

Mathematics resiliency and anxiety of senior high school students

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Abstract

This study investigated the level of mathematics anxiety and mathematics resiliency in problem solving among ABM senior high school students. A mixed methods research design was utilized, with 88 students surveyed and 8 students interviewed. The findings showed that the level of mathematics anxiety and resiliency of the students was high. The students reported three challenges in solving problems in mathematics: dealing with complex problem-solution pressure, memorizing mathematical formulas, and having low confidence in performing tasks. They also reported three coping mechanisms: seeking help from peers or teachers, taking remedial measures, and self-conditioning. The study proposes an intervention plan that includes providing students with more opportunities to practice solving problems, providing them with support from peers and teachers, and helping them to develop confidence in their mathematical abilities.

Keywords: math anxiety, math resiliency, problem solving

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INTRODUCTION

In the academe, especially those studying mathematics, struggle with math-related anxiety. Numerous factors, including teachers, learning procedures, and math assessments, contribute to this anxiety. Mutlu (2019) describes math anxiety as the fear of math or an intense and negative emotional response to mathematics. However, students' resiliency and coping mechanisms of senior high school students in this challenging time are imperative, which prompted the researchers to assess the students' resiliency and coping mechanisms. Through this study, the positive coping mechanisms of students employed would come into play, as encouraged by the World Health Organization, to employ positive coping strategies in addressing various stressful and mental health concerns (Wu et al., 2020).

Hence, studying math resilience and anxiety in problem-solving is vital for various reasons. First, math anxiety is a widespread problem. According to a study by the National Council of Teachers of Mathematics, about 20% of students have a significant level of math anxiety. It means that millions of students are struggling to learn and succeed in mathematics because of their anxiety. Second, math anxiety can have a significant impact on academic achievement. Studies have shown that students with math anxiety are more likely to avoid math classes, perform poorly on math tests, and drop out of school. Hence, math anxiety can harm students' future educational and career opportunities. By studying math resilience and anxiety, we can develop interventions that help students to manage their anxiety and improve their math performance.

On the other hand, a study by Escarez and Ching (2022) found that 60% of 7th-grade students had moderate to severe math anxiety. Math anxiety has shown harm to students' mathematical achievement as well as their overall academic performance. Various factors can contribute to math anxiety. These include prior unpleasant mathematical experiences and a lack of trust in one's mathematical aptitude, and cultural stereotypes about mathematics. Math anxiety can become worse with certain teaching methods, such as a focus on rote memorization or a lack of emphasis on problem-solving.

In addition, students are experiencing difficulties solving math problems. It is evident in the low scores they have been getting on math tests and the feedback from their teachers. Other factors may be contributing to this difficulty, including the students' lack of motivation in math, the student's lack of prior knowledge in math, and the student's anxiety about math. However, students are willing to persevere. They don't give up easily, and they keep working until they solve the problem.

Therefore, resilience is the most important factor in dealing with challenges in teaching and learning. It has been demonstrated to reduce depression in college students and mental health problems in kids and

teenagers (Zamirinejad et al., 2018, as cited by Wu, Yu, Wu, Faded, Wang, & Lu, 2020). Inconsistent results have been reported in the literature, and it is unclear how resilience and pupils' coping mechanisms relate to one another. (Li et al., 2012; Chen, 2016 as cited by Wu et al., 2020).

Despite the initiative of the researchers to clarify these phenomena, there is no research, or little studies, if there is, that have explored the identified factors of math anxiety in students and resiliency in solving problems. The intent of this research focused on the mathematics anxiety and resiliency in problem-solving of senior high school students. This is a serious issue, as mathematics is a core subject in many academic and professional fields. More research is needed to better understand the causes and effects of math anxiety.

The objectives of this study are to determine the level of math anxiety and resiliency of the students and to identify the challenges of students in solving problems in mathematics and their coping mechanisms. Additionally, to develop effective action plans to help students overcome it.

This study is anchored on the processing efficiency theory (PET), which was proposed by Eysenck and Calvo (1992) to explain the complex relationship between anxiety and performance. The theory states that anxiety has two main effects on performance: it reduces the storage and processing capacity of working memory. When the storage and processing capacity of working memory is reduced, it can be difficult to remember information such as formulas and procedures. This can lead to students forgetting the formula and the procedure for solving math problems. It increases on-task effort and activities designed to improve performance. Students may spend more time studying math, or they may try to practice math problems more often. However, this increased effort can backfire, as it can lead to feelings of frustration and inadequacy.

This is also anchored on the theory proposed by Johnston-Wilder and Lee (2010) about mathematical resilience. Mathematical resilience, as proposed by Johnston-Wilder and Lee (2010), is multidimensional and is influenced by three correlated factors: values, struggle, and growth.

Supported by the Mathematics Resiliency-Based Theory of Callaman (2023), it is a theory that describes how students handle the difficulties of mathematics learning. The theory is based on the resilience theory, which argues that it's not the nature of adversity that is most important, but how we deal with it. It argues that both direct and indirect coping strategies are important for mathematical resilience. Direct coping strategies help students overcome specific challenges, while indirect coping strategies provide general support that can help students be more resilient in the face of challenges. Moreover, by teaching students about coping strategies, helping them develop a growth mindset, and providing them with a supportive learning environment, we can help them succeed in mathematics.

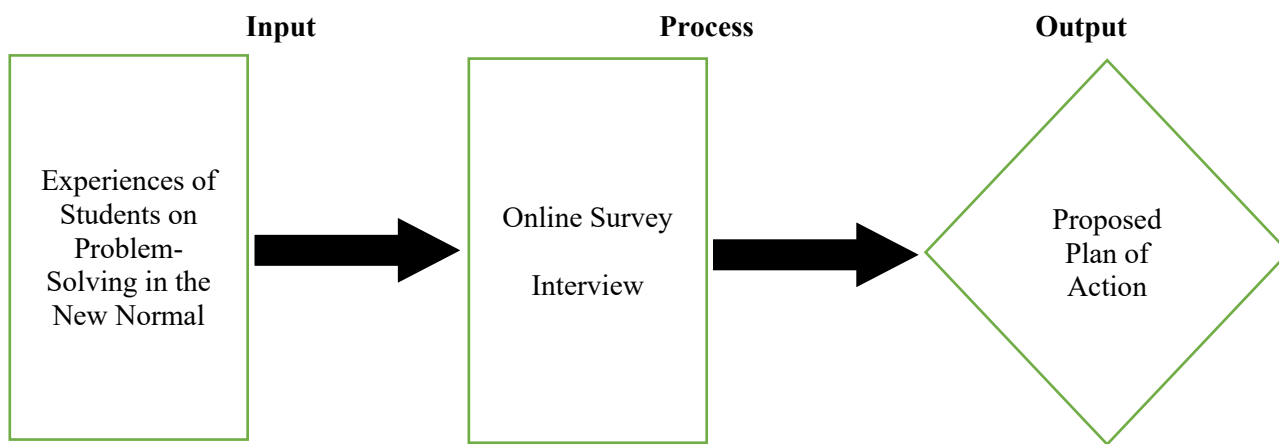


Figure 1. Conceptual framework of the study

Figure 1 shows the conceptual framework of the study. This study made use of the Input-Process-Output (IPO) as a framework. The input was the experiences of students on problem-solving in the new normal. This is to understand how the new normal has affected students' mathematical problem-solving skills and to identify any challenges or opportunities that they face. The process would be the conduct of the online survey and interview to get the data and to draw a conclusion. The output would be the proposed plan of action, to develop and improve the students' mathematical skills.

The study of math anxiety and resiliency is an important area of research that has the potential to improve the academic performance and overall well-being of students who struggle with math. By understanding the factors that contribute to these constructs, we can develop action plans to help students overcome math anxiety and succeed in math (Ashcraft et al., 2022).

The outcome of this study will greatly benefit the following: students, teachers, school administrators, and future researchers. For students, the study can help them to understand their levels of math anxiety and resilience and to develop strategies for coping with anxiety. For teachers, the study can provide insights into the factors that contribute to math anxiety in students and how to create a more supportive learning environment. For administrators, the study can provide data on the prevalence of math anxiety in students and the impact of this anxiety on student achievement.

METHOD

This study utilized the descriptive mixed method of research design. In particular, the explanatory model involves gathering both quantitative and qualitative data. This method was utilized to draw a clearer picture from the quantitative data and then use the qualitative data to explain and better comprehend the relevant study. Creswell and Clark (2007) stated that the explanatory design (also called sequential design) is a two-stage mixed method design.

A complete enumeration sampling technique was used to determine the respondents of this study. The officially enrolled grade 11- Accountancy, Business, and Management (ABM) students for AY 2022-2023 answered the modified and adapted mathematics resilience scale and anxiety scale. Meanwhile, the interviewed participants were purposively chosen whose scores belong to the lower 10% of the anxiety test.

Ethical considerations in research play an important role, as they are the collection of all values and principles that should be followed in dealing with the respondents and in the conduct of the study. This part of the paper makes sure that no individual will be harmed, no human rights are violated, and no hidden agenda is conducted. In general, it guides the researcher by not engaging in unethical conduct in the study.

Mean was used to describe the level of mathematical resilience and anxiety of the students. In addition, thematic analysis was used to analyze the gathered data. This will provide common themes on the reasons for students' anxiety in mathematics. Braun and Clarke's (2006) thematic analysis method was used. It was a flexible method to analyze a variety of data types, including interviews, focus groups, and documents. It was also a rigorous method that produced reliable and valid results, and it was a transparent method that allowed researchers to track their analysis and explain their findings.

RESULTS AND DISCUSSION

This section is divided into five parts, the level of mathematics anxiety in solving problems, the level of mathematics resiliency in solving problems, challenges of students in solving math problems, the coping mechanisms of students in solving math problems, and the proposed intervention plan.

Level of Mathematics Anxiety in Solving Problems

Table 1 shows that the overall weighted mean was 3.57, which signifies that the overall level of ABM students' anxiety in solving mathematics problems is high. It means that senior high school students are afraid of failing in mathematics and have a fixed mindset when solving problems in mathematics. They might have had negative experiences with problem-solving in the past. (Zhang et al., 2019). In addition, the statements "I usually have been uneasy in answering mathematics problems", "When taking a mathematics test, I feel not confident when I start from answering the problem-solving part", and "I get stressed and forget steps in solving math problems" are the three highest means of math anxiety and signified high levels. It describes the symptoms of math anxiety. Students with math anxiety often feel uneasy, anxious, and stressed when they have to do math. They may also have difficulty concentrating, forget steps in problem-solving, and have low confidence in their math abilities (Ashcraft, 2020). Meanwhile, the statements "I stop reading the mathematics problem when I don't understand the concepts", "If I find the problem difficult, I spend less time solving it", and ". I don't think that I could solve math problems" are the three lowest means of math anxiety and indicate moderate levels. It is considered mild math anxiety. Students with mild math anxiety may avoid math problems, spend less time on them, and have less confidence in their ability to solve them (Ashcraft & Ridley, 2022).

Table 1. Level of Mathematics Anxiety in Solving Problems

	Mean	Description
1. I usually have been uneasy in answering mathematics problems.	3.95	High
2. I think I could not handle difficult mathematics problems.	3.54	High
3. I am unable to think clearly when working with mathematics problems.	3.60	High
4. Problem-Solving in Math does scare me at all.	3.35	Moderate
5. For some reason, even though I study, mathematics seems unusually hard for me.	3.68	High
6. I don't think that I could solve math problems.	3.08	Moderate
7. I do not feel secure whenever I attempt to solve math problems.	3.32	Moderate
8. I'm not the type to do well in mathematics.	3.63	High
9. I get stressed and forget steps in solving math problems.	3.84	High
10. When taking a mathematics test, I feel not confident when I start answering the problem-solving part.	3.87	High
11. I stop reading the mathematics problem when I don't understand the concepts.	3.29	Moderate
12. If I find the problem difficult, I spend less time solving it.	3.27	Moderate
13. My mind turns blank if I see a difficult problem in mathematics.	3.70	High
14. In solving problems, I usually mixed up the steps.	3.84	High
Overall Mean	3.57	High
<i>1.00-1.80=Very Low</i>	<i>2.61-3.40=Moderate</i>	<i>4.21-5.00=Very High</i>
<i>1.81-2.60=Low</i>	<i>3.41-4.20=High</i>	

The statement "I usually have been uneasy in answering mathematics problems," which has a weighted mean of 3.95 and is labelled as high, is the highest or main indicator of why we can determine that students have anxiety in math. It implies that the students experience anxiety or discomfort when faced with math problems. Hence, students who are anxious about math may be less likely to participate in class discussions or to ask for help when they are struggling. They may also be more likely to avoid taking advanced math courses or to drop out of math altogether (Ashcraft & Moore, 2021).

On the other hand, the statement "I don't think that I could solve math problems," which has a weighted mean of 3.08 and is labelled as moderate, states that students with math anxiety don't think that they could solve math problems. It implies that the students lack confidence in their math abilities. Additionally, students may avoid participating in class discussions or asking questions for fear of being wrong, give up easily on math problems, even if they can understand the concepts involved, and may develop negative attitudes towards math, such as believing that they are "not a math person" or that math is "useless" (Hung & Cai, 2020).

In addition, students who feel uneasy or uncomfortable when answering mathematics problems may perform poorly on math tests. This can lead to further anxiety and stress, and it can make it difficult for them to overcome their math anxiety. Moreover, the cognitive and affective components of mathematics anxiety are important factors that contribute to math performance (Krinzinger et al., 2019). They suggested that interventions that target the cognitive and affective components of mathematics anxiety could be effective in improving math performance.

Moreover, Manaloto et al. (2017) showed that the overall level of math anxiety among Grade 11 ABM students was high. This means that most of the ABM students in the study experienced significant levels of anxiety when solving math problems. This is likely due to several factors, including the difficulty of the math curriculum, the way math is taught in schools, and the stereotypes that exist about math ability. Moreover, students with higher levels of math anxiety were more likely to use avoidant coping strategies, such as procrastination and giving up easily (Lew & Hwang, 2019).

Level of Mathematics Resiliency in Solving Problems

Table 2 shows that the overall weighted mean of the grade 11 ABM students' resiliency in mathematics is 4.00, which is considered high. This means that the students are more likely to succeed in mathematics courses than students with low mathematical resilience. A study by Ho (2017) supports this finding, as it showed that students with high mathematical resilience are more likely to be confident in their ability to solve problems and use a variety of problem-solving strategies. This confidence and skill set allow them to manage their time effectively and to work independently.

Table 2. Level of Mathematics Resilience in Solving Problems

	Mean	Description
Value	3.91	High
1. Mathematics is essential for my future.	4.19	High
2. Mathematics concepts are necessary to learn other school subjects.	3.92	High
3. Mathematics will be useful to me in my life's work.	4.19	High
4. Mathematics courses are very helpful no matter what I decide to study.	4.06	High
5. Knowing how to solve mathematical problems contributes greatly to achieving my goals.	4.00	High
6. Having a solid knowledge of math helps me understand more complex topics in my field of study.	4.06	High
7. Thinking mathematically can help me with things that matter to me.	3.70	High
8. It would be easy to succeed in life with enough knowledge of mathematics.	3.73	High
9. Mathematics develops good thinking skills that are necessary to succeed in any career.	4.10	High
10. People who are good at solving mathematical problems have more opportunities than those who are not good at math.	3.17	Moderate
Struggle	3.99	High
1. Everyone struggles in solving mathematics problems at some point.	4.27	Very High
2. Good mathematicians experience difficulties when solving problems.	3.92	High
3. People who solve problems in math-related fields sometimes find math challenging.	4.08	High
4. Everyone makes mistakes at times when solving mathematical problems.	4.35	Very High
5. Struggle is a normal part of solving problems in mathematics.	4.51	Very High
6. People in my peer group struggle sometimes with mathematical problems.	3.38	Moderate
7. People who are good at math may fail a hard math test specifically in problem-solving.	3.57	High
8. Making mistakes is necessary to get good at math.	4.03	High
9. Math teachers are sometimes confused by a math problem.	3.70	High
10. When someone struggles in math, it doesn't mean they have done something wrong.	4.08	High
Growth	4.11	Very High
1. Math can be learned by anyone.	4.52	Very High
2. If someone is not a math person, they can still be able to learn much math.	4.38	Very High
3. If someone is not good at math, there is something that can be done to change that.	4.13	High
4. People are either good at math or they aren't.	4.00	High
5. Everyone's math ability is not determined at birth.	4.06	High
6. People have strategies to use when get stuck in trying to solve math problems.	4.38	Very High
7. People who are not smart can be good at math.	4.22	Very High
8. Everyone's mathematical problem-solving ability can be enhanced.	4.32	Very High
9. Working harder can help those who perform poorly in problem-solving in mathematics.	4.19	High
10. Some people cannot learn math.	2.92	Moderate
Overall Mean	4.00	High
<i>1.00-1.80=Very Low 2.61-3.40=Moderate 4.21-5.00=Very High</i> <i>1.81-2.60=Low 3.41-4.20=High</i>		

The mean of growth had the highest value of 4.11, which is high. It means that indicators of a student's mathematical resilience were dominated by growth. Most students are convinced that they have the nature of survival, never give up, and always give a positive response to learning mathematics (Tan & Gracia 2018). found that the factor of growth was the strongest predictor of mathematical resilience. Supported by a study that concluded that the primary predictor of mathematical resilience was growth (Boaler & Sengupta, 2017). This means that students who were convinced that they could improve their math abilities were more likely to be resilient in mathematics.

On the other hand, the struggle had the second highest value of 3.99, which is high. It shows that students had will and perseverance in learning mathematics, despite the difficulties, obstacles, and challenges. Some students believe that struggle is a necessary part of learning mathematics, and they are not afraid to ask for help when they need it. Moreover, it can be a sign that some students are engaged in the learning process and are not afraid to challenge themselves and try new things. This can lead to deeper understanding and better problem-solving skills (Kookken et al., 2016).

Lastly, the value has the lowest mean of 3.91, which is also high. It means that fewer students are convinced that mathematics is valuable and necessary to learn and master. Additionally, students may not have the confidence, perseverance, or problem-solving skills necessary to succeed in mathematics. It is important to identify these students early on and to provide them with the support they need to succeed (Kookken et al., 2020).

Moreover, the mean score suggests that the students in the study were somewhat less likely to value mathematics than the other indicators. This could be due to several factors, such as the student's perception of the relevance of mathematics to their lives or their belief that they are not good at mathematics. On the other hand, the mean score for the struggle suggests that the students in the study were more likely to see the struggle as a positive part of learning mathematics. This could be due to the students' belief that struggle helps them learn and grow, or their perception that it is a normal part of learning mathematics. Lastly, the mean score for growth suggests that the students in the study were the most likely to believe that they could grow their mathematical abilities. This could be due to the students' positive attitude towards mathematics, their belief that they can learn anything with hard work, or their confidence in their ability to overcome challenges. Furthermore, the overall mean suggests that the students in the study had a high level of mathematical resilience. This means that they were likely to succeed in mathematics courses and overcome challenges in mathematics.

Challenges of Students in Problem Solving

Problem-solving is a complex skill that requires a variety of cognitive abilities. Students can face several challenges when trying to solve problems, including a lack of understanding of the problem, a lack of knowledge or skills, a fear of failure, and an inability to break down the problem. These are just some of the challenges that students can face when trying to solve problems.

When the students were asked about their challenges in solving problems in mathematics, three themes emerged from the study are the following: (1) dealing with complex problem-solution pressure (2) Procedural fluency without conceptual understanding, and (3) low-confidence in performing tasks.

Theme 1: Dealing with complex problem-solution process

The first theme that emerges is dealing with complex problem-solution processes. This refers to the process of identifying, understanding, and resolving complex problems. Complex problems are those that are difficult to define, have multiple causes, and have no easy solutions. In fact, throughout the interview, the participants raised this theme. Participants said:

“The challenging part is kapag ang problem ay maraming process o procedure para makuha ang answer.” (The challenging part is when the problem involves multiple processes or procedures to obtain the answer) [Student 1]

“Ang procedure talaga ang isa sa struggle ko like the steps itself makalimot jud ko sir.” (The procedure is one of my struggles I tend to forget the steps themselves, sir.) [Student 8]

Solving math problems can be challenging, even for students who are proficient in mathematics. One of the main challenges is understanding the procedure or process for solving the problem. This can be difficult for several reasons. It is difficult for students to solve math problems that require a procedural or process-based approach. It also shows their level of anxiety in the statement "I get stressed and forget steps in solving math problems," with a mean of 3.95, which signifies a high level. Therefore, it is important for teachers to be aware of these challenges and to provide students with the support they need to overcome them. A study by Vidad et al. (2022) found that students who use problem-focused coping strategies, such as breaking down the problem into smaller steps and seeking help from others, are more likely to be successful in solving math problems. Meanwhile, Kim et al. (2020) found that students who use visualization techniques, such as drawing a diagram or creating a mental model, are more likely to be successful in solving math problems. However, students mentioned that they are also struggling to comprehend the worded problem. Some participants said:

“Maglisod jud ko pag worded problem sir like ma test jud jud akong comprehension sa problem. Kanang pag analyze jud sa problem.” (I struggle with worded problems, sir, like my comprehension of the problem is truly tested. Especially when it comes to analyzing the problem) [Student 5].

“One of my problems is my comprehension; sometimes I have difficulties in comprehending the problem itself. Sometimes I forget the procedures in solving math.” (Student 7)

Word problems are a common type of math question that require students to read and understand a real-world situation to solve the problem. However, many students struggle with comprehending word problems. It also shows their level of anxiety in the statement "I stop reading the mathematics problem when I don't understand the concepts," with a mean of 3.29, which signifies a moderate level. Boonen et al. (2019) investigated the challenges that students face when comprehending mathematical word problems. They also found that the challenges of comprehending mathematical word problems were compounded for students who had poor reading comprehension skills. These students were more likely to make mistakes when interpreting the problem, and they were less likely to be able to solve the problem correctly. Therefore, teachers need to provide explicit instruction in mathematical vocabulary and problem-solving skills. They also need to be aware of the challenges that students face when comprehending mathematical word problems, and they need to provide support to help students overcome these challenges.

Theme 2: Procedural fluency without conceptual understanding

Students may be able to memorize formulas and procedures without truly understanding them. This can lead to difficulty recalling or remembering the formulas when they are needed because they do not understand the underlying concepts. On the other hand, memorizing mathematical formulas means being able to recall them accurately and without hesitation. This can be a helpful skill for solving mathematical problems, as it allows you to focus on the concepts involved in the problem without having to worry about remembering the specific formula. During the interview, students shared about their difficulties in memorizing the formula. Students mentioned that:

“Mahirap kasi mag memorize ng process, minsan magulo na. mahirap din mag memorize ng formula.” (It's difficult to memorize the process, and sometimes it becomes confusing. It's also challenging to memorize the formula) [Student 1]

“Isa sa mga problema ko talaga ay ang pag memorize ng formula.” (One of my problems is memorizing formulas) [Student 2]

“Isa sa akong problem sir is ma mental block ko during mag solve og problems labi nag memorize nako ang formula.” (One of my problems, sir, is that I experience mental blocks while solving problems, especially when I'm trying to memorize the formula) [Student 4]

“Ang mahirap sa pagsolve talaga is ang pag memorize sa formula and sa procedure po. Makalimutan ko sometimes talaga.” (The challenging part in solving is memorizing the formula and the procedure. I do tend to forget sometimes) [Student 8]

Memorizing math formulas is a common challenge for many students. Some students find it difficult to remember the symbols, the order of the numbers, or the meaning of the formula. This can lead to difficulty solving math problems and can also be a source of anxiety for students. It also shows their level of anxiety in the statement "My mind turns blank if I see a difficult problem in mathematics," with a mean of 3.70, which signifies a high level. A study by Zhang et al. (2019) investigated the challenges that students face when memorizing math formulas. The study found that students had difficulty understanding the meaning of math formulas, remembering the order of the symbols in the formulas, and applying the formulas to solve problems. The study also found that students who had difficulty memorizing math formulas were more likely to experience anxiety and frustration in math class. Students also point out that, aside from memorizing, sometimes they forget the formula. Students said that:

“Makalimot pod ko sa formula og procedures kay daghan og taas na kayo ang procedure sa pag solve.” (I also tend to forget the formulas and procedures because there are too many and they are already too complicated in solving) [Student 5]

“I’ve always found math very difficult because most of the time no matter how hard I study math I will always forget how to solve the problem or forget the formula.” (Student 6)

Callan et al. (2023) investigated why students forget formulas. The researchers found that students were more likely to forget formulas if they did not understand the concepts behind the formulas. They also found that students were more likely to forget formulas if they did not see the relevance of the formulas to their own lives. It also shows in their level of anxiety in the statement "I stop reading the mathematics problem when I don't understand the concept," with a mean of 3.29, which signifies a moderate level, and "I think I could not handle a difficult mathematics problem," with a mean of 3.54, which signifies a high level. However, they found that students who had a positive attitude toward math were more likely to be successful in memorizing formulas. They recommend that teachers create a classroom environment that is supportive and encouraging and that they focus on helping students develop a positive attitude toward math.

Theme 3: Low confidence in performing tasks

The third theme that comes out is low confidence in performing tasks; it refers to a lack of faith in one's ability to complete a task successfully. This can be caused by several factors, including previous failures, negative feedback, or a lack of experience. People with low confidence in performing tasks may often procrastinate, avoid challenges, or make excuses for why they cannot do something. The participants in the interview raised this issue several times. Participants said:

“Isa sa problem nako is murag naa koy anxiety kanang mahadlok ko na mamali akong answer.” (One of my problems is that I seem to have anxiety, sir, like I'm afraid to give the wrong answer.) [Student 3]

“Mag overthink pod ko like, what if mamali ko o mabagsak ko sa test sa math maong usahay mahadlok jud ko sa numbers” (I also tend to overthink, sir, like, what if I make a mistake or fail the math test, that's why sometimes I really get scared of numbers) [Student 4]

Fear of failure is a common experience for many people, and it can be especially pronounced in the context of mathematics. It also shows in their level of anxiety in the statements "When taking a mathematics test, I feel not confident when I start from answering the problem-solving part," with a mean of 3.87, which signifies a high level, and "I think I could not handle a difficult mathematics problem," with a mean of 3.54, which also signifies a high level. Math anxiety is a specific type of fear of failure that is characterized by feelings of worry, nervousness, and dread about math. This anxiety can lead to several negative consequences, including avoidance. It is a common problem in math that can affect students of all ages. Students who had a fear of failure in math were more likely to avoid math problems, have lower math self-efficacy, and perform worse on math tests (Gunderson et al., 2022).

Furthermore, the fear of failure in math is a common problem that can have several negative consequences for students (Beilock et al., 2019). However, there are several things that students can do to overcome this fear. By reframing failure as a learning opportunity, setting realistic goals, and getting help from a tutor or teacher, students can improve their math skills and achieve their academic goals. Aside from the fear of failure, students also experience peer pressure and a lack of faith in their abilities. Students mentioned that:

“Sometimes I asked myself, why I can't solve specific problems and my other classmates can and I always see them that they don't find the problem hard.” (Student 6)

“Sometimes I felt nervous and pressured because my classmates are expecting that I can solve the problem because I am an honor student.” (Student 7)

Students who lack confidence are more prone to succumb to peer pressure because they fear rejection or mockery from their classmates. They may also feel like they need to do whatever it takes to fit in, even if it means doing something they know is wrong (Zhang et al., 2002). It is also shown in their level of anxiety in the statement "I don't think that I could solve math problems," with a mean of 3.08, which signifies a moderate level. In the context of math, peer pressure can lead students to cheat, give up on challenging problems, or avoid math altogether. It is a real challenge for many students, but it is important to remember that it is not inevitable. By creating a positive math environment, encouraging collaboration, and talking to students about the dangers of peer pressure, teachers and parents can help reduce the impact of peer pressure on math achievement (Beilock et al., 2019).

In conclusion, low confidence in performing tasks in math is a common problem that can affect students. This lack of confidence can lead to avoidance of math altogether, difficulty concentrating in math class, and decreased performance on math tests. It is important to remember that everyone learns math at their own pace. There is no shame in struggling with math, and there are many resources available to help students succeed. By working together, students, teachers, and parents can help increase confidence in math and ensure that all students have the opportunity to succeed.

The challenges of dealing with complex problem-solving processes, memorizing mathematical formulas, and having low confidence in performing tasks can all be interrelated. These challenges can have a significant impact on a student's success or failure in their field. It is important for educators to be aware of these challenges and to provide support to students who are struggling (Green, 2016).

Coping Mechanisms of Students in Problem Solving

A coping mechanism or coping strategy is required for solving mathematical problems. Students must minimize or tolerate challenges in solving problems in mathematics to improve their academic performance. Students coping mechanisms are also described as an individual way of resolving problems and addressing changes as well. Students should know how to manage and overcome the challenges of solving a particular math problem.

When the participants were asked about their coping mechanisms in solving problems in mathematics, three themes emerged from the study. These include (1) seeking help from peers or teachers (2) taking remedial measures, and (3) self-conditioning.

Theme 1: Seeking help from peers or teachers

The first theme that emerges is seeking help from peers or teachers; it refers to the act of asking for assistance from one's classmates or teachers. This can be done in a variety of ways, such as asking questions during class, visiting office hours, or working together on group projects. This theme was brought up by the participants during the interview. Participants said:

"Ang ginagawa ko pag mahirap na talaga ang problem is nagtatanong na ako sa mga classmates ko na marunong sa process ng pag solve" (What I do when the problem becomes really difficult is I start asking my classmates who are knowledgeable about the solving process.) [Student 1]

"Asking the teachers to clarify some problems, especially in solving math problems." (Student 3)

"I also ask my friends how they solve the problem." (Student 7)

When students work together to solve math problems, they can share their different approaches and strategies. This can help them see the problem from a different angle and come up with a solution that they might not have thought of on their own. It is supported by the level of growth in MRS in the statement "People have strategies to use when getting stuck trying to solve math problems" at a very high level.

Meanwhile, it was also claimed by another participant that seeking assistance from their teachers helps them understand the process of solving the problem. They ask questions and clarify some ambiguous parts of the problem at hand. Since teachers have a deep understanding of math concepts, they can help students identify their misconceptions and develop effective problem-solving strategies. They can also provide students with the resources they need to succeed, such as practice problems, hints, and explanations.

The study by Degrande et al. (2016) supports this claim, stating that students who seek help are more likely to succeed in math. They highlighted that peers can provide different perspectives and insights, while

teachers can provide expert guidance and support. Thus, seeking help from peers or teachers is an important strategy for students who are struggling to solve math problems.

On the other hand, more knowledgeable others (MKOs) can play a valuable role in supporting learning. MKOs can provide learners with the knowledge, skills, and strategies that they need to succeed in challenging tasks. They can also provide learners with feedback and support, which can help them overcome obstacles and make progress. For instance, the results imply that teachers might be crucial in helping pupils learn through scaffolding. Teachers can offer clear guidance and criticism, as well as support and encouragement (Stylidis et al., 2021).

Theme 2: Taking remedial measure

Remedial measures refer to students who are receiving additional instruction or support to help them improve their academic performance. There are several different ways that students can take remedial measures, and these measures can be very beneficial for students who are struggling academically. During the interview, participants propounded that one of their remedial strategies is note-taking. They mentioned:

“Importante din ang notes taking para di malimutan ang lesson at para mabalikan ang naisulat.” (Taking notes is also important to not forget the lesson and to be able to review what was written) [Student 1]

“Ang ginabuhat nako sir kay notes taking jud para mabalikan pa nako unsaon pag solve labi na ang step by step.” (What I'm doing, sir, is really taking notes so that I can review how to solve it, especially the step-by-step process) [Student 8]

This experience made them realize the importance of taking notes in their math class. It is supported by the level of growth in MRS in the statement "If someone is not good at math, there is something that can be done to change that," with a mean of 4.13, which signifies a high level. Note-taking is the practice of writing down or otherwise recording key points of information. It is an important skill for students, professionals, and anyone else who wants to learn and remember new information. It can help the students focus, pay attention during lectures or presentations, and retain information. Moreover, taking notes can help students organize and structure the information they are learning. This can make it easier to study and review the material later. Additionally, notes can provide a valuable resource for brainstorming and problem-solving (Mueller & Oppenheimer, 2014).

In addition, Carter et al. (2017) mentioned that the best note-taking strategy for a particular student will depend on their learning style and preferences. However, all students can benefit from taking notes in a way that forces them to actively engage with the material. By taking notes, students can improve their focus, memory, understanding, and organization skills. With this, students are motivated to study. Some participants said that:

“Magstudy lang jud ko sir para di jud ko kayo mag lisod. Balik balik lang jud ko solve sir.” (I'll just study, sir, so I won't have a hard time. I keep practicing solving problems, sir) [Student 5]

“I always study math. I just study hard.” (Student 6)

“One thing that I did is to try and try to solve the problem for me to master the procedure.” (Student 7)

Since students are motivated to study and give importance to this, studying helps them learn the material. It is supported by the level of growth in MRS in the statement "Working harder can help those who perform poorly on problem-solving in mathematics," with a mean of 4.19, which signifies a high level. When students study, they are forced to think about the material and make connections between different concepts. This helps them better understand the material and remember it later. It also helps students develop their problem-solving and management skills. Carter et al. (2017) found that students who studied for longer periods were more likely to achieve higher grades. The researchers also found that students who studied more effectively were more likely to retain the information they learned. These studies suggest that studying is an important part of academic success.

However, it is important to note that there is no one-size-fits-all approach to studying. What works for one student may not work for another. The best way to study is to find a method that works for you and stick with it. Students mentioned that one of the methods that works for them is watching videos on YouTube.

“Ang akong ginabuhat jud sir kay mag watch ko og mga videos sa youtube. Daghan jud na mga videos sir. Mag balik pod ko tanaw sa basic concepts pod para makasabot jud ko. (What I'm doing, sir, is I watch videos on YouTube. There are really a lot of videos, sir. I also go back to review the basic concepts so that I can really understand) [Student 5]

“Ang ginabuhat nako para dili makalimot, magbasa basa lang jud ko always. Usahay mag watch ko sa youtube sad.” (What I do to not forget is I always read and sometimes I also watch on YouTube) [Student 2]

Students realize that watching videos on YouTube is one of the alternative ways to grasp the concepts of mathematics, and it helps them understand the lesson. It is supported by the level of growth in MRS in the statement "Math can be learned by anyone," with a mean of 4.52, which signifies a very high level. YouTube is a popular platform for learning, with millions of videos on a wide range of topics. Some students use YouTube videos to supplement their coursework, while others use them as a primary source of learning. Alves & Haddad (2018) found that students who watched YouTube videos about math concepts scored significantly higher on a math test than students who did not watch the videos. This is because the videos helped students visualize the concepts and understand them more deeply.

However, it is important to note that not all YouTube videos are created equal. Some videos are well-made and informative, while others are poorly made and can be misleading. It is important to choose videos from reliable sources and to evaluate them critically before using them to study (Park et al., 2017).

Theme 3: Self-conditioning

The last theme that appears is self-conditioning. It can be a challenging process, but it can be very rewarding. When students learn to control their thoughts and behaviors, they gain a greater sense of control over their lives. Students can also become more resilient to stress and setbacks, and they can achieve their goals more easily. Conditioning yourself can be a powerful tool for changing your behavior. By being specific and consistent and choosing rewards and punishments that are meaningful to you, you can increase the likelihood of success.

“Akong ginabuhat lang jud sir kay dapat makatulog jud ko og tarong og dapat maka study jud ko. I rest pod nako akong utok usahay para maka hunahuna ko og tarong saon pag solve.” (What I do is that I really need to sleep well and I should be able to study effectively. I also give my mind a rest sometimes so I can think properly about how to solve things) [Student 4]

“Prepare lang jud always.” (Just always be prepared) [Student 6]

"Gina encourage pod nako ako self na di maulaw mag ask sa classmates." (also encourage me not to be shy to ask my classmates) [Student 8]

It is supported by the level of growth in MRS in the statement "People have strategies to use when getting stuck trying to solve math problems," with a mean of 4.38, which signifies a very high level. The three emerging themes of coping mechanisms of the students in problem-solving conform to the Mathematics Resiliency Theory of Callaman (2023). According to the theory, both direct and indirect coping mechanisms have an impact on students' ability to remain resilient while learning mathematics. While social, time management and resourcefulness are examples of indirect coping strategies, direct coping techniques include compensation schemes.

In particular, the theme of seeking help from peers or teachers adheres to the indirect coping strategies for resilience. wherein students asked for help from teachers and peers in understanding mathematical concepts. While the themes of taking remedial measures and self-conditioning were forms of compensation schemes under direct coping strategies, When students face a variety of challenges in their academic journey, they need to seek help from peers, teachers, or other resources. Taking remedial measures can also be helpful,

as can self-conditioning. One of the best ways for students to get help is to reach out to their peers or teachers. Peers can often offer helpful advice and support, as they may have faced similar challenges in the past. Teachers can also provide guidance and assistance, and they may be able to offer extra help or resources.

In addition to seeking help from peers or teachers, students can also take remedial measures to improve their academic performance. This may involve attending tutoring sessions, joining a study group, or using online resources. Remedial measures can be especially helpful for students who are struggling with specific subjects.

Finally, students can also improve their academic performance by self-conditioning. This involves developing positive habits and attitudes that can help them stay motivated and focused. For example, students can create a study schedule and stick to it, or they can find a quiet place to study where they will not be interrupted. They can also reward themselves for their hard work, which can help them stay motivated (Sudhakar, 2023). Hence, seeking help from peers or teachers, taking remedial measures, and self-conditioning are all important strategies for students who are struggling academically. By using these strategies, students can improve their academic performance and reach their full potential.

Proposed Plan of Acton

Figure 2 presents the logic frame of the proposed plan of action. This plan of action focused on improving students' academic performance in mathematics. Four activities are being presented. The first activity is a seminar on problem-solving strategies. Problem-solving strategies can help students approach math problems systematically. This can help them feel more confident and in control when they are working on math problems. The students will be taught specific problem-solving strategies, such as breaking down problems into smaller steps, working backward from the answer, and using manipulatives.

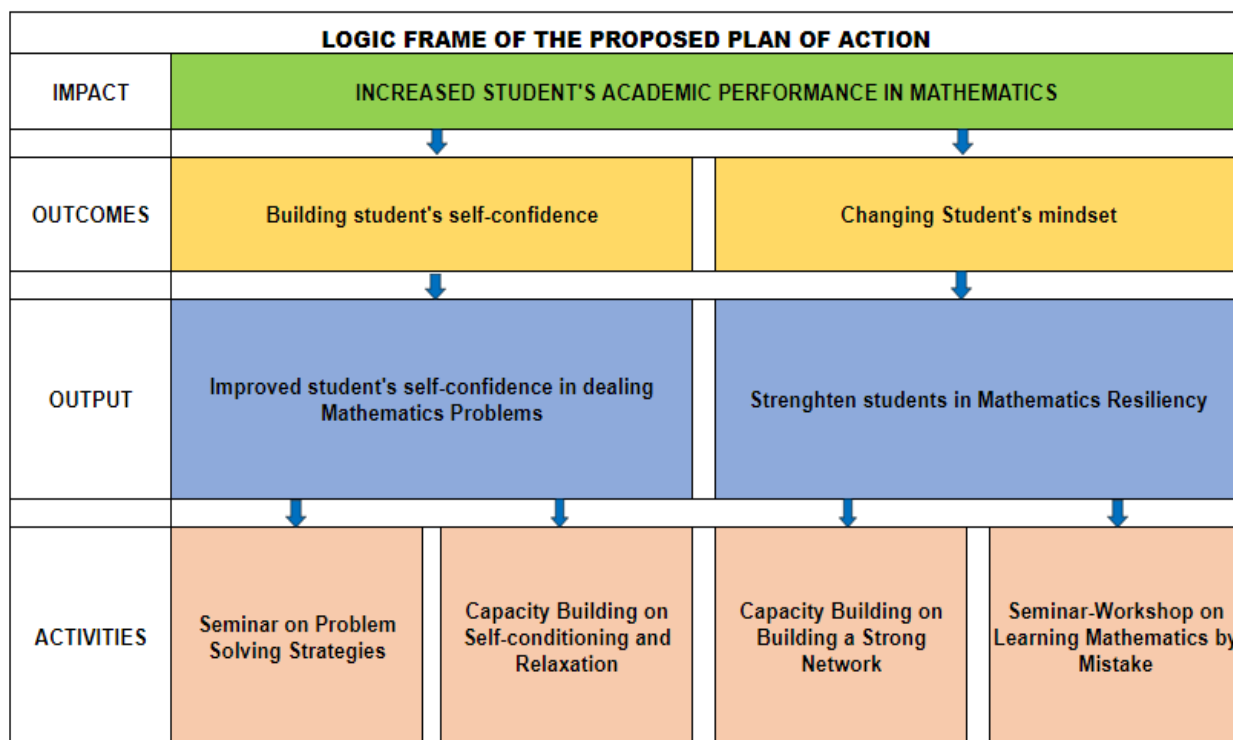


Figure 2. Logic frame of the proposed plan of action

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Another activity is capacity-building through self-conditioning and relaxation. Students will be taught relaxation techniques, such as deep breathing and visualization, to help them manage their anxiety during math tasks. They will be given opportunities to practice math problems at their own pace and level of difficulty.

Building student self-confidence is an important part of education. When students feel confident in their abilities, they are more likely to be engaged in learning and succeed in school.

The third activity is capacity building, which involves building a strong network. Students must surround themselves with people who believe in them and can offer support when they need it. This includes peers, classmates, friends, family, and teachers who can offer them support and encouragement. By providing students with opportunities to receive support, you can help them develop math resilience.

The last activity is a seminar workshop on learning mathematics by mistake. Mistakes are a natural part of learning, and they can be helpful for students to learn from. When students make mistakes, be sure to help them understand what went wrong and how they can improve. It helps the students view mistakes as opportunities to learn and use them as a chance to figure out what they did wrong and how to improve.

CONCLUSION

Senior high school students are afraid of failing in mathematics and they have a fixed mindset in solving problem solving mathematics. They might have had negative experiences with problem-solving in the past. Students can persevere in the face of challenges and continue to learn mathematics despite setbacks. This is a positive sign, as it suggests that the students are well-equipped to succeed in mathematics. Students who have difficulty solving mathematical problems often face challenges. They feel pressure to solve complex problems quickly and correctly. They struggle to memorize mathematical formulas and they have low confidence in their ability to perform mathematical tasks. Students who struggle with mathematics often use a variety of coping mechanisms to help them overcome their difficulties. These coping mechanisms include seeking help from others, taking remedial measures, and self-conditioning.

Based on the findings, the following recommendations are proposed to help future researchers, students, teachers, and school administrators: Help these students to develop a growth mindset and to overcome their fear of failure by providing them with positive reinforcement and opportunities to succeed. Teachers should encourage students to persevere in the face of challenges and to view setbacks as opportunities to learn. This will help students to develop mathematical resiliency and succeed in mathematics. Teachers should create a positive and supportive learning environment for students who struggle with math, and help them to develop their confidence and problem-solving skills. Students who struggle with mathematics should seek help from others, take remedial measures, and practice self-conditioning to overcome their difficulties.

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