1
Value	<---	TeachingModality	.649	.057	11.333	***	par_2
Enjoyment	<---	TeachingModality	.543	.102	5.332	***	par_3
Motivation	<---	TeachingModality	.541	.117	4.613	***	par_4
MATHPERFORMANCE	<---	TeachingModality	.522	.329	1.589	.112	par_5
MATHPERFORMANCE	<---	selfConfidence	.424	.150	2.824	.005	par_6
MATHPERFORMANCE	<---	Value	-.707	.268	-2.638	.008	par_7
MATHPERFORMANCE	<---	Enjoyment	-.431	.151	-2.859	.004	par_8
MATHPERFORMANCE	<---	Motivation	.158	.131	1.205	.228	par_9

Figure 1 also shows that the Face-to-Face teaching modality has a positive direct effect to the mathematics performance and a positive indirect effect when the Attitude of students is more on Self-confidence and Motivation as shown in the figure. However, Figure 1 is not a good model because the Chi-square value = 945.689 is too high with a degrees of freedom =6 and an RMSEA value of 0.791.

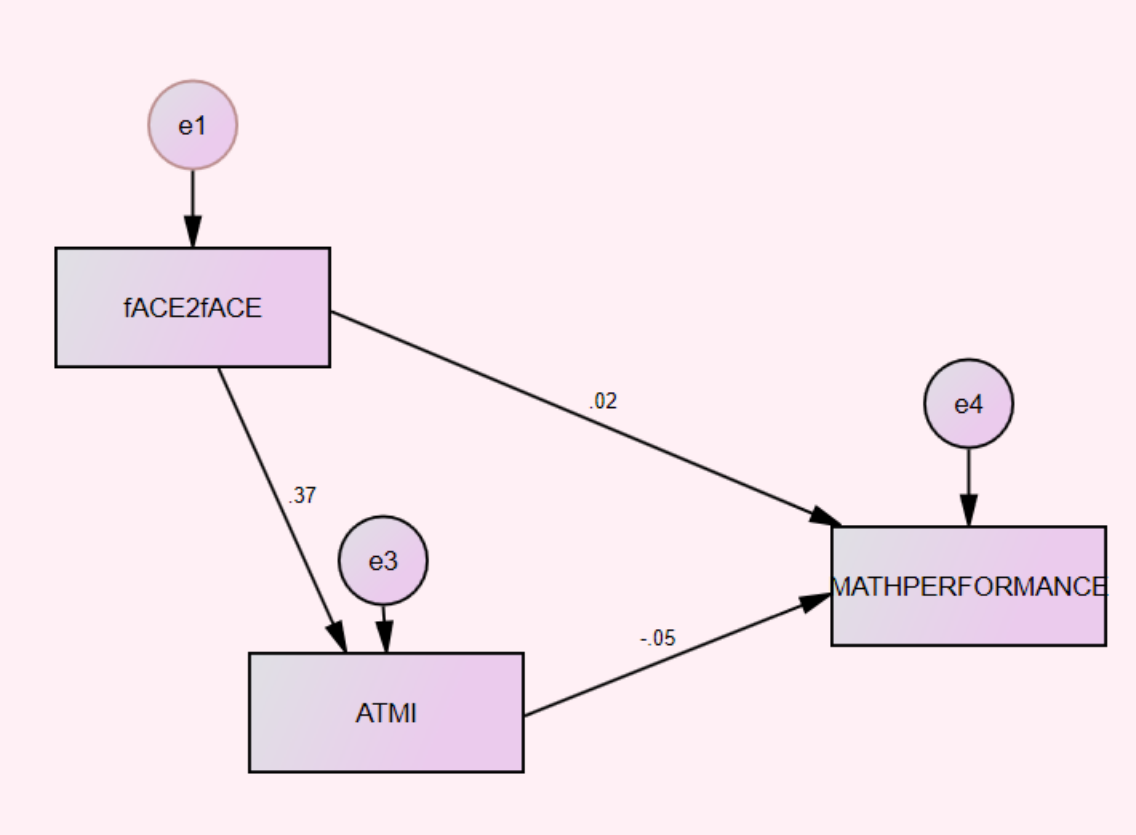

Figure 2.

Path Model showing the Direct and Indirect Effects of Face-to-Face Teaching Modality and Student Attitudes Towards Mathematics to the Mathematics Performance of the Students

Figure 2 presents the present the direct and indirect effect of Face-to-Face Teaching Modality to the Mathematics performance of the students. Result of the Path Analysis as shown in the regression estimates below shows that the Face-to-Face teaching modality is significantly correlated to the students' attitudes towards mathematics. The indirect effect of this teaching modality mediated by the students' attitudes toward mathematics produced a negative effect. This further implies that the model suggests that the face-to face teaching modality results to either positive or negative attitude towards mathematics of the students which will also affect their performance in mathematics.

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
ATMI	<---	fACE2fACE	.556	.088	6.300	***	par_2
MATHPERFORMANCE	<---	ATMI	-.133	.183	-.727	.467	par_1
MATHPERFORMANCE	<---	fACE2fACE	.097	.274	.354	.723	par_3

Also, Figure 2 is not a good-fit model because both the Chi-square value and degrees of freedom are both equal to 0.00 or are not available . The value of RMSEA = 0.145 however suggests that Figure 4 can be considered an Independence Model for the three given variables.

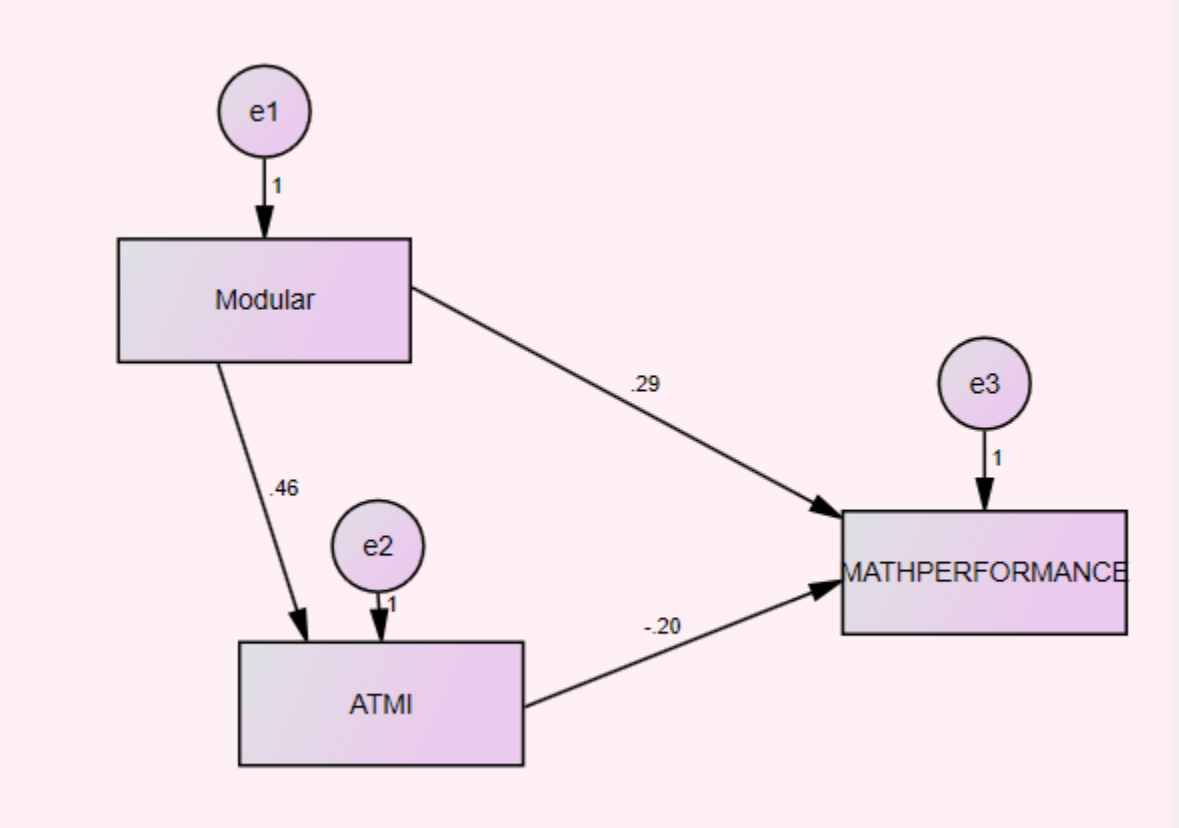

Figure 3

Path Model showing the Direct and Indirect Effects of Modular Teaching Modality and Student Attitudes Towards Mathematics to the Mathematics Performance of the Students

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
ATMI	<---	Modular	.459	.071	6.425	***	par_2
MATHPERFORMANCE	<---	ATMI	-.200	.183	-1.094	.274	par_1
MATHPERFORMANCE	<---	Modular	.294	.223	1.321	.186	par_3

Figure 3 shows that when the teaching modality is modular, the level of the students' attitude towards mathematics is directly affected. This is further supported by the Regression Weights result that is presented above. This further implies that the quality of module given or distributed to the students may create either a positive or negative attitude towards mathematics and this will eventually have an indirect effect to their mathematics performance. The following values present the result of the analysis that will support this claim.

Total Effects (Group number 1 - Default model)

	Modular	ATMI
ATMI	.459	.000
MATHPERFORMANCE	.202	-.200

Standardized Total Effects (Group number 1 - Default model)

	Modular	ATMI
ATMI	.377	.000
MATHPERFORMANCE	.062	-.075

Direct Effects (Group number 1 - Default model)

	Modular	ATMI
ATMI	.459	.000
MATHPERFORMANCE	.294	-.200

Standardized Direct Effects (Group number 1 - Default model)

	Modular	ATMI
ATMI	.377	.000
MATHPERFORMANCE	.090	-.075

Indirect Effects (Group number 1 - Default model)

	Modular	ATMI
ATMI	.000	.000
MATHPERFORMANCE	-.092	.000

Standardized Indirect Effects (Group number 1 - Default model)

	Modular	ATMI
ATMI	.000	.000
MATHPERFORMANCE	-.028	.000

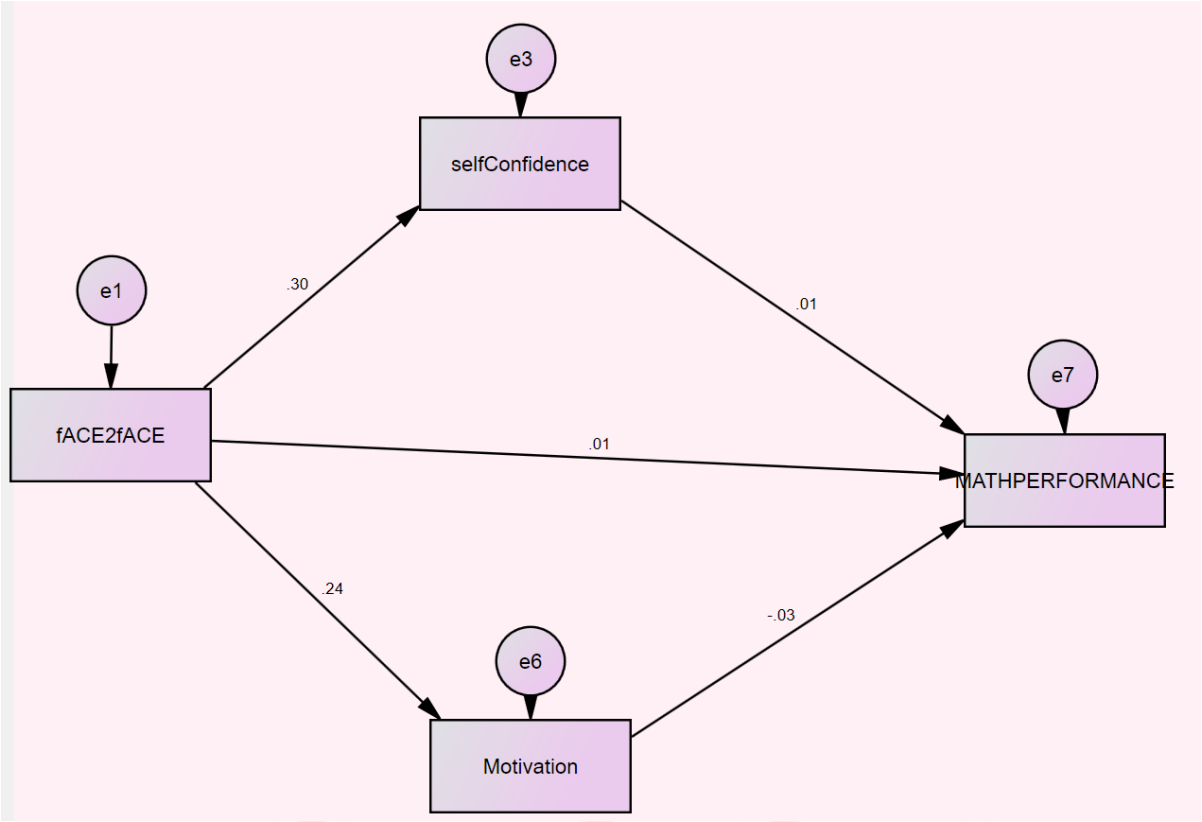

Figure 4

Path Model on the Effect of Face-to-Face Teaching Modality to the Mathematics Performance of Students with Self-Confidence and Motivation as Mediating Factor

It can be seen from Figure 4 that the face-to face teaching modality has a positive direct effect to the mathematics performance of students. When this teaching modality is mediated by the attitude of the students towards mathematics, an indirect effect is also observed. The path shows that we can have a model if we let the face-to-face teaching modality will helped develop the "Motivation" attitude of the students towards mathematics. This implies that when the students were motivated in dealing with mathematics, they will perform better in their math activities. The more positive attitude they will develop, the higher will be their mathematics performance.

This result corroborate with the findings of Subia, et.al (2018) in their study "Attitude and Performance in Mathematics I of Bachelor of Elementary Education Students: A Correlational Analysis" stating that Their attitudes are significantly correlated with their performance in Mathematics I. The higher their positive attitude, the higher their performance ($r=.792^{**}$, $p< 0.01$).

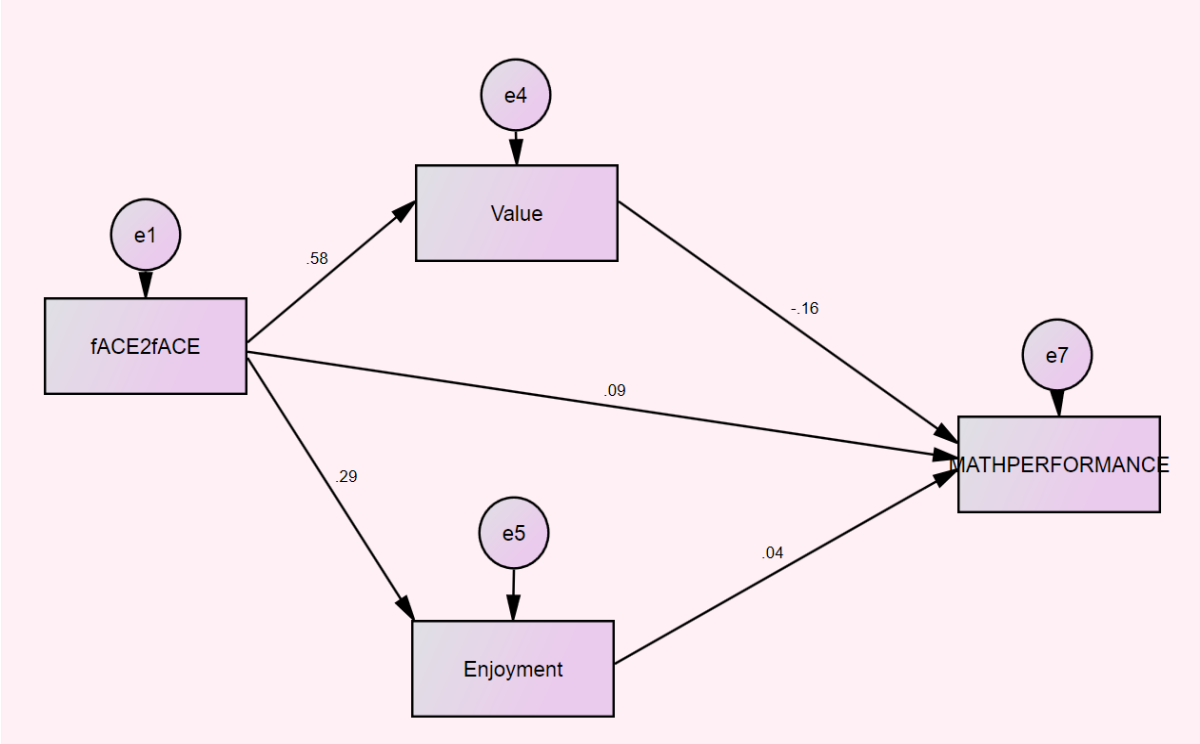

Figure 5

Interrelationship Between the effect of Face to Face Modality to the Value and Enjoyment of Students and Their Mathematics Performance

Figure 5 presents the model focusing only on the Face-to-face teaching modality and the two factors of ATMI namely Value and Enjoyment. The figures show the result of the analysis made on the three variables.

Scalar Estimates (Group number 1 - Default model)

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
Value	<---	fACE2fACE	.673	.059	11.308	***	par_3
Enjoyment	<---	fACE2fACE	.503	.107	4.707	***	par_4
MATHPERFORMANCE	<---	Value	-.570	.270	-2.114	.035	par_1
MATHPERFORMANCE	<---	Enjoyment	.095	.150	.630	.529	par_2
MATHPERFORMANCE	<---	fACE2fACE	.359	.321	1.121	.262	par_5

It can be seen from the result that the use of Face-to-Face teaching modality is significantly related to their Value and Enjoyment attitudes toward mathematics. Results showed that the manner of teaching in the face-to-face

modality will influence the students to consider studying mathematics as an important component of their educational journey. The more they consider Math as an important subject to study, the higher will be their level of performance.

Also, the teaching modality also influence the students to develop enjoyment when learning mathematics that will eventually influence or affect their level of mathematics performance.

According to Laney Kennedy (2019) in his blog, the relationship between attitude towards math and learning outcomes is bidirectional. A positive attitude towards math can lead to higher achievement, and high achievement can result in more favorable attitudes. Also, students' attitude towards math can affect their overall achievement. Value, self-confidence, enjoyment, motivation and anxiety surrounding math are all reflected in a student's attitude. Getting involved as early as possible is the best way to prevent long-lasting negative attitudes towards math, hence the teaching modality plays a great role in teaching the students develop positive attitude towards mathematics.

Conclusions and Recommendations

Based on the findings the following conclusions were drawn:

On Effectiveness of Teaching Modalities: Both face-to-face and modular teaching modalities are perceived positively by students, which indicates that students find both methods effective in terms of motivation, instruction, and assessment. The consistency in high ratings across motivation, instruction, and assessment underlines the success of these teaching strategies in engaging learners and facilitating understanding. The minimal variability in responses for face-to-face and moderate variability for modular methods reflect a general consensus among students regarding their effectiveness.

Students' Attitudes Towards Mathematics: Students exhibit a low level of confidence in mathematics which indicates a pervasive lack of confidence and anxiety, which can hinder their engagement and performance in the subject. The value students place on mathematics is strongly negative, thus, negative perception can impact their motivation to learn and engage with the subject, potentially affecting their overall academic growth and future opportunities in fields requiring mathematical competence. Enjoyment of mathematics is also low, which suggests that students derive minimal satisfaction from the subject. This lack of enjoyment can further diminish their intrinsic motivation and engagement. This could have long-term implications for their academic and career choices.

Mathematics Performance: The performance data suggests varying levels of achievement among students, though the study's details on specific performance metrics are limited.

Relationship Between Teaching Modalities and Student Attitudes: There is a moderately strong positive correlation between students' attitudes towards mathematics and their perception of teaching modalities. This

suggests that students with a more positive attitude towards mathematics also tend to view both teaching modalities favorably.

Relationship Between Teaching Modalities and Mathematics Performance: The correlation between teaching modalities and students' mathematics performance is relatively weak. This implies that while teaching modalities have some influence, they are not the primary determinants of students' mathematics performance. Other factors, such as individual student characteristics, teaching quality, and external influences, play more significant roles.

Relationship Between Attitudes Towards Mathematics and Performance: There is a very weak inverse relationship between students' attitudes towards mathematics and their performance. This suggests that students' attitudes towards the subject have little to no practical impact on their actual performance, indicating that other factors are more critical in determining their success in mathematics.

Diversified teaching approaches in both face-to-face and modular teaching methods are effective, allowing educators to choose the best approach based on situational needs without compromising quality.

Addressing attitudinal challenges pervasive negative attitudes towards mathematics suggest a need for targeted interventions to build confidence, increase perceived value, and enhance enjoyment and motivation. Strategies could include making math more relevant to students' lives, incorporating engaging teaching methods, and providing robust support systems.

In addition, the holistic performance enhancement gives the weak correlation between attitudes and performance, a multifaceted approach that considers various influences on students' mathematical achievement is essential. This includes improving teaching quality, addressing individual student needs, and mitigating external factors.

Generally, by addressing these areas, educators can better support students in overcoming attitudinal barriers and achieving higher levels of engagement and success in mathematics.

RECOMMEDATIONS

Based on the findings regarding the effectiveness of teaching modalities and students' attitudes towards mathematics, the following recommendations are made:

1. Consistency in high-quality delivery of instruction to ensure that both face-to-face and modular teaching modalities deliver high-quality instruction, motivation, and assessment. Regular training and professional development for teachers can help maintain and improve these standards.
2. Implement regular feedback mechanisms where students can provide insights on both modalities and develop and implement hybrid models that combine the strengths of both face-to-face and modular teaching
3. Leverage technology to enhance both modalities. For example, using online platforms for modular teaching to provide interactive and engaging content, and integrating digital tools in face-to-face classes to enrich the learning experience.
4. Develop targeted support programs, such as tutoring, mentoring, and workshops, specifically aimed at building students' confidence in mathematics. Focus on demystifying complex concepts and providing positive reinforcement.
5. Incorporate growth mindset principles into the curriculum, helping students understand that their mathematical abilities can improve with effort and practice.
6. Highlight the real-world applications of mathematics in various fields and everyday life to help students see its relevance and importance. This can be done through project-based learning, guest speakers from industry, and practical examples.
7. Build partnerships with community organizations and local businesses to provide additional resources, support, and real-world learning opportunities for students.

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