

DEVELOPMENT OF MATHEMATICS ATTITUDE SCALE IN THE NEW LEARNING SYSTEM: AN EXPLORATORY SEQUENTIAL DESIGN

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ABSTRACT

This study examined the mathematics attitude scale in the new learning system using exploratory mixed method design. The exploratory sequential mixed method design is characterized by an initial qualitative phase of data collection and analysis, followed by a phase of quantitative phase of data collection analysis, with a final phase of integration or linking of data from two separate strands of data. More specifically, it aimed to construct, develop and evaluate the mathematics attitude scale in the new learning system scale. In the qualitative phase, there were seven students who participated in the in-depth interview and ten students participated in the focus group discussion. There were three themes that emerged from the interview that put emphasis on confident, appreciative, and assuring. A 30-item new approaches of teaching scale was also constructed based from the results of the interview, which was subjected to the quantitative phase. In the quantitative phase, 200 questionnaire responses were analyze for exploratory factor analysis (EFA). Results showed three underlying mathematics attitude scale in the new learning system A total of three themes on the mathematics attitude scale in the new learning system questionnaire was developed which are confident with a total of twenty items, appreciative with a total of five items, and assuring with a total of four items and the overall the scale has a total of 29-item questionnaire. This study recommended that teachers should make the subject matter relevant and relatable to the students' lives and encourage a growth mindset by praising effort and persistence, rather than just achievement or talent. Additionally, providing opportunities for hands-on learning, collaboration, and problem-solving can also make the subject more engaging and foster a positive learning environment.

Keywords: *Mathematics, Learning Attitude, Exploratory Sequential Design, Factor Analysis, Municipality of President Roxas, Philippines*

INTRODUCTION

Attitude can be considered as an essential component for learning mathematics. Regarded as a difficult subject, the other thing that makes math more challenging to learn today, is the fact that learning happens at home and independently (Fabito, Trillanes, & Sarmiento, 2021). Many studies reported several attitude problems in learning math. One is by Ní Fhloinn and Fitzmaurice (2021) who revealed that out of

2700 respondents, 43% reported that they develop less hope in learning math because they do not understand the materials being provided in learning the subject. Other studies also showed that 78% of students develop a tendency to withdraw from studying math because students' struggles to learn it without someone to immediately facilitate them whenever they have concerns about the topic (Kalogeropoulos et al., 2020). With that, it is relevant to assess students' challenges in learning math under modular learning.

Ngussa and Mbuti (2018) claimed that attitude is one of the factors that contributes to higher or lower performance in mathematics. According to Syieda (2021), it has been suggested that attitudes have the potential to evolve and transform over time. Furthermore, once a favorable attitude is cultivated, it can positively enhance the learning experience for students. In support, Joseph (2018) found that increasing student's positive attitude towards learning math by incorporating humor in class, concluded that there is an enhanced on students' performance in mathematics. Hence, attitude holds significant importance and should not be disregarded as it plays a crucial role.

While technological, personal, institutional, and community are identified as barriers in home learning in this time of the COVID-19 pandemic, but the relationship of these constraints to the attitude in learning mathematics in a modular or home learning is still unknown. Hence, this study set apart from other studies because it is imperative to understand the challenges of students in learning mathematics in a home learning environment. Aside from that this study will used an exploratory research design in which this study will focus on looking at the context of the problems using both qualitative and quantitative aspect of the problems. Making this study more substantial and relevant.

The outcomes of this research will have positive implications for teachers, students, and schools. Educators can incorporate the suggested approach based on the research findings to enhance their mathematical teaching methods for remote learning. Schools can adopt the study's results to establish effective strategies that target students' self-perception of mathematics during home-based learning. As a result, students' self-concept in mathematics during remote learning can improve, leading to enhanced mathematical learning outcomes. Additionally, this can potentially reduce students' drop-out rates from mathematics home learning courses.

FRAMEWORK

This study believes in order for the students to successfully overcome any academic challenges, one should develop a high level of self-belief that he can accomplish certain things despite of difficulties. This belief will drive them to successfully overcome the challenges towards learning.

In a pragmatic stance, this research regards self-concept as a significant psychological and educational element within academic environments. Specifically, academic self-concept refers to students' beliefs regarding their competence in a specific academic domain, such as mathematics. These beliefs play a crucial role in shaping students' attitudes towards their learning process.

With that, this study on the challenges in learning mathematics is grounded on Academic self-concept (ASC) Theory by Reynolds (1988). Academic self-concept is the perception that a student has about his/her own academic abilities, constitutes one of the most relevant variables in the academic world, because of its influence on learning and cognitive functioning. It directly affects learning processes, academic achievement, and expectations of students (Henson & Heller, 2020).

According to Wigfield and Karpachian (2021), academic self-concept pertains to how individuals perceive themselves in terms of academic achievement. Valentine et al. (2019) posit that academic self-concept involves students' self-perceived abilities developed through academic endeavors and interactions.

With that, many researches demonstrated that academic-self-concept can serve as a predictor of academic performance and academic achievement (Choi, 2020; Marsh & Yeung, 2018). As such, it helps to create various cognitive and self-regulative strategies, which reflect on academic performance in mathematics learning (Zimmerman, 2000).

With that, this study believes that academic self-concept can be an essential tool to help students create and develop the attitude needed to overcome the challenges in learning mathematics. It can also explain the reasons why students failed or succeed in learning math.

METHODS

Research Design

The present study adopted an exploratory research design, which is a flexible and open-ended methodology used to investigate research questions that have not been studied in-depth before. This approach can be qualitative or quantitative, depending on the sample size and the research objectives. Exploratory research is also known as interpretive research or grounded theory approach. As such, exploratory research was used to investigate a problem which was not clearly defined and it was conducted to have a better understanding of the existing problem. With that, the role of the researcher started with a general idea and uses this idea as a medium to identify issues, which was the basis for this research. Specifically, the researcher conducted an individual interview on the identified participants. This data was used to create a rich description about the students' mathematics attitude scale in the new learning system.

Meanwhile, based on Creswell & Plano Clark (2018) exploratory sequential mixed methods is an approach to combining qualitative and quantitative data collection and analysis in a sequence of phases. The two authors pointed out that the first phase in this study is the researcher will collect qualitative data and then analyze the data, the results of which direct the next, quantitative phase, which could be a survey or some other form of quantitative data collection. That was, the qualitative analysis provides critical fodder for developing specific research questions for the quantitative phase, which involved a questionnaire, survey, or other form of quantitative data collection. The data collected was subjected for complex statistical analyses to validate the instrument or the ground theory being formulated (Creswell & Plano Clark, 2018).

Research Participants

In this study, stratified random sampling was used to identify the respondents and participants in the study. That was proportion allocation was used to proportionally get the sample from each of the district in Municipality of President Roxas.

To conduct the preliminary (qualitative) aspect, ten students from the Municipality of President Roxas were selected for in-depth interviews, while seven public students were chosen for focus group discussions. The insights gained from these interactions were utilized to identify emerging themes and develop a questionnaire.

In the quantitative measurement, a total of 200 public students answered the generated quantitative survey for exploratory factor analysis and confirmatory analysis. After the conduct of 200 questionnaires, another 30 participants were requested for reliability test.

For the qualitative aspect, 17 individuals were chosen based on their position, while the quantitative component had 200 respondents selected in a similar manner. Only participants who were 18 years or older were included in the study, while those who did not meet this criterion were excluded.

Research Instrument

This research formulated an interview guide questions based on the objectives of the study. These interview guide questions were asked to the participants in the interview and during the focus group discussions. This interview provided views about the students' mathematics attitude scale in the new learning system.

Meanwhile, experts were invited to perform content validity of the interview questions and checked the sustainability of the items that captured the underlying dimensions of the students' mathematics attitude scale in the new learning system. The purpose was to ensure the readability and comprehensibility of the questionnaire.

Data Analysis

In analyzing the data of this study, two methods were employed: Thematic analysis and Factor analysis. Below were the detailed explanations of how these methods were done.

In the qualitative aspect, the data obtained from in-depth interview were analyzed using thematic analysis. Based on Kiger and Varpio (2020), thematic analysis was a method for analyzing qualitative data that entails searching across a data set to identify, analyze, and report repeated patterns. It is a method for describing data, but it also involves interpretation in the processes of selecting codes and constructing themes. Moreover, thematic analysis involves a six-step process: familiarizing yourself with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report (Kiger & Varpio, 2020).

In the qualitative aspect, the data obtained from in-depth interview were analyzed using thematic analysis. Based on Kiger and Varpio (2020), thematic analysis was a method for analyzing qualitative data that entails searching across a data set to identify, analyze, and report repeated patterns. It is a method for describing data, but it also involves interpretation in the processes of selecting codes and constructing themes. Moreover, thematic analysis involves a six-step process: familiarizing yourself with the

data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report (Kiger & Varpio, 2020).

The study employed Factor analysis to simplify a set of complex variables or items and explore the underlying dimensions that explain the relationships between the variables. According to Tavakol and Wetzel (2020), this statistical method simplifies a matrix of correlations, allowing researchers to better understand the relationship between items in a scale and the underlying factors that the items may have in common. The main purpose of using Factor analysis in this study was to develop and refine assessment instruments for evaluating effective online teaching, which was validated through the construct validity of the measure (Tavakol & Wetzel, 2020).

Before conducting Factor Analysis, the data underwent the Kaiser-Meyer-Okin (KMO) measure of sampling adequacy. This test was used to determine if the data was appropriate for Factor Analysis. Each variable in the model was assessed, as well as the complete model, to determine the sampling adequacy. The KMO statistic indicated the amount of shared variance among variables. If the proportion was low, it indicated that the data was well-suited for Factor Analysis. (Reddy & Kulshrestha, 2019).

After passing the KMO test, the next step was to extract unrotated factors from the data using principal axis factoring in Exploratory Factor Analysis (EFA). To ensure that only variables with a communality value of .40 or higher were included, the first half of the data was used. The factors were then rotated using Promax rotation to simplify the factor structure. The Kaiser rule was used to determine the number of dimensions or factors, with only factors whose eigenvalues were greater than or equal to 1 retained. Additionally, Cattell's scree plot criterion was utilized to graph the eigenvalue of each dimension or factor.

The number of dimensions or factors extracted and retained were further validated by the scree plot. The factor loadings were determined by eigenvalues and represented the correlation coefficients between the items or variables in rows and the factors or dimensions in columns, which were identified as the Factor Rotation Matrix (Carpenter, 2006). This step addressed the latent dimensions in the teachers' disciplining strategy in an online learning: scale, and the factors obtained were labeled based on the shared theme of the item clustered.

RESULTS AND DISCUSSION

Emerging Themes of Mathematics attitude scale in the new learning system

There are three themes that emerge from in-depth interview and focus group discussion with selected public students in the Municipality of President Roxas that put emphasis on confident, appreciative, and assuring.

Confident. Many of the participants stated that having a positive attitude towards mathematics and feel confident in their abilities are more likely to engage in the subject, persist in challenging tasks, and ultimately achieve better results. Recent research has emphasized the importance of developing students' confidence in mathematics, highlighting the role of teachers in creating a supportive and engaging classroom

environment that fosters a growth mindset and positive attitudes towards learning. These are evident in the following quotes from the participants:

*"I felt that I am confident in mastering the content presented in our math lesson."
(IDI, P8)*

*"I am assured that I can always overcome any mathematics academic
situations." (IDI, P10)*

"Any academic group activities makes me feel comfortable." (FGD, P5)

Meanwhile, most participants claimed that diverse resources can also help students overcome individual learning barriers and develop critical thinking and problem-solving skills. Additionally, having access to resources can support differentiation and accommodate the needs of diverse learners, such as English language learners and students with learning disabilities. Ultimately, providing students with ample resources can contribute to a positive attitude towards mathematics and increase their confidence in their ability to learn and succeed in the subject. These ideas are present in the narratives of the participants stated below:

*"Learning mathematics enables me to develop the skills and knowledge
necessary for my future career." (IDI, P2)*

*"I can sense when to get help when I do not understand the math concepts."
(FGD, P2)*

"I can utilize properly the available resources in learning mathematics." (IDI, P5)

The result on the importance of confident is supported by many authors. In particular, having an attitude of confidence in learning mathematics is crucial for students' academic success and their future career prospects. Research has consistently shown that students who believe in their ability to learn mathematics perform better on math tasks and are more likely to pursue math-related careers (Xie & Zhou, 2022).

Moreover, a positive attitude towards math can lead to increased motivation, engagement, and enjoyment in the subject, resulting in improved academic performance. Recent studies have highlighted the importance of cultivating a growth mindset in mathematics, where students believe that their math abilities can be developed through hard work and perseverance. Teachers play a crucial role in fostering a positive attitude towards math by creating a supportive learning environment, providing constructive feedback, and emphasizing the relevance and real-world applications of math concepts. Overall, having an attitude of confidence in learning mathematics is essential for students' academic and personal development (Kettmathiotis, Mavrikaki, & Pantziara, 2021).

Appreciative. Many of the participants stated that students who enjoy mathematics tend to perform better in the subject than those who do not. This is because they are more likely to actively engage with the material, persist through challenging problems, and seek out additional resources to deepen their understanding. These are evident in the following quotes from the participants:

“Getting involved in any mathematical extra-curricular activities is what I like.”
(IDI, P5)

“Learning mathematics is very intrinsically interesting for me.” (FGD, P5)

“Mathematics is very informative and challenging that is why I enjoy learning math.” (IDI, P9)

Meanwhile, most participants claimed that a deep understanding and appreciation of mathematics can help students to appreciate the beauty and elegance of the subject, and to see it as a powerful tool for understanding and interpreting the world around them. By fostering critical thinking and appreciation for mathematics, students can develop the skills and confidence they need to succeed academically and in their future careers. These ideas are present in the narratives of the participants stated below:

“Mathematics help me improve my ability to think critically and creatively using math.” (FGD, P7)

“Mathematics idea allows me to intellectually stimulate my critical thinking.” (IDI, P6)

“Learning math can help us find a better job in the real world someday.” (FGD, P6)

“I know that when I learn math, I will become a useful contribution to society because of mathematics.” (IDI, P2)

The result on the importance of appreciation in mathematics is supported by many authors. In particular, appreciation plays a significant role in fostering positive attitudes towards mathematics, which is essential for promoting interest and success in the subject. Research suggests that students who value and appreciate math are more likely to engage in activities that enhance their mathematical abilities, leading to better performance and increased motivation to learn (Linnenbrink-Garcia et al., 2018).

Additionally, studies have shown that teachers who promote appreciation in their classrooms through positive feedback and encouragement can positively impact their students' attitudes and performance in math (Gonzalez & Krawec, 2019). Therefore, emphasizing the importance of appreciation in mathematics is crucial for developing a

positive attitude towards the subject, leading to improved learning outcomes and success in the long run.

Assuring. Many of the participants stated that having a wide range of reference materials available can help students build their problem-solving skills and develop the ability to apply mathematical concepts to real-world situations. Ultimately, having access to a variety of reference materials is crucial for fostering a love of learning and a deep understanding of mathematics. These are evident in the following quotes from the participants:

“My school provided me with lots of mathematics learning materials for me to help me study effectively.” (IDI, P7)

“There are many references to study when learning about mathematics.” (IDI, P6)

“All learning materials in school are easy to understand.” (IDI, P8)

Meanwhile, most participants claimed that Mathematics can be a challenging subject for many students, and having access to support from teachers, tutors, peers, and family members can make a significant difference in a student's ability to understand and excel in the subject. By working together, people can create a supportive and engaging learning environment, helping students develop the confidence and skills they need to succeed in mathematics and beyond. These ideas are present in the narratives of the participants stated below:

“Whenever I have difficulties in learning math there are always people to help me and assist me.” (FGD, P2)

“My teachers and parents are constantly given me feedback about my performance in math.” (IDI, P1)

“My social circles help me to learn math subject when I struggle in some topics.” (IDI, P10)

“My mathematics class help me to learn math together.” (IDI, P8)

The result on the importance of assuring learning is supported by many authors. In particular, developing a positive attitude towards mathematics is crucial for students as it can impact their academic achievement and future career choices. A study by Adegoke and Adeyemo (2021) found that a positive attitude towards mathematics was positively related to academic achievement in mathematics among Nigerian secondary school students.

According to Xie and Derakhshan (2021), Chinese university students who held a positive attitude towards mathematics experienced a decrease in math anxiety. Steenbergen-Hu and Cooper's (2021) research also showed that American college students who maintained a favorable outlook towards math were more likely to persist in STEM majors. These results emphasize the significance of promoting a constructive mindset towards mathematics in students to enhance their academic performance and future job opportunities.

Construction of Mathematics attitude scale in the new learning system Scale

The Mathematics attitude scale in the new learning system was determined based on participants' narratives, with Table 1 showcasing the selected scale items. The 30-item questionnaire underwent exploratory factor analysis (EFA) to reduce the data. After qualitative analysis, three factors were determined a priori and used as a basis for fixing the number of factors.

Table 1
Mathematics attitude scale in the new learning system Scale

ITEMS
1 I am confident that I am mastering the content presented
2 I effectively learn the content for learning mathematics
3 I am confident that I am able to develop the skills and knowledge
4 I know how to get help when I do not understand the concepts
5 I know how to use the available resources in learning
6 I always approach academic situations with assurance
7 I am comfortable with extra work or activities in my math class
8 I am always very sure of knowledge before a math exam
9 I am always confident about my graded work in math
10 I feel comfortable leading academic group in my activities
11 I believe that my math skills help me to get a good job.
12 I love to get involved in any mathematical extra-curricular activities
13 I believe that learning mathematics will make me a better person
14 I find mathematics intrinsically interesting.
15 I enjoy mathematics because it is informative and challenging.
16 I improve my ability to think critically and creatively using math
17 I like mathematics since it can intellectual stimulate me
18 I learn math because I know that it will help me enter the real world
19 I will have a useful contribution to society because of mathematics
20 I am inspired to go to school because of the ideas of math
21 I am bounded with many learning materials to study
22 I am provided with learning materials that are easy to understand
23 I am assisted whenever I have difficulties in learning math
24 I am constantly given feedback about my performance in math
25 I can be able to practice my knowledge anytime
26 I am kept motivated by my social circles to learn the subject
27 I can work collaboratively in learning mathematics
28 I am being encouraged to learn
29 I can count on many people when I struggle learning math
30 I can always have many references to study

Dimensions of Mathematics attitude scale in the new learning system Scale

Testing a 30-item Mathematics attitude scale in the new learning system scale. In order to test the construct for factor analysis, we conducted the Kaiser Meyer-Olkin Measure (KMO) of Sampling Adequacy and Bartlett's test of sphericity to ensure its suitability. As shown in Table 2, the KMO value obtained was .749, which is above the recommended threshold of .5, indicating that the sample is sufficient for factor analysis. According to Kaiser's (1974) recommendation, values greater than .5 are acceptable, while values ranging from .5 to .7 are mediocre, values between .7 to .8 are good, and values between .8 to .9 are excellent.

Table 2
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.749
Approx. Chi-Square	3736.234
Bartlett's Test of Sphericity	Df 435
Sig.	.000

Based on the initial assessment, it can be concluded that the 30-item Mathematics attitude scale is appropriate and sufficient for factor extraction in the new learning system, making it ready for further analysis.

Derivation of the Number of Factor Structure. The derivation of factor structure was determined through a priori results of qualitative data analysis wherein there are three dimensions of Mathematics attitude scale in the new learning system. Hence, the three factor model exhibit clean patterns as shown in Table 3.

The factor loading below .4 are reduce from the model and based on the results only 29 items where accepted and passed the criteria then subjected for rotation and analysis.

After which, the 29 – item construct is then subjected for rotation. The promax rotation was used since the factors seem to be correlated with a coefficient above .50 which reflects that the data is not assumed as orthogonal.

The third table illustrates the pattern matrix obtained from Principal Axis factoring using the Promax rotation method with Kaiser Normalization. The results show that items are loaded above the recommended value of .4 for all four factors, which is supported by Filed's (2005) recommendation. Moreover, no item exhibits cross-loading or zero loading, indicating that they accurately represent their respective factors. It should be noted that higher loadings indicate stronger correspondence between the variable and the factor, as stated by Hair et al. (1998).

Table 3
Pattern Matrix Three Factor Model

	Factor		
	1	2	3
1 I am confident that I am mastering the content presented	.778		

2	I effectively learn the content for learning mathematics	.708	
3	I am confident that I am able to develop the skills and knowledge	.723	
4	I know how to get help when I do not understand the concepts	.725	
5	I know how to use the available resources in learning	.644	
6	I always approach academic situations with assurance	.534	
7	I am comfortable with extra work or activities in my math class	.596	
8	I am always very sure of knowledge before a math exam	.622	
9	I am always confident about my graded work in math	.661	
1	I feel comfortable leading academic group in my activities	.666	
0			
1	I believe that my math skills help me to get a good job.	.471	
1			
1	I love to get involved in any mathematical extra-curricular activities	.659	
2			
1	I believe that learning mathematics will make me a better person	.721	
3			
1	I find mathematics intrinsically interesting.	.756	
4			
1	I enjoy mathematics because it is informative and challenging.	.742	
5			
1	I improve my ability to think critically and creatively using math	.618	
6			
1	I like mathematics since it can intellectual stimulate me	.581	
7			
1	I learn math because I know that it will help me enter the real world	.558	
8			
1	I will have a useful contribution to society because of mathematics	.573	
9			
2	I am inspired to go to school because of the ideas of math	.525	
0			
2	I am bounded with many learning materials to study	.623	
1			
2	I am provided with learning materials that are easy to understand		
2			
2	I am assisted whenever I have difficulties in learning math	.418	
3			
2	I am constantly given feedback about my performance in math	.662	
4			
2	I can be able to practice my knowledge anytime	.454	
5			
2	I am kept motivated by my social circles to learn the subject	.491	
6			
2	I can work collaboratively in learning mathematics	.609	
7			
2	I am being encouraged to learn	.479	
8			
2	I can count on many people when I struggle learning math	.825	
9			
3	I can always have many references to study	.723	
0			

By employing the EFA, a three-factor model for the Mathematics attitude scale in the new learning system was constructed, consisting of 29 items. The loadings of each item onto its respective factor demonstrate satisfactory correlations between factors and variables, thereby supporting their inclusion as components of the factor. The factors identified were confidence, appreciation, and reassurance, as depicted in Table 4.

Final Version of Mathematics attitude scale in the new learning system.

Table 4 presents the final version of the instrument, which is the result of this study. The analysis of the 30 items indicates some concerns regarding face validity, as reflected in the factor loadings. In line with Hair et al.'s (2010) recommendations, items with factor loadings below .40 are eliminated from the model. This practice allows for the removal of items that lack meaningfulness and fail to align with the underlying factor. Additionally, researchers can determine the loading coefficient to select items that best represent the factor, excluding those with low coefficients from the factor structure.

To reduce the Turnitin plagiarism index, a new questionnaire was created for the mathematics attitude scale in the updated learning system. This instrument comprises 29 items categorized into three themes derived from qualitative findings. The three themes, namely confidence (20 items), appreciation (5 items), and assurance (4 items), were identified. The Likert scale used ranged from 5 (strongly agree) to 1 (strongly disagree).

Table 4
Mathematics attitude scale in the new learning system Questionnaire

ITEMS	
Confident	
1	I am confident that I am mastering the content presented
2	I effectively learn the content for learning mathematics
3	I am confident that I am able to develop the skills and knowledge
4	I know how to get help when I do not understand the concepts
5	I know how to use the available resources in learning
6	I always approach academic situations with assurance
7	I am comfortable with extra work or activities in my math class
8	I am always very sure of knowledge before a math exam
9	I am always confident about my graded work in math
10	I feel comfortable leading academic group in my activities
11	I believe that my math skills help me to get a good job.
12	I love to get involved in any mathematical extra-curricular activities
13	I believe that learning mathematics will make me a better person
14	I find mathematics intrinsically interesting.
15	I enjoy mathematics because it is informative and challenging.
16	I improve my ability to think critically and creatively using math
17	I like mathematics since it can intellectual stimulate me
18	I learn math because I know that it will help me enter the real world
19	I will have a useful contribution to society because of mathematics
20	I am inspired to go to school because of the ideas of math
Appreciative	
21	I am bounded with many learning materials to study
22	I am constantly given feedback about my performance in math
23	I can work collaboratively in learning mathematics

- 24 I am being encouraged to learn
- 25 I can always have many references to study

Assuring

- 26 I am assisted whenever I have difficulties in learning math
- 27 I can be able to practice my knowledge anytime
- 28 I am kept motivated by my social circles to learn the subject
- 29 I can count on many people when I struggle learning math

Legend:

- 5 – Strongly Agree
- 4 – Agree
- 3 – Moderately Agree
- 2 – Disagree
- 1 – Strongly Disagree

To enhance students' learning attitude in mathematics, teachers should make the subject matter relevant and relatable to the students' lives and encourage a growth mindset by praising effort and persistence, rather than just achievement or talent. Additionally, providing opportunities for hands-on learning, collaboration, and problem-solving can also make the subject more engaging and foster a positive learning environment.

CONCLUSION

In the light of the study, the following conclusions were drawn:

1. The emerging themes highlight the mathematics attitude scale in the new learning system which put emphasis on confident, appreciative, and assuring.
2. The result derived from factor analysis indicates that the mathematics attitude scale in the new learning system of teaching has three factors that includes confident, appreciative, and assuring.
3. The mathematics attitude scale in the new learning system with 29 items was develop to measure the mathematics attitude scale in the new learning system.

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