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Assessment of Learning Style Preferences, Interest, and Problem-Solving Proficiency Among ABM Senior High School Students: A Basis for Intervention Strategy Development

Arnel B. Belza[1]; Vyrna R. Salcedo[2]

[1;2]National Teachers College

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ABSTRACT

This research aimed to investigate the preferred learning styles, the corresponding interest in mathematical problem-solving, and the current proficiency level of Grade 11 Accountancy, Business, and Management (ABM) students at Ninoy Aquino Senior High School, with the objective of formulating a necessary intervention plan.

The study employed an explanatory mixed-methods design, initiating with a quantitative phase that gathered data from thirty purposively selected students. Data collection involved the use of the VARK learning style questionnaire (Visual, Auditory, Read/Write, Kinesthetic), problem-solving interest surveys, and a validated assessment of problem-solving skills. The subsequent qualitative phase involved interviews with three ABM teachers and three students to obtain deeper perspectives on instructional strategies and classroom experiences.

Findings indicated that the majority of participants were categorized as Visual learners (42.86%), followed by Auditory learners (22.86%), Read/Write learners (20.00%), and Kinesthetic learners (14.29%). Overall, the problem-solving performance of the students Did Not Meet Expectations (63.43%). While the highest mean score was observed in Executing the Problem (72.38%), students displayed significant skill deficits in Understanding the Problem (47.62%) and in Developing and Verifying the Problem (both 68.57%). Furthermore, student feedback emphasized a desire for instructional activities that are more interactive, collaborative, and aligned with real-world applications.

Based on these results, a comprehensive intervention plan (Project IBA) is proposed. This plan focuses on differentiating instructional strategies to align mathematics education with students' identified learning preferences, thereby enhancing overall engagement and improving problem-solving proficiency, especially in the areas of comprehension and solution verification.

Keywords: *Explanatory Mixed-Methods, Learning Styles, Problem-Solving, VARK Model, Mathematics Education, Instructional Strategies.*

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CHAPTER ONE
INTRODUCTION

➢ *The Problem and its Background*

The Introduction, Study Background, Literature Review, Theoretical Framework, Conceptual Framework, Problem Statement (Research Questions), Significance of the Study, Study Scope and Limitations, and Definition of Terms are all included in this chapter.

Many students find mathematics to be one of the most difficult topics in school, especially when it comes to solving problems. When presented with challenging mathematics tasks, students often feel anxious tackling problems, and they frequently don't know where to start. For example, many students find it challenging to apply logical reasoning and computational skills when presented with real-world scenarios that involve numerical quantities and unit conversions. This challenge highlights a broader issue with students' preferred learning methods, mathematical enthusiasm, and problem-solving abilities, all of which are crucial to their ability to comprehend and retain mathematical concepts. Personal learning styles can either help or hinder students' engagement with the subject; therefore, the problem goes beyond academics to include how they approach problem-solving issues generally.

Following the implementation of the K–12 curriculum in the Philippines, Grades 11 and 12 now prioritize mathematics across various academic paths, particularly within the Accountancy, Business, and Management (ABM) strand. In the 2019–2020 academic year, While the ABM strand represented over 11% of the 3.2 million academic track enrollees during the 2019–2020 academic year (Department of Education, 2019), concerns remain regarding the efficacy of national teaching practices, particularly given the consistently low scores of Filipino students on international math assessments like PISA (Department of Education, 2019). Given the necessity to help students develop critical problem-solving skills to prepare for professions in management and business, the scenario suggests that the way mathematics is taught needs to be reevaluated. Given these challenges, learning styles, mathematical interest, and problem-solving skills are the three main components of this study. At ABM Senior High School, it examines students' level of problem-solving skills, enthusiasm in mathematics, and preferred learning modalities (visual, auditory, and kinesthetic). The study aims to understand these components and develop an intervention strategy that aligns teaching strategies with students' learning preferences and problem-solving needs to enhance students' comprehension and performance on math assessments. These observations will add to the continuing discussion on how to give kids worthwhile problem-solving exercises and give them the tools they need to succeed in school and in their future employment.

➢ *Background of the Study*

To solve problems, one must first grasp mathematical ideas and apply the best learning techniques to enhance understanding and memory. When it comes to taking in knowledge and picking up new skills, different students have different preferences. A student's performance in arithmetic problems will increase once they choose which learning style is most relevant to them.

One of the major factors influencing our lives is our learning style. It also influences and modifies how we behave and handle problems in our day-to-day lives. Individuals tend to choose distinct approaches to handling, interpreting, and engaging with information when they are learning (ŞİrİN & GÜzel, 2006). Thus, determining a person's preferred method of knowledge presentation and determining their own learning style requires an understanding of learning styles.

According to John Santrock (Intelligent Learning Styles, Module 5, 2022), learning style is the way a person chooses to use his abilities. This shows that learning styles are related to the way children learn, as well as the way they like to learn. As the way he likes, then someone in learning will often use it and find it easy when learning with it. However, several experts share learning styles through various perspectives including Deporter and Hernacki classifying learning styles based on how to receive information easily (modalities) into three types, namely visual, auditory, and kinesthetic. Children with the visual learning style type tend to be dominant in capturing learning through their eyes, while the auditory type is more dominant in capturing learning by hearing and the last is the kinesthetic type where children in acquiring knowledge (learning) are more dominant in capturing learning with visible physical movements. A student with multiple learning styles is versatile, meaning they can learn effectively through various methods such as watching a demonstration, listening to a lecture, reading a textbook, or participating in hands-on activities. This flexibility can enhance their ability to understand and retain information across different subjects and teaching methods. In this research, identifying the preferred learning style of the students in problem-solving such as; Visual, Auditory, or Kinesthetic Learning will help us to determine the best intervention plan or program that we can create and apply to our teaching style.

Understanding how students' learning preferences affect their ability to solve problems in the context of mathematics education—specifically, in Grade 11 ABM students at Ninoy Aquino Senior High School—represents a research gap. Although a lot of study has been done on learning styles, less has been done to examine how these preferences specifically affect Filipino students' ability to solve mathematical problems. This study intends to close this gap by determining the students' preferred

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learning style (visual, auditory, or kinesthetic) and creating an intervention strategy specifically designed to enhance problem-solving abilities in math classes. The results will provide important information about how learning styles might improve student performance and direct the creation of more efficient teaching methods.

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CHAPTER TWO
LITERATURE REVIEW

Research is required on teaching methods that support students' acquisition of mathematical problem-solving skills, which are an essential part of teaching mathematics. More research is still required to understand how teachers might assist their pupils with this difficult task, despite the fact that problem-solving research has advanced over time (Lester and Cai, 2016). Program for International Student Assessment (PISA) results indicate that just 53 percent of students from participating nations were able to solve issues that required more than simple deduction and the use of representations from many sources of information (OECD, 2019).

From the perspective of our students, every individual possesses a unique information processing system or learning style. For him, as well as educational designers and faculty, identifying pupils with specific learning styles and information processing systems may be useful. Most teacher-training programs can be built on the concept of learning styles. Teaching pupils about their preferred learning styles will help them learn more effectively and perform better. Learning about the different learning styles of pupils can help teachers employ a variety of teaching strategies (Louange, 2007).

Finding a learner's preferred learning style in relation to their learning characteristics, according to Louange (2007), can help them set and meet learning objectives, improve their use of instructional techniques, and maximize the effectiveness of their learning outcomes. Learning styles are taken into account by Ozgan & Alkan (2012) as a factor that influences how a person learns mathematics. To enhance learning, it is imperative to incorporate the teaching methodology with the student's preferred learning patterns.

In large-scale international mathematics tests, the Philippines has regularly done poorly. Based on national averages, the Philippines placed second to last in mathematics according to the results of the 2018 Programmed for International Student Assessment (PISA) (Department of Education, 2019). In particular, 26.9% of the students achieved Level 1 proficiency, 18.5% of the pupils exceeded the minimal criteria outlined in the PISA 2018 (i.e., Level 2 or higher), while the majority of the participating Filipino students (54.6%) scored below the lowest proficiency group, Level 1. When compared to their age group counterparts from other countries, this clearly indicates that a greater proportion of Filipino students fall short of international standards in terms of mathematics competency.

Students from public schools did not fare as well as those from private institutions, with means of 395 and 343, respectively. Emphasizing that learning style should consider the learner's perspective in addition to the teaching style is crucial in this study. As a result, the relationship between teaching and learning styles should take into account the preferences of the students for comprehending, learning, and solving math issues.

Educators who recognize and incorporate various learning styles into problem-solving tasks can help students strengthen their abilities to analyze, interpret, and solve complex issues. Understanding and applying learning styles can significantly impact the development and effectiveness of problem-solving skills.

➢ *The Three Different Learning Styles in Problem-Solving*

- *Visual Learning:*

Visual learning is a popular method of learning mathematics through problem-solving. Charts, graphs, and other visual aids are the most effective ways to graphically express data and information, and they are particularly appealing to visual learners. It makes sense to use images and diagrams to visualize mathematical issues and give concrete form to abstract ideas. These pupils can maintain mental organization by using color-coded materials or visual organizers. To effectively absorb and retain knowledge, students who practice visual thinking connect words, concepts, and ideas to images. This type of learning also involves the use of visual learning techniques. We use interactive visual tools to visually display information. Visual learning is a powerful technique based on the cognitive science of human learning, according to Williams' 2009 study on the subject and its impact on pupils. The practice of employing visual aids to concretize abstract notions is supported by research in areas such as instruction, cognition, and child development.

- *Auditory Learning:*

Another effective method for learning how to solve mathematical puzzles is auditory learning. To help auditory learners assimilate information, speaking and listening are employed. These people could find it helpful to have a peer explain their thinking, watch movies or listen to podcasts that teach mathematical principles, or read arithmetic problems aloud. By employing their auditory senses, these kids are better able to recall and comprehend mathematical material. For students who learn best by hearing, the teacher's explanation of the mathematical content is essential (Rahman and Ahmar, 2017). To aid their memory, they also frequently repeat mathematical concepts, like formulas.

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- *Kinesthetic Learning:*

However, when it comes to learning new concepts, kinesthetic learners like active learning and hands-on experiences. By utilizing manipulatives like blocks or counters, enacting word problems, or integrating movement into their study regimen, kinesthetic learners can visualize mathematical issues graphically. Kinesthetic learners integrate movement and tactile experiences with math problem-solving to enhance their understanding and proficiency of mathematical concepts. When learning mathematics, students with a kinesthetic learning style are more likely to move or touch, such as by holding things or moving their bodies (Irvine, 2019). As a result, they tend to be less cautious when answering mathematical problems.

Numerous research on these three distinct learning styles in the context of solving mathematical problems only serves to highlight the critical importance of students' preferences in the problem-solving process. It also shows how effective teaching strategies can be if they consider and utilize the chosen learning style of the students.

- *Synthesis:*

Understanding how students solve problems and how their preferred learning styles might improve students' understanding, competency, and retention when it comes to solving mathematical problems is the main objective of this study (Ozgan & Alkan, 2012). Another pillar of this study that attempts to bridge the gap noted by Louange (2007) is the enhancement of teaching materials by teachers as part of the intervention strategy.

➢ *Theoretical Framework*

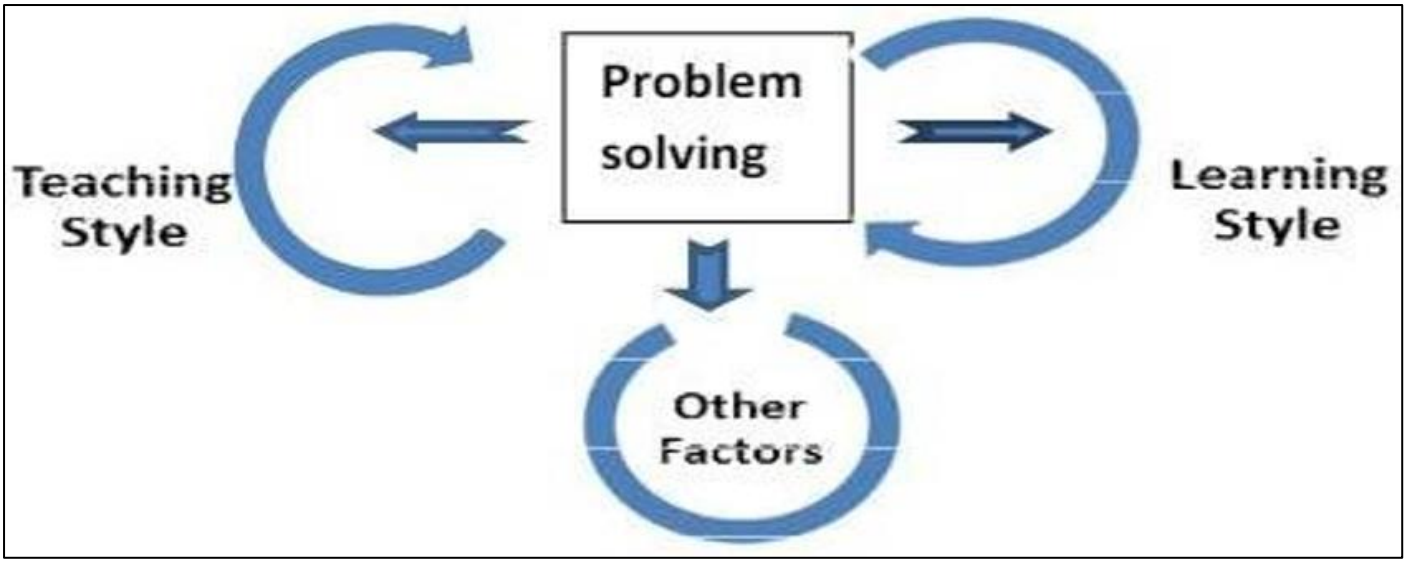

Fig 1 Theoretical Framework

- *The Relationship between Learning Styles, Teaching Styles, and Problem Solving.*

The study's hypothesis states that in order for students to enhance their understanding and problem-solving skills, teaching strategies and learning styles should consider their preferences for picking up problem-solving procedures.

The development and efficacy of problem-solving abilities can be strongly impacted by an understanding of and application of learning styles. By identifying and integrating different learning styles into problem-solving exercises, teachers can support students in developing their capacity to evaluate, comprehend, and resolve difficult problems.

The VARK or VAK model, created by Neil D. Fleming, is one of the most popular and widely applied models of learning styles, and it forms the basis of this inquiry.

According to Fleming, students can improve their learning by focusing on the mode that works best for them, that is, by identifying their preferred learning style using the VAK model. Stated differently, the learning styles hypothesis maintains that a fit between learning styles and instructional models increases learning. According to the VAK/VARK models, this would entail adjusting education to the sensory needs of the pupils. For instance, a visual learner would receive instruction that is visually oriented, an auditory learner would receive instruction that is verbal, and so on.

Wickremesinghe and Hettiarachchi claim that the VAK theory is the most successful at quickening the learning community because its advantages and principles go well beyond its initial uses to encompass all forms of learning and development.

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➢ *Conceptual Framework*

The study's conceptual framework, which was influenced by the Fleming VAK model, is shown in the image below. This demonstrates that the students at ABM Senior High School in Grade 11 are the independent variables and that their preferred learning styles—visual, auditory, and kinesthetic—will be ascertained through the use of a standardized learning style questionnaire. The findings of their quiz on the General Mathematics assessment tool will be used to analyze their performance in the subjectss and validity testing should be conducted.

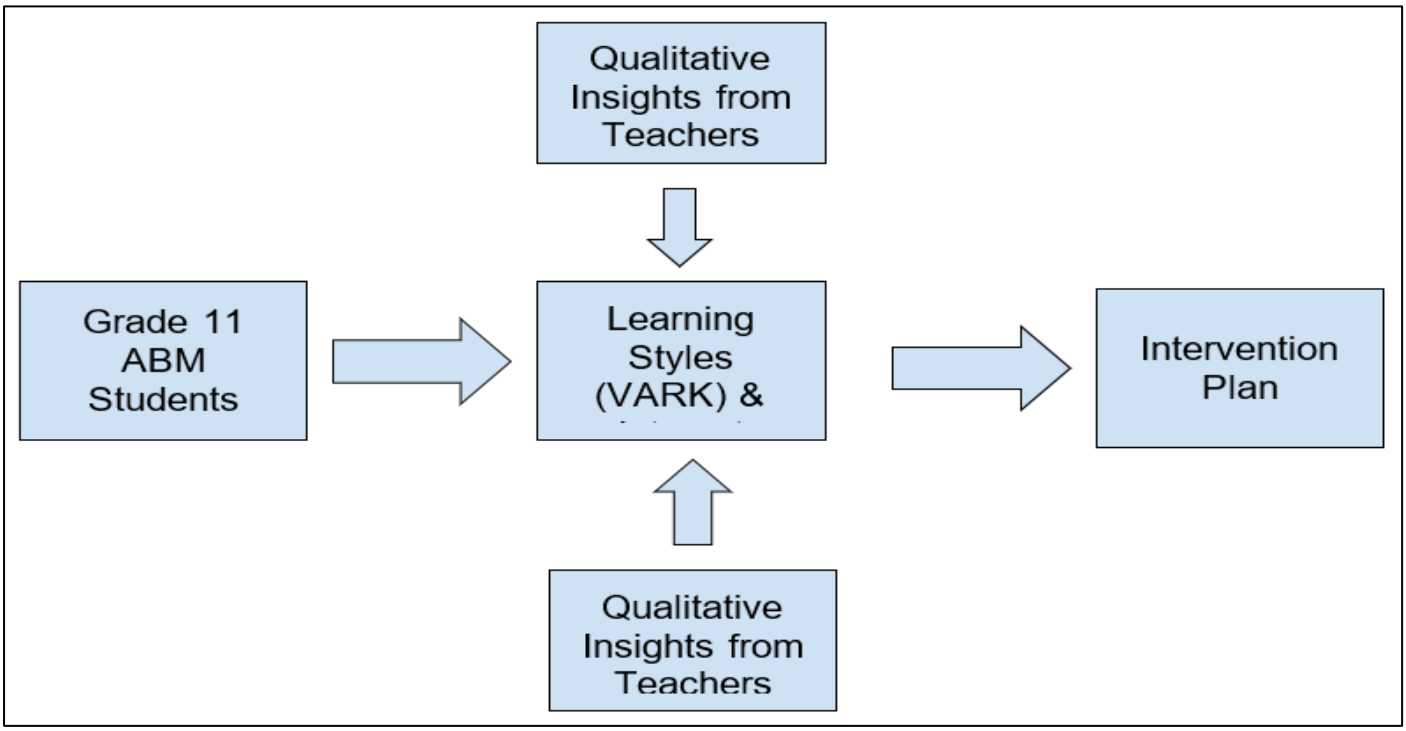

Fig 2 Conceptual Framework based on the VAK Mode

This conceptual framework shows the flow of this research in which the preferred learning styles of the student should help them to exhibit good performance in solving Mathematical problems effectively and efficiently.

➢ *Statement of the Problem*

The purpose of this study is to determine the preferred learning styles of Grade 11 ABM Senior High School Students and will serve as a basis for creating an intervention plan or program to increase the level of their comprehension, retention, and competency in problem-solving. In this study, the result should answer the following questions below:

- What is the preferred learning style(s) and interest of every ABM student in terms of problem-solving?
- What is the level of problem-solving skills perceived by the Grade 11 ABM student in terms of:

✓ Understanding the problem
✓ Developing the problem
✓ Executing the problem
✓ Verifying the problem

- How may the findings be utilized/applied in the teaching styles of ABM teachers in terms of problem-solving?

➢ *Significance of the Study*

The goal of this study is to identify the most effective learning technique that Ninoy Aquino Senior High School's Grade 11 ABM students can learn through problem-solving instruction. Additionally, an intervention plan or program will be developed as a result of this study to raise participants' levels of comprehension, competency, and retention when it comes to solving mathematical puzzles. Ninoy Aquino Senior High School math teachers can also offer advice and resources to support them in delivering a successful and productive teaching approach.

- *Learner:*

Students in Grade 11 ABM are able to communicate their preferred learning styles, which will subsequently demonstrate their intense curiosity in solving problems without considering or sensing the difficulty of the mathematical problems. Because

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their preferred learning style is being taken into account and applied to their teacher's teaching methods, students will also easily understand the mathematical problem and develop and improve their critical thinking skills.

- *Math Teachers:*

Teachers of mathematics will have an understanding of how to make mathematical problems simple for their pupils to comprehend and solve. Additionally, they can enhance the quality of their problem-solving instruction, which will benefit their students' performance. In order to improve active involvement in the classroom and motivate students to pay attention, teachers should incorporate innovative instructional resources into their pedagogical approaches.

- *School:*

Developing an intervention strategy or program for teachers and students to raise their levels of understanding, retention, and problem-solving ability is one of the study's objectives.

- *Parents:*

This will demonstrate how various learning styles might impact students' ability to solve math problems and comprehend how their own child learns and is supported at home. Collaborating with educators, parents can provide a home and school atmosphere that fosters the development of their kids' excellent problem-solving abilities.

- *Future Researchers:*

This will enable further research and the development of even more effective approaches to teaching problem-solving techniques. Additionally, it will expand on their current understanding of how arithmetic is learned by pupils and develop new, more efficient methods for teaching problem-solving techniques.

➢ *Scope and Delimitation of the Study*

The scope of this study is only limited to the Grade 11 ABM students of Ninoy Aquino Senior High School to correspond to its purpose in determining the preferred learning style of the students in solving mathematical problems which leads to the basis of creating an intervention plan or program to improve the comprehension, competency, and retention in terms of problem-solving.

The study will mainly focus on the preferences of the students on the learning styles that give them the easiest way of understanding, help them develop critical thinking, and provide solutions to every mathematical question.

This study will be conducted with limited amounts of financial resources and a just-time framework.

- *Definition of Terms*

Below are the terminologies that were used in this study and their descriptions.

✓ *Mathematics:* The science of quantity, space, and numbers in abstract form. Pure mathematics is the study of mathematics in isolation. Applied mathematics, on the other hand, is the study of mathematics in relation to other fields like physics and engineering.
✓ *Problem Solving:* Figuring out how to use your existing knowledge and abilities to solve new kinds of mathematical issues.
✓ *Learning Styles:* An individual's specific learning style refers to their favored approach to acquiring, processing, comprehending, and recalling information. John Santrock (2022), in *Intelligent Learning Styles*, further defines this concept as the manner in which a person chooses to utilize their inherent abilities.
✓ *Teaching Styles:* These are the overarching ideas, pedagogical directives, and instructional strategies that are applied in student instruction.
✓ *Visual Learning Styles:* It describes a style of instruction in which pupils use visual aids to help them retain and comprehend the subject matter. Visual learners are highly color-oriented, possess a strong sense of proportion and alignment, have no trouble visualizing objects, and can imagine images with ease.
✓ *Auditory Learning Styles:* This indicates that listening is the best way for a pupil to learn. They would rather hear project instructions than follow instructions from a textbook, or they would rather listen to a lecture than go through an assignment.
✓ *Comprehension:* It is the ability, or the act, of understanding something. The ability to complete a task successfully or sufficiently is known as competency. Retention refers to the process of retaining knowledge.
✓ *Intervention Plan:* It acts as a manual to help pupils reach certain goals or advance their skills. In other words, it's a strategy. An intervention plan typically consists of an objective, an intervention strategy, a schedule, and a way to track progress.

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CHAPTER THREE
METHODOLOGY

This section covers the study design, study participants, population and sampling, research instrument, data collection process, and data analysis.

- *Research Design*

This research employed an explanatory mixed-methods approach, including quantitative and qualitative data, to gain a comprehensive understanding of the preferred learning styles and problem-solving skills of Ninoy Aquino Senior High School Grade 11 ABM students. The quantitative component included a survey designed to determine the students' interest in problem-solving and preferred learning styles (visual, auditory, and kinesthetic). Additionally, the quantitative component included a validated and pilot-tested problem-solving test that used a standardized quiz integrated into the survey form to assess the students' problem-solving abilities. The survey and test results provided a gauge of the students' preferred learning methods, mathematical curiosity, and problem-solving skills.

The study's qualitative approach included interviewing three ABM students and three experienced math instructors to support the quantitative results. The opinions of the teachers impacted the development of instructional strategies that better suited the students' preferred methods of learning to better align instruction with their requirements. The results provided the basis for creating an intervention technique aimed at improving students' understanding and retention of mathematical concepts. Combining quantitative and qualitative data enhanced the validity and dependability of the results.

The survey results showed patterns in students' learning preferences and problem-solving abilities, but the qualitative data from interviews provided more profound insights into the experiences and viewpoints of both teachers and students regarding the teaching and learning process. By combining these insights, the study developed an effective intervention plan that aimed to address each student's unique learning needs and enhance their problem-solving abilities.

- *Population and Sampling*

The quantitative section of the study, which employed total enumeration sampling, involved thirty Grade 11 ABM students. These students completed an interest test, a problem-solving achievement skills test, and the VARK learning style questionnaire to assess their learning preferences, interest levels, and problem-solving capabilities. To address any questions or concerns, the researcher held an information session after school or during lunch breaks. This procedure ensured that potential volunteers fully understood the study's objectives and methods.

In addition to the student respondents, the researcher conducted interviews with three math professors at senior high schools to gather expert opinions. These teachers helped develop an appropriate intervention plan based on their observations of students' problem-solving abilities and their experiences using a range of instructional strategies. We also conducted interviews with three students to validate the findings and gather their perspectives on the intervention approach. Their input was crucial in confirming the effectiveness of the recommended approach and ensuring that it considered their learning preferences and challenges. We selected these senior high school math teachers with master's degrees due to their willingness and ability to participate in the study. The chosen students were Grade 11 student leaders who had a lot of interaction with the study participants, which enabled them to provide insightful and thorough answers. The mixed-methods technique, which incorporated survey data from students and teacher interview data, allowed the researcher to perform a thorough and effective examination of the elements influencing problem-solving skills.

- *Respondents of the Study*

This study focused on two participant groups, starting with a class of thirty students from the ABM strand at Ninoy Aquino Senior High School for the 2024–2025 academic year. These students needed to have strong problem-solving skills to comprehend management strategies, accounting concepts, and other important business ideas. As they prepared for business professions, the students' analytical and critical thinking abilities were crucial for success in fields like marketing, financial management, and entrepreneurship. Many of these students struggled to solve problems, despite the expectation that they could handle challenging business difficulties effectively. Their lack of awareness of their learning preferences may have contributed to this challenge. The insights they gained from their experiences were essential in developing an intervention program designed to enhance their understanding and memory of problem-solving techniques. The team aimed to create a tailored curriculum that enhanced students' problem-solving skills and matched their unique learning preferences by collaborating with experts who provided priceless expertise.

- *Research Instrument*

The instrument has five (5) parts which include (1) a letter to the respondents' parents, (2) a demographic profile, (3) simple problem-solving skills, (4) a learning styles test, and (5) interest questionnaire. Below is the information about the tool to be administered to the students:

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- *Part 1:*

The problem-solving ability of Grade 11 ABM students in general mathematics will be evaluated via a quantitative problem-solving abilities test. Experts with advanced degrees in the subject validated the tool, awarding perfect ratings for attainment, direction, clarity, adequateness, attainment, objective, scale, and evaluation rating. Since the study targets difficult learners, it only included five (5) things at first. However, validators stressed the need for more items and contributed suggestions on how the problems' terms may be improved, therefore ten (10) items were constructed as tests of problem-solving skills. Reducing bias and ensuring consistency and fairness in evaluations can be achieved by establishing explicit assessment standards and rubrics. The questionnaires were disseminated by the researchers via paper copies for participants who chose a hard copy format as well as online survey platforms. The completed surveys were kept in a safe place that was easily accessible, and the information was put into a spreadsheet so that it could be examined. The researcher followed up with participants by phone and email to promote completion in cases where they did not respond completely, and I used multiple imputation approaches to address missing data to maintain the dataset's integrity.

Pilot testing of this test was conducted with current grade 11 ABM students who share the same characteristics as the study's target participants. The exam comprised fifteen-word questions that were linked to the curriculum for general mathematics. A Cronbach alpha test was performed to see if every item measured the intended construct. Five (5) items, including item numbers 2, 4, 6, 8, and 10, have a negative correlation, as indicated by the initial analysis, which resulted in a poor dependability index value of 0.35. The dependability increased to an acceptable level of 0.70 after being eliminated; as a result, the final problem-solving exam consisted of just 10 items. The appendices section contains the validators' curriculum vitae and statistics figures pertinent to reliability analysis.

Table 1 Reliability Analysis

Variable	Number of Items	Reliability Index	Interpretation
Problem- Solving Skills	10	.70	Acceptable

- *Part 2:*

The VARK (Visual, Auditory, Read/Write, and Kinesthetic) learning type questionnaire was employed. This standardized tool, developed by VARK Learn Limited, consists of sixteen items that gauge each learner's preferred method of learning. On its website, it states that it fosters metacognition, which helps students become more self-aware and discover their preferred learning styles. According to Peyman et al. (2014), experts have acknowledged the validity of the tool, which has Cronbach's alpha value coefficients of 0.86. The email answer that is attached to this publication serves as proof that the organization gave their approval for the use of VARK in this study. The standardized nature of the test prevents any component changes, making pilot testing impractical. Additionally, the study's interest survey included questions intended to gauge students' motivation, engagement, and preferred methods of learning in relation to mathematical problem-solving. It assesses students' confidence and enthusiasm when taking on problem-solving tasks in addition to their overall interest in mathematics. The study also identifies their preferred learning styles, which include hands-on activities, visual aids, and aural learning. To ascertain how learning preferences affect students' zeal and efficacy in solving mathematical issues, it also evaluates their interest in applying mathematical problem-solving to real-world situations, such as business-related obstacles.

- *Part 3:*

Students were asked to elaborate on their experiences and difficulties using open-ended questions. The outcomes will serve as the foundation for developing an intervention strategy or program aimed at raising the students' comprehension and retention of problem-solving techniques.

The General Math Teachers at Malabon National High School, the Senior High School Faculty in Mathematics at the University of Santo Tomas, and the Math Teachers from Kaunlaran High School in Navotas City were interviewed as part of the second data collection phase. The purpose of this interview process is to identify the common problems that students face in their problem-solving abilities based on verifiable evidence (student work, classroom observations), and to get their perspectives on how their teaching methods or styles affect the students' interest and proficiency in solving mathematical problems. The open-ended surveys were evaluated by qualified mathematics teachers from Kaunlaran High School in Navotas City, Malabon National High School, and the faculty teachers of the University of Santo Tomas Senior High School. The appendix contained their biographies and remarks. The appendix on ethics review contained their biographies and remarks.

➢ *Data Gathering and Procedure*

The data-gathering protocol involved multiple steps to ensure ethical and comprehensive data collection from all participants. Initially, formal permissions were secured from the School Superintendent of Malabon City, the School Principal of Ninoy Aquino Senior High School, and the parents, teachers, and students involved. All stakeholders received clear communication regarding the research objectives.The study also ensured that participants' identity, privacy, and confidentiality were always protected. (Nishiyama, n.d)The VARK learning styles questionnaire and the problem-solving skills test were administered as part of the quantitative component to all Grade 11 ABM students who willingly agreed to participate. We assured

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these students that their participation would not impact their grades. The researcher gave the students clear instructions and enough time to complete the assessments. The school administration selected the testing site to minimize disruptions and preserve uniformity. Additionally, the SHS ABM math teachers in Malabon City received a survey. The results allowed for a thorough understanding of the teachers' pedagogical approaches and perspectives on how students' learning styles affect their ability to solve problems. Descriptive statistics (frequency, percentage, weighted mean, and standard deviation) were used to analyze quantitative data and describe the survey and test outcomes. Thematic analysis was used concurrently to find recurring patterns and themes in the qualitative data from teachers' observations and open-ended survey questions. This practice allowed for a more thorough and nuanced knowledge of the factors influencing students' learning preferences and problem-solving skills. Finally, we triangulated the quantitative and qualitative data to compare and contrast the findings and identify areas of agreement and disagreement. This validation process ensured a thorough understanding of the problem-solving abilities and preferred learning methods of Grade 11 ABM students. These findings prompted the creation of an educational program that took into account the students' chosen learning styles while simultaneously addressing the challenges identified in their approaches to problem-solving. The teaching methods, exercises, and materials in this program could be used by general mathematics teachers in Malabon City to help their Grade 11 ABM students strengthen their problem-solving skills.

- *Data Analysis*

This was done in order to provide an overview of the distribution of learning preferences and degrees of interest in problem-solving. The quantitative data from the interest and favorite learning style surveys were subjected to frequency and percentage analyses. Utilizing the mean and standard deviation of the data obtained from the problem-solving abilities test, we were able to assess the students' ability to solve mathematical problems. The qualitative information that was gathered from the observations of the teachers and the open-ended questions was also subjected to thematic analysis in order to facilitate the identification of recurrent themes and patterns. Having a greater understanding of how the instructional strategies and learning styles of students influenced the problem-solving abilities of students was made feasible as a result of these discoveries.

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CHAPTER FOUR
RESULTS AND DISCUSSIONS

➢ *Preferred Learning Style Based on VARK (Visual, Auditory, Read or Write, and Kinesthetic) and Interest of Respondents*

For the purpose of enhancing academic success, it is necessary to have an understanding of how individuals learn, and the VARK model is a helpful instrument for determining individual preferences toward learning. Kinesthetic, visual, auditory, and read/write reading and writing are the four categories that students are placed into by VARK. When it comes to activities that involve problem-solving, the way in which individuals approach these activities can be significantly impacted by the fact that every group represents a preferred method of taking in and processing information. In the context of the problem-solving qualities that were investigated in this study, gaining an understanding of how the decisions that learners make regarding their VARK can have an effect on their strengths and weaknesses can provide valuable insights. Especially for students who, due to their individual learning styles, struggle with particular phases of problem-solving, frequency and percentage statistics can be utilized to indicate regions that might require additional assistance. This is especially helpful for students who are struggling with specific challenges. A structured survey was utilized to determine the degree of interest that students had in the study. The survey inquired about the students' chosen topics, levels of confidence, learning methods, and the frequency with which they solved problems. Additionally, three students participated in interviews to discuss their particular experiences with problem-solving exercises. These interviews were conducted in addition to interviews. The data were improved as a result of these interviews because they provided a more in-depth insight of how students approach problem-solving and how their learning preferences influence the approaches they use to solve problems.

Table 2 Learning Styles

VARK Preference	Description	Frequency	Percentage
Visual	Prefers to see and use images, diagrams, charts, and other visual representations to understand information.	15	42.86%
Auditory	Prefers to hear and learn through listening, such as through lectures, discussions, and audio resources.	8	22.86%
Kinesthetic	Prefers learning through hands-on activities and physical movement, often through real-world applications.	5	14.29%
Read/Write	Prefers learning through written words, using reading and writing tasks such as notes, textbooks, and written instructions.	7	20.00%

The distribution of 35 respondents' learning preferences according to the VARK model is shown in the table. The largest group, 42.86%, described as visual learners, meaning they prefer charts, diagrams, and pictures to help them understand information. This demonstrates how visual aids have the ability to greatly improve comprehension for this population.

22.86% of respondents identified as auditory learners, who prefer auditory approaches and are likely to gain from lectures, talks, or podcasts. Role-playing or experiments could enhance the educational experience of kinesthetic learners, who make up 14.29% of the student body and thrive on hands-on activities and physical involvement. Last but not least, 20.00% of the group are Read/Write learners, who prefer to learn by reading and writing and who would do well with notes, textbooks, and written assignments. The findings suggest that the group possessed a variety of preferences for learning, which underscores the necessity of personalizing instructional strategies that incorporate kinesthetic, visual, auditory, and reading/writing skills in order to maximize the quantity of knowledge that students are able to gain. Specifically with regard to their ability to discover solutions to problems, the research that has been done on learning styles reveals that the preferences of students on how they take in and process information might have an effect on their academic performance. This is especially true when it comes to the ability to find answers to problems. In 2019, Bakay and Bacay carried out a study that studied the learning preferences of students in the eleventh grade and how those choices impacted the students' ability to solve mathematical problems. The study was done in the United States. The findings suggested that there was no significant association between the learning styles of the students and the degree to which they were able to solve problems. This was despite the fact that the majority of students preferred visual learning since it was easier for them to understand. The findings suggest that although there is a significant relationship between learning styles and the capacity to solve mathematical problems, there may not be a strong association between the two. This conclusion may be drawn from the findings. On the other hand, the research that was carried out by Bosman and Schulze (2018) investigated the connection that exists between the arithmetic abilities of secondary school students and the learning strategies that they favor the most. During the course of their analysis, they came to the conclusion that individual learning styles, in particular kinesthetic and visual learning styles, were favorably connected with mathematical aptitude. On the other hand, this demonstrates the potential advantages that could be obtained by adapting instructional strategies to the preferred learning styles of students in order to improve academic achievement.

There are various prevailing learning styles that may be present among students attending ABM Senior High School (SHS). Visual learners, for instance, perform very well when they are engaging in the process of learning with charts, graphs, and infographics. For those who learn best by hearing, discussions and lectures may be beneficial; but, for those who learn best

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through kinesthetic means, practical exercises and real-world problem-solving situations are appropriate. A study by López and Salas (2021) found that using multimodal learning strategies—which include visual, aural, and kinesthetic components—led to more successful learning outcomes. López and Salas accomplished this by catering to the various specific needs of students. Although it would be tempting to focus just on the learning style that is more prevalent in a classroom setting, research suggests that a multimodal approach is more effective. According to research by Williams and Powell (2020), a teaching approach that integrates all VARK modalities—visual, auditory, reading/writing, and kinesthetic—helps students develop their overall problem-solving abilities, even though it is advantageous to recognize students' main learning preferences. By exposing students to a variety of techniques, this method enhances their educational experiences and meets a range of cognitive needs.

Table 3 Interest in Learning More About Problem-Solving

Interest Level	Frequency	Percentage (%)
Very Interested	6	20.00%
Interested	7	23.33%
Neutral	9	30.00%
Uninterested	5	16.67%
Very Uninterested	3	10.00%

The results show that 43.33% of students showed a strong desire to learn more about problem-solving techniques. On the other hand, 30% took a neutral position, while 26.67% (which fall into the Uninterested and Very Uninterested groups) showed little to no interest. According to this finding, some students might not yet understand how problem-solving techniques can benefit them in their day-to-day activities, which could be lowering their engagement levels.

There is a strong link between how much students like resolving problems and how important they think the skills are. According to the Organization for Economic Co-operation and Development (OECD), children perform better on homework that aligns with their daily activities. Rahman and Ahmar (2017) came to the same conclusions. Rahman and Ahmar (2017) say that students are more likely to solve problems when the way they learn fits with their hobbies. The study's results back up these ideas, showing that teaching kids how to solve problems should be more tailored to their needs and the things they do in their daily lives. If we aim to increase students' interest in problem-solving, we should incorporate hands-on activities and real-life examples into our lessons. The goal of these tasks is to help you understand and use complex ideas. Case studies, game-based learning, and real-life problem-solving tasks are all excellent ways for teachers to keep us interested and motivated.

Table 4 Confidence in Problem-Solving

Confidence Level	Frequency	Percentage (%)
Very Confident	4	13.33%
Confident	8	26.67%
Neutral	9	30.00%
Unconfident	5	16.67%
Very Unconfident	4	13.33%

There is a wide range in how confident students are in their ability to solve problems. About 40% of students say they are secure or very confident, which means they find it easy to solve problems. 30%, on the other hand, don't have an opinion, which suggests they might need more help. The fact that the other 30% of students feel uncertain or very insecure shows how important focused help techniques are for helping these students get better. Self-efficacy is consistently shown to be a major determinant of problem-solving success. Lester and Cai (2016) observed that many students possess the necessary skills but lack the confidence required for successful application. Furthermore, the OECD (2019) indicated that students reporting low confidence in mathematical skills often avoid complex problem-solving challenges entirely. Rahman and Ahmar (2017) argue that providing structured problem-solving experiences and continuous feedback can significantly improve student confidence.

To increase students' confidence in problem-solving, a scaffolded learning approach should be adopted. This could involve step-by-step guidance, peer mentorship, and structured problem-solving frameworks that gradually increase in complexity. Additionally, providing immediate feedback and celebrating small successes may help students develop a stronger sense of confidence over time.

Table 5 Preferred Approach to Problem-Solving

Problem-Solving Approach	Frequency	Percentage (%)
Analyzing all available data before making a decision	5	16.67%
Brainstorming ideas with peers	5	16.67%
Trying different solutions until finding one that works	6	20.00%
Seeking advice or strategies from others	7	23.33%
Other	7	23.33%

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Students have shared a variety of strategies for solving problems. Interestingly, many of them tend to seek advice from others, with about 23.33% opting for this approach, while around 20% prefer experimenting with different solutions. Some students like to analyze data before making a decision, making up 16.67% of the responses, and another 16.67% enjoy brainstorming ideas with their peers. This range of preferences highlights the importance of providing diverse ways of teaching problem-solving skills.

Research shows that the methods students use can vary widely, often depending on their individual learning styles and prior experiences. For instance, Louange (2007) pointed out that students really strengthen their problem-solving abilities when they're given the freedom to try out various techniques. Additionally, Vygotsky's sociocultural theory (1978) supports the idea that collaborative learning can enhance understanding, as students often learn better when they engage in discussions and work together to solve problems.

To meet the different needs of students, it would be beneficial for the program to combine both collaborative and independent problem-solving exercises. Activities like group brainstorming sessions, structured data analyses, and simulations of real-world problems can provide valuable opportunities for students to sharpen their problem-solving skills in engaging and meaningful ways.

Table 6 Preferred Problem-Solving Setting

Setting	Frequency	Percentage (%)
Working Alone	6	20.00%
Collaborating with a Group	8	26.67%
In a Structured Classroom Environment	7	23.33%
In a Competitive Scenario	5	16.67%
Other	4	13.33%

The data reveals some interesting insights about student preferences when it comes to problem-solving. Group collaboration stands out as the most popular option, with 26.67% of students opting for it. Close behind are structured classroom environments, which attract 23.33% of learners. It's noteworthy that 20% prefer to tackle problems on their own, indicating that some students really thrive in independent settings.

Research by Ozgan and Alkan (2012) supports the idea that collaborative environments can boost students' problem-solving skills. Engaging in discussions with peers not only fosters critical thinking but also sparks creativity. On the flip side, Williams (2009) highlights that "some students benefit more from self-paced problem-solving", allowing them to delve deeper into the material. These findings suggest that a one-size-fits-all approach isn't ideal.

To accommodate various learning preferences, the program should mix group activities with tasks that allow for independent work. By promoting collaboration among peers while also giving students the space for individual reflection, we can create a more inclusive and supportive learning environment.

Table 7 Perceived Importance of Problem-Solving in Career

Importance Level	Frequency	Percentage (%)
Extremely Important	8	26.67%
Very Important	7	23.33%
Somewhat Important	7	23.33%
Not Very Important	5	16.67%
Not Important at All	3	10.00%

The data reveal that a significant majority of students—73.33%—acknowledge the importance of problem-solving in their careers. Among them, 26.67% consider it extremely important, while 23.33% rate it as very important or somewhat important. This suggests that most students understand the value of problem-solving skills in their professional lives. However, there's a noteworthy portion, 16.67%, who think it isn't very important, and another 10% who see it as entirely irrelevant. This highlights a potential gap in understanding how critical problem-solving can be for success in the workplace. It is obvious that the link between problem-solving education and its practical applications needs to be strengthened.

We might make this seem more important to the kids if we finish it. For today's jobs, problem-solving skills are essential. Critical thinking and problem-solving skills are critical to companies, according to the OECD (2019). Companies view these skills as essential for workers to adapt to evolving job markets. Students who are adept at solving problems are also better prepared to do well at work where things are difficult and move quickly, according to Lester and Cai (2016). Rahman and Ahmar (2017) say that students who learn how to solve problems in a structured way become more bold and adaptable, which makes them in demand by employers. Like our study, they show how important it is to teach kids how to solve problems to get them ready for the

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future. Students should learn how to solve problems in the real world to fix the gap in priorities. Case studies, models, or projects that are based on real events from the workplace could help you get these skills and use them in different jobs. Students can also learn how to resolve problems in the real world through training programs, internships, and talks by professionals. Giving them more useful and job-related experiences can help them understand how important it is to learn how to solve problems for their future growth.

Table 8 Preferred Learning Style for Problem-Solving

Learning Style	Frequency	Percentage
Strongly Prefer Visual Aids	5	16.67%
Prefer Visual Aids	7	23.33%
No Preference	8	26.67%
Prefer Written Explanations	6	20.00%
Strongly Prefer Written Explanations	4	13.33%

The results indicate that students have different views for how to solve problems. 23.33% are leaning toward visual aids, and 16.67% really like them. However, 26.67% don't have a strong taste and may be able to adapt to other methods. This underscores the importance of using charts and graphs in lessons. Additionally, 20% prefer written explanations, and 13.33% have a strong preference for text, highlighting the importance of structured materials.

Research backs up the idea of tailoring teaching to these preferences. Louange (2007) found that students retain information better when instruction matches their learning style. Williams (2009) points out that visual learners benefit from graphics, while textual learners thrive on detailed written instructions. The OECD (2019) adds that “using various learning modalities can lead to better outcomes”.

To effectively teach problem-solving, it's crucial to blend visual and written resources. Interactive diagrams, videos, and structured reading materials give students flexibility. Offering choices—like visual demonstrations or text-based case studies—can boost engagement and understanding in the learning process.

Table 9 Discussion of Problem-Solving Strategies with Others

Frequency of Discussion	Frequency	Percentage
Very Often	6	20.00%
Often	5	16.67%
Occasionally	9	30.00%
Rarely	7	23.33%
Never	3	10.00%

The results show a variance among students in how often they discuss problem-solving strategies with peers. Around 30% of them engage in these discussions occasionally, while 20% do so very often, and about 16.67% partake frequently. This suggests that while some students appreciate collaborative discussions, many aren't consistent about it. On the other hand, 23.33% rarely engage in such conversations, and 10% never do, indicating that some might prefer working alone or lack chances for structured interaction. These insights point to a need for fostering more peer interactions to boost collaborative problem-solving skills.

Collaborative learning is vital for developing problem-solving abilities. Vygotsky’s sociocultural theory (1978) suggests that peer interactions are key to enhancing learning, and the OECD (2019) similarly noted that students who participate in collaborative problem-solving tend to manage complex tasks more effectively than solitary learners. Furthermore, Rahman and Ahmar (2017) highlighted that the frequent sharing of problem-solving strategies among students sharpens their critical thinking and analytical competencies.

To promote more frequent and meaningful discussions, programs should include structured peer-learning activities like think-pair-share exercises and group discussions. Online platforms for discussion can also help students connect outside of class. Encouraging guided dialogues, where students share their solutions and reasoning, can boost confidence for those who are less inclined to engage in discussions, enhancing their overall problem-solving skills.

Table 10 Preferred Activities for Improving Problem-Solving Skills

Activity Type	Frequency	Percentage
Workshops and Seminars	7	23.33%
Group Projects and Collaborative Tasks	6	20.00%
Individual Assignments and Research	8	26.67%
Online Courses or Resources	5	16.67%
Other	4	13.33%

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The data reveals that students have varied preferences for activities that enhance their problem-solving skills. Approximately 27% prefer independent assignments and research, indicating a strong inclination toward self-directed learning. Meanwhile, 23% favor workshops and seminars, which highlights a desire for structured, expert-led guidance. Group projects attract 20% of students, emphasizing the value of peer learning, while 17% lean toward online courses, reflecting an interest in more flexible, technology-driven formats. Lastly, 13% chose other activities, suggesting a need for a wider range of instructional methods.

Research supports the idea that diverse learning activities enhance problem-solving skills. Louange (2007) notes that students learn more effectively when teaching strategies match their preferred styles. Similarly, Ozgan & Alkan (2012) highlight that collaborative tasks improve communication and reasoning abilities. The PISA 2018 report (OECD, 2019) also indicates that students engaging in structured activities, such as workshops and guided assignments, perform better in real-world problem-solving.

To effectively teach people how to solve problems, programs should include planned workshops, group projects, and independent learning. People who learn best when they work together will benefit from fun group activities, while individuals who learn best when they work alone will benefit from using the internet's tools. Students will learn many useful problem-solving skills that will be helpful in many real-life situations when they use that way. It is critical to teach students how to resolve problems in a way that is flexible and focuses on them, as this study shows. It's important to use various teaching methods because each student learns and trusts things in different ways. It could be taught through written materials, discussions with other students, visual aids, and hands-on exercises so that all kinds of students could learn what they need to. Setting up a place for everyone to learn together is important because it helps students remember what they've learned and think critically. For students to learn skills that will help them in the long run, the program should include workshops, real-life situations where they have to solve problems, and job-related applications. Online classes and interactive simulations are two types of digital tools that can help people who need professional help and give more freedom to people who would rather learn on their own. It is best for students to have a plan that includes learning alone, working with others, and doing things in the real world. These actions will give them the confidence and skills they need to do well in school and get a job. Three students were interviewed in order to gain a deeper understanding of their experiences with problem-solving exercises in the classroom. They discussed how well these activities worked, how engaged they were, and how they could be improved to make the experience more pleasurable. Questions centered on how they felt about the problem-solving exercises they were doing at the moment, what activities or instructional strategies piqued their interest, and what they would like to see changed. Creswell's qualitative method was used to examine the responses, which made it easier to organize the data, find important themes, and understand the participants' experiences. The most crucial areas for improving problem-solving training are highlighted in tables that summarize the findings and rank the themes by frequency.

Table 11 Student Perceptions on the Engagement and Effectiveness of Current Problem-Solving Activities

Themes	Codes	Sample Statements
Need for More Challenging and Independent Problem-Solving Tasks	Simple tasks, Lack of challenge, Need for exploration, Guided learning	"Although I usually participate well in our class's problem-solving exercises, I believe they could be more difficult. Without direction, some things are too simple, while others are too challenging. Step-by-step solutions are typically provided by our teacher, which sometimes bores me. I wish I had more chances to explore and try things out on my own." (Student 1)
Interest in Interactive and Collaborative Learning	Group work, Communication, Project-based problem-solving	"I believe it would be fantastic if our teacher could provide more interactive and cooperative activities that let us work in groups to enhance problem-solving exercises. In addition to encouraging communication and teamwork, this would also motivate us to exchange ideas and gain knowledge from one another." (Student 3)
Preference for Self-Paced and Digital Learning Methods	Flipped classroom, Online resources, Self-directed study	"The flipped classroom method, which involves watching films or using internet resources to grasp fundamental ideas before working on more difficult tasks in class, intrigues me. I can take charge of my education and work at my own pace using this method." (Student 2)

Students shared a variety of experiences with problem-solving activities in their classes. Some felt that the tasks were too structured and repetitive, making them less interesting and not very challenging. However, many students believed that group work might increase engagement by promoting conversation and idea exchange, and they valued collaborative learning. Additionally, because digital tools like flipped classrooms and online resources allowed them to learn at their own pace, some students preferred self-paced learning. Overall, it appears that a more adaptable strategy that combines digital resources, group projects, and solo problem-solving might better accommodate students' varied learning preferences.

Table 12 Preferred Problem-Solving Activities and Teaching Methods

Themes	Codes	Sample Statements
Preference for Interactive	Teamwork, Peer	"I believe it would be fantastic if our teacher could provide more

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and Cooperative Learning	collaboration, Group problem-solving	interactive and cooperative activities that let us work in groups to enhance problem-solving exercises." (Student 3)
Desire for Independent and Exploratory Learning	Hands-on learning, Freedom to experiment, Trial-and-error	"I wish I had more chances to explore and try things out on my own instead of always following step-by-step instructions." (Student 1)
Technology-Enhanced Problem-Solving Methods	Flipped classroom, Online tools, Gamification	"The flipped classroom method, which involves watching films or using internet resources to grasp fundamental ideas before working on more difficult tasks in class, intrigues me." (Student 2)

Three main strategies surfaced when students were questioned about their favorite ways to solve problems: technology-enhanced learning, independent inquiry, and interactive group work. Working together with peers not only increased their engagement but also streamlined the problem-solving process, according to several students who benefited from interactive and cooperative learning.

Some students appreciated the freedom that self-directed work provided, while others believed that exploring various problem-solving techniques enhanced their learning experience. Many students expressed their appreciation for online tools and flexible classes, highlighting how these resources offered them greater freedom and enhanced their understanding of the material. A study emphasized the importance of employing various teaching methods that effectively integrate technology, tailored instruction, and collaborative learning. Offering this range enables teachers to address the needs and enhance the capabilities of each student.

Table 13 Student Suggestions for Improving Problem-Solving Activities

Themes	Codes	Sample Statements
Incorporating Real-World Applications in Problem-Solving	Practical tasks, Real-world relevance, Applied learning	"I believe it would be fantastic if we had more chances to work on real-world problems or take part in math competitions to make problem-solving exercises more entertaining and interesting." (Student 3)
Introducing More Engaging and Creative Teaching Strategies	Interactive learning, Project-based assessments, Innovation in instruction	"Additionally, I would like more real-world evaluations, such as project-based assessments, instead of conventional multiple-choice tests." (Student 3)

Giving people well-thought-out jobs and full support can help them deal with issues and get help when they need it. "Also, I'd really appreciate it if our teacher could give us more support and direction before we start these exercises." Individual third party Students have come up with smart ways to make tasks that require them to solve problems more fun and useful. They all agree on one thing: it's important to use models from real life. Many people think that learning can be more fun if they compete or solve problems in the real world. Another big need is for teaching methods that are more creative and get students involved. As an example, some students suggested that instead of standard multiple-choice tests, projects should be used as tests. This change could encourage students to study harder and get them thinking of new ways to use what they've learned. The necessity for improved teaching and support services was a major point of discussion. The students mentioned that they would be able to solve their problems faster and more accurately if they received organized assistance and clear instructions. When you consider everything, these results demonstrate ways to improve problem-solving lessons. When we tackle real-life problems, get organized support, and use engaging teaching methods, it noticeably boosts our motivation to study and helps us perform better.

- *Level of Problem-Solving Skills of Selected Grade 11 ABM Students*

The assessment of Problem-Solving Skills was conducted across four key dimensions: (1) Understanding the Problem, (2) Developing the Problem, (3) Executing the Problem, and (4) Verifying the Problem. Instead of depending only on total scores, this framework provides a nuanced view of particular areas that might need further attention from the responders. To enable a thorough study and interpretation, descriptive statistics like the grand mean, standard deviation, and percentages were used.

Table 14 Dimensions of Problem-Solving Skills

Dimension	Items	HPS	Mean	SD	Percentage	Interpretation
Understanding the Problem	1, 3, 10	3.00	1.43	0.98	47.62%	Did Not Meet Expectations
Developing the Problem	2, 7	2.00	1.37	0.55	68.57%	Did Not Meet Expectations
Executing the Problem	4,5,6	3.00	2.17	0.82	72.38%	Did Not Meet Expectations
Verifying the Problem	8, 9	2.00	1.37	0.49	68.57%	Did Not Meet Expectations
Overall	All Items	10.00	6.34	2.26	63.43%	Did Not Meet Expectations

Legend: 90–100 (Outstanding), 85–89 (Very Satisfactory), 80–84 (Satisfactory), 75–79 (Fairly Satisfactory), Below 75 (Did Not Meet Expectations) as per DepEd Order No. 8, s. 2015; HPS (Highest Possible Score), SD (Standard Deviation)

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The respondents achieved an overall score of 63.43% in the assessment, measured against the highest possible score of 10. Unfortunately, none of the scores reached the 75% threshold required for a "Fairly Satisfactory" performance, as outlined in DepEd Order No. 8, s. 2015. Among the four dimensions evaluated, the highest mean score was found in "Executing the Problem," at 72.38%. This was followed by "Developing the Problem" and "Verifying the Problem," at 63.43%. Notably, "Understanding the Problem" scored only 47.62%, highlighting a significant area that requires improvement.

Research indicates that ABM (Accountancy, Business, and Management) students often exhibit average thinking skills, particularly in foundational cognitive processes such as memory. According to Rodriguez (2022), they struggle with more complex issues since they haven't progressed past a fundamental understanding. Researchers have found that those in the ABM track often struggle with time management and problem-solving, which can make it more challenging for them to study effectively and succeed in school overall (Delos Santos, 2019). It looks like ABM students may not have a solid background in cognitive processing and critical thinking, which are essential for tackling difficult tasks. We have to address these issues promptly so that students can develop critical thinking skills, which are essential for business and management studies. The problems we found fit well with Bloom's Taxonomy, highlighting a clear progression from basic to more advanced thinking skills. Many students in ABM struggle to move beyond the basic levels, which makes it challenging for them to tackle the complex problem-solving tasks essential for success in business-related areas (Rodriguez, 2022; Delos Santos, 2019). This slow progress at lower brain levels might be because there aren't enough teaching methods that promote analytical and practical skills. It would be helpful if teachers assigned more tasks that encourage us to think critically, assess problems, and find solutions, as this would help us grasp Bloom's hierarchy more thoroughly. If these issues are not resolved, pupils may continue to perform poorly, which will make them less prepared for college and the workforce. Being able to solve problems effectively is essential for making decisions, which is a fundamental business and management ability. ABM pupils run the risk of being unprepared for situations in the real world that call for critical and analytical thinking if they don't receive assistance (Rodriguez, 2022). Given that poor problem-solving abilities affect academic success and have long-term effects on employability and professional competence in a cutthroat corporate environment, this emphasizes the urgent need for focused interventions.

Structured ways can help fill in these gaps, according to research. One example of this is Polya's system for solving problems. It shows how to solve tough problems in a clear and organized way. Hernandez (2023), for example, says that “this method makes senior high school students much better at handling problems when it is used regularly in the classroom”. So, Polya's framework gives students an organized way to solve problems, which keeps their brains from getting too busy and helps them think more clearly. Using this method in normal lessons can help students feel better about themselves and get better at solving problems. Researchers have found that problem-based learning (PBL) puts students in real-life situations where they have to answer problems. This helps them think more critically and analytically. Garcia (2019) says “this method works well in technical and scientific areas”, which means it could be used more in business. When you use PBL, you make the classroom more active and hands-on, which pushes students to work together to solve problems. Using PBL in ABM classes can help teachers prepare their students for real-life problems by closing the gap between what they know in theory and what they can do in practice. Responders did not do well in this area, so these results show that we should focus on interventions that help people understand the problem.

Enhancing this fundamental ability can set the stage for enhancing other facets of problem-solving. Teaching tactics should incorporate structured frameworks such as Polya's approach and problem-based learning to give students the tools they need to improve their critical thinking, analytical, and procedural skills. In order to close the gaps and make ABM students ready for success in the classroom and in the workplace, these focused interventions are essential (Hernandez, 2023; Garcia, 2019). Since comprehension is the cornerstone of successful problem-solving, concentrating on understanding the problem first has a cascading effect on other skills. By addressing this shortcoming, ABM students will gain the self-assurance and skills necessary to succeed in all areas of problem-solving.

- *Problem-Solving Intervention Plan Through Improved Teaching Styles of ABM Teachers*

The learning preferences among ABM Senior High School students indicate a pronounced predisposition towards visual learning, with 42.86% identifying as visual learners. This group is followed by auditory learners at 22.86%, read/write learners at 20%, and kinesthetic learners at 14.29%. The data suggest that most students demonstrate enhanced comprehension and analytical abilities when information is conveyed through visual means such as diagrams, charts, and other graphical representations. Verbal communication environments, such lectures and conversations, are ideal for auditory learners. Kinesthetic learners, on the other hand, gain from experiential, hands-on activities that entail physical connection with the learning content, whereas read/write learners prefer written information and assignments. These realizations can help teachers put plans into action that will guarantee no student is left behind.

It is noteworthy that none of the assessed dimensions or general problem-solving abilities met the 75% criteria in spite of these preferences, suggesting the need for an all-encompassing intervention. This research shows that although students show relative strengths in some aspects of problem-solving, there is still significant opportunity for improvement in four crucial areas: comprehending the problem, coming up with a solution, carrying it out, and confirming the solution. Understanding the issue and validating the solution, which are essential for efficient problem solving, showed the poorest results. The need for focused

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interventions to help at-risk pupils who are having difficulty with these fundamental abilities is highlighted by this underperformance. ABM educators can use specialized teaching methods and materials by filling in these gaps. For instance, systematic scaffolding that includes guided issue breakdowns, detailed instructions, and opportunities for reflective practice may be beneficial for children who struggle with comprehension and verification. By providing more practice in executing solutions and frequent evaluations of their validity, educators can use individualized instruction to meet the requirements of a wide range of students. As a result, ABM instructors can help students become more proficient and confident in handling challenging business issues.

We asked three (3) experienced ABM teachers to describe their approach to teaching students problem-solving skills. They were asked how they involve students in tough problem-solving activities, how they adjust to the different skill levels of their students, and what strategies they use to boost creativity and critical thought. They were also asked how they include real-world problems into their lesson plans, what kind of instruction they prefer for helping students solve challenges, and how they track and assess students' progress over time. The teachers also addressed the challenges in teaching problem-solving skills and differentiating instruction to support those who struggle with these competencies. Their contributions underwent thematic analysis, and the respondents were requested to validate the themes identified to ensure their accuracy and relevance.

- *Thematic Analysis of the Responses Related to Samples of Challenging Problem-Solving Activities Teachers have used to Engage Students.*

The common strategies employed by teachers were (1) board games, (2) hands-on activities by building models, (3) interactive tools to visualize problems, (4) passing the ball, and (5) anything visual. Below are the raw responses:

- Respondent #1 "BOARD GAMES. Games like chess, it develop strategic planning skills that adapt tos their problem-solving effectively."
- Respondent #2 "Visual and hands-on activities by building models or using interactive tools can help students visualize problems and think about them from different angles."
- Respondent #3 "PASS THE BALL. It helps the students to improve social esteem, confidence, creativities, and problem-solving abilities."

It can be inferred that most of the activities were related to visual, auditory, and kinesthetic, but none of the approaches are related to the read/write approach. The strategies teachers implement primarily facilitate both the execution and understanding of problems. Board games and hands-on activities promote practical engagement with solutions, whereas interactive tools and visual aids enhance comprehension of the issues. The "Pass the Ball" activity encourages collaboration in the problem-development process.

Nonetheless, the observed lower performance in understanding and verifying problems suggests that students require targeted interventions, such as scaffolding and reflective practices, to strengthen these foundational skills and enhance their problem-solving abilities. These interventions align well with Read/Write learning styles, prioritizing written tasks and reflective practices, allowing students to deconstruct problems in writing and effectively evaluate their solutions.

- *Thematic Analysis of the Responses Related to their Approach to Teaching Problem-Solving Skills to Students with Varying Abilities*

Common approaches were the encouragement to have (1) multiple solutions (2) self-evaluation, (3) scaffolding, and (4) collaboration. See raw responses below:

- “I encourage them to have multiple solutions and evaluate their effectiveness “-Respondent #1
- By using the scaffolding technique, wherein I break down the problem into smaller steps to provide guidance-Respondent #2
- "I encourage them to have collaboration in their group, so that they learn from each other."- Respondent #3

Read/Write, and Kinesthetic learners would benefit most from the most common strategies, such as thinking of multiple solutions, self-evaluation, scaffolding, and collaboration. Read/Write learners excel in self-evaluation and multiple solutions, as these strategies promote written reflection, which aids in understanding and verification. On the other hand, Kinesthetic learners benefit from scaffolding and collaboration, as they thrive on hands-on problem-solving, particularly during the execution and development stages. In contrast, Auditory learners, who prefer verbal discussions and would benefit from collaboration, may find these methods less effective. To enhance learning for Auditory learners, incorporating discussion-based problem-solving and audio resources could better engage them and support their participation in all problem-solving phases.

- *Thematic Analysis of the Responses Related to their Preferred Teaching Style when Guiding Students Through Problem-Solving Exercises*

Socratic method emerged as the most common approach where one transcends to more than just asking questions. The Socratic method is distinct because it employs a series of open-ended, probing questions that encourage critical thinking and help

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students discover answers independently rather than simply providing direct responses. Below are the raw responses:

- "I prefer a Socratic approach when guiding students through problem-solving exercises." Respondent #1
- "Asking question that help them think critically about the problems and explore different strategies."- Respondent #2
- "I help them to develop their understanding and problem-solving skills"- Respondent #3

The Socratic method effectively enhances the Understanding and Verifying problem-solving dimensions for Read/Write and Auditory learners. Read/Write learners deepen their comprehension through reflective open-ended questions, while Aural learners benefit from dialogue to explore strategies and verify solutions.

However, Kinesthetic learners may struggle with this method, as they prefer hands-on activities, and Visual learners may need supplementary visual aids to grasp concepts fully. Therefore, while the Socratic method fosters critical thinking, it should be supported by interactive or visual strategies for Kinesthetic and Visual learners, especially during the Executing and Developing phases.

➢ *Thematic Analysis of the Responses Related to the Particular Challenges they have Encountered in Teaching Problem-Solving Skills to Students and how they Address them*

All the teachers agreed to have experienced challenges in teaching problem-solving skills. Strategies include (1) integrating real-world problems relevant to students' interests and future goals, (2) fostering a growth mindset by highlighting the importance of learning from mistakes, and (3) utilizing organized group activities for effective collaboration. See raw responses below:

- "Yes. I incorporate real-world problems and examples that connect to their interest and future aspirations." - Respondent #1
- Yes. I promote a growth mindset by emphasizing that mistakes are a natural part of learning and an opportunity to improve.- Respondent #2
- "Yes. I used structured group activities with clearly defined roles and responsibilities to have productive collaborations."- Respondent #3

This proves that beyond learning styles, it is important to build on their other interests and soft skills such as growth mindset, collaborative and communication skills, and the value of empowering them rather than just engaging them through real-life problems. Based on the qualitative and quantitative findings, below is the mixed-methods table and the recommended intervention plan to improve teaching strategies of ABM Math Teachers:

Table 15 Mixed-Methods Table

Statement of the Problem	Quantitative Findings	Qualitative Findings
SOP #1: Preferred Learning Style and Interest of Respondents	Most students are visual learners, followed by auditory, read/write, and kinesthetic learners. Interest in problem-solving is high for some, while others remain neutral or disengaged. Confidence levels are varied, indicating the need for structured support.	Students expressed that problem-solving activities should be more engaging, interactive, and aligned with their preferred learning styles. Some prefer independent exploration, while others thrive in structured, collaborative environments.
SOP #2: Level of Problem-Solving Skills of Selected Grade 11 ABM Students	Students showed moderate competence in understanding and executing problems but struggled in developing and verifying solutions. The overall problem-solving performance did not meet expectations, highlighting areas for improvement.	Students noted that while they could understand and execute problems, they struggled with applying their knowledge to complex tasks. They requested clearer guidance and more real-world applications in problem-solving activities.
SOP #3: Problem-Solving Intervention Plan through Improved Teaching Styles of ABM Teachers	Common teaching strategies include interactive, hands-on, and visual methods. Read/write strategies are underutilized. The Socratic method, collaboration, and scaffolding are frequently used, but improvements are needed to address all learning styles effectively.	Teachers recognized the effectiveness of existing strategies but acknowledged the need for more differentiated instruction. Some students highlighted that hands-on activities and technology-enhanced learning improved their engagement in problem-solving.

- Intervention Plan: Project IBA
- (Innovating Based on Abilities: Promoting Diverse and Holistic Approaches in Problem-Solving)

➢ *Introduction*

Based on the study findings, students exhibit varied problem-solving abilities, learning styles (VARK), and interests, which affect their engagement and confidence in tackling problem-solving tasks. The results indicate gaps in developing and verifying

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problems, as well as the need for more interactive, self-paced, and real-world applications of problem-solving. Additionally, insights from teachers highlight the importance of differentiated instruction, scaffolding, and diverse teaching strategies to address these concerns.

Project IBA is designed to enhance students' problem-solving skills by integrating their learning preferences, interests, and insights from teachers into a structured intervention plan. This initiative promotes a diverse and holistic approach to strengthening problem-solving competencies through differentiated instructional strategies aligned with the VARK model.

➢ *Objectives*

- Enhance students' least-developed problem-solving skills (Developing and Verifying Problems) by integrating targeted instructional strategies aligned with their VARK learning preferences.
- Increase student engagement and confidence in problem-solving through interactive, collaborative, and self-directed learning opportunities.
- Utilize insights from teachers to refine teaching strategies that foster critical thinking, independent exploration, and structured problem-solving approaches.
- Implement a differentiated intervention that incorporates real-world applications, gamification, technology-based learning, and collaborative activities to support diverse learners.

Table 16 Implementation Plan

Component	Strategy	Target Group	Expected Outcome
Visual Learning Approach	Integrate diagrams, flowcharts, and infographics to illustrate problem-solving processes	Visual Learners	Improve comprehension and engagement in problem-solving tasks
Auditory Learning Approach	Conduct problem-solving discussions, recorded lectures, and peer tutoring sessions	Auditory Learners	Enhance understanding through verbal explanation and collaborative discussions
Read/Write Learning Approach	Provide structured problem breakdowns, step-by-step guides, and written reflections	Read/Write Learners	Strengthen critical thinking and structured reasoning skills
Kinesthetic Learning Approach	Implement hands-on activities, real-world simulations, and project-based learning	Kinesthetic Learners	Increase engagement and problem application through experiential learning
Interactive Problem-Solving Sessions	Incorporate group problem-solving challenges, math competitions, and case study analyses	All Students	Foster teamwork, communication, and collaborative problem-solving
Self-Paced Digital Learning	Utilize gamified platforms, interactive apps, and flipped classroom methods	Students preferring technology-assisted learning	Enhance problem-solving confidence through personalized, self-directed practice
Scaffolding & Teacher-Guided Support	Implement structured guidance, feedback loops, and mentorship programs	Students requiring additional support	Develop problem-solving independence and confidence in tackling complex problems
Real-World Application	Connect problem-solving exercises to business simulations, case studies, and industry challenges	All Students	Reinforce relevance and applicability of problem-solving skills
Monitoring & Assessment	Conduct pre- and post-intervention assessments, student reflections, and teacher feedback surveys	All Participants	Measure effectiveness and continuously improve intervention strate

Table 17 Implementation Timeline

Phase	Activities	Duration
Phase 1: Preparation & Training	Orientation for teachers and students, preparation of instructional materials, selection of intervention strategies	Month 1
Phase 2: Implementation	Conducting intervention sessions based on VARK, integrating teacher insights, and applying student-centered strategies	Months 2-4
Phase 3: Monitoring & Evaluation	Administering assessments, gathering feedback, analyzing effectiveness, and refining strategies	Month 5
Phase 4: Sustainability & Scaling	Institutionalizing best practices, integrating interventions into regular teaching, and training more teachers	Ongoing

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➢ *Expected Outcomes*

- Improved problem-solving competencies, particularly in developing and verifying problems.
- Enhanced student engagement and confidence through differentiated instruction aligned with learning preferences and interests.
- Refined teaching strategies based on teacher insights, ensuring sustained improvements in problem-solving instruction.
- More meaningful and applicable problem-solving experiences, integrating real-world applications and self-directed learning opportunities.

Project IBA addresses the identified problem-solving skill gaps by promoting a differentiated, holistic, and student-centered approach to learning. By leveraging VARK-based instruction, real-world applications, and teacher insights, this intervention plan ensures that all students, regardless of learning preferences, have access to engaging and effective problem-solving strategies. Through structured implementation, students will develop confidence, critical thinking skills, and the ability to apply problem-solving techniques effectively in real-life scenarios.

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CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATION

A. *Summary of Findings*

➢ *Preferred Learning Style based on VARK (Visual, Auditory, Read or Write, and Kinesthetic) and Interest of Respondents*

- *Learning Styles*

✓ 42.86% are Visual learners who prefer to use images, diagrams, and charts to comprehend information.
✓ 22.86% are Auditory learners who favor learning by listening to lectures, discussions, and audio materials.
✓ 14.29% are Kinesthetic learners, who learn best through hands-on activities and physical movement.
✓ 20.00% are Read/Write learners who excel in learning through reading and writing tasks, such as notes, textbooks, and written instructions.

- *Interest*

✓ The findings indicate that 43.33% of students have a strong interest in acquiring more knowledge about problem-solving. In contrast, 30% maintain a neutral stance, while 26.67% (comprising the categories of Uninterested and Very Uninterested) show minimal to no interest.
✓ Confidence levels in problem-solving vary significantly among students. Approximately 40% feel confident or very confident, suggesting that they approach problem-solving with ease. However, 30% remain neutral, indicating that they might require more guidance. The remaining 30% feel unconfident or very unconfident, highlighting the need for targeted support strategies to help these students improve.
✓ Interestingly, many students tend to seek advice from others, with about 23.33% opting for this approach, while around 20% prefer experimenting with different solutions. Some students like to analyze data before making a decision, making up 16.67% of the responses, and another 16.67% enjoy brainstorming ideas with their peers.
✓ Group collaboration stands out as the most popular option, with 26.67% of students favoring it. Close behind are structured classroom environments, which attract 23.33% of learners. Notably, 20% prefer to tackle problems independently, indicating that some students thrive in solitary settings.
✓ The data reveal that a significant majority of students (73.33%) acknowledge the importance of problem-solving in their careers. Among them, 26.67% consider it extremely important, while 23.33% rate it as very important or somewhat important. This suggests that most students recognize the value of problem-solving skills in their professional lives. However, there is a noteworthy portion (16.67%) who believe it is not very important, and another 10% who see it as entirely irrelevant.
✓ The findings show varying preferences among students for problem-solving approaches. Approximately 26.67% have no strong preference and can adapt to different methods, while 23.33% lean towards visual aids, with 16.67% strongly favoring them. This underscores the importance of incorporating diagrams and charts into lessons. Additionally, 20% prefer written explanations, and 13.33% have a strong preference for text, emphasizing the necessity of structured materials.
✓ The results show divergence among students in how often they discuss problem-solving strategies with peers. Around 30% engage in these discussions occasionally, while 20% do so very often, and about 16.67% participate frequently. This suggests that while some students value collaborative discussions, many do not engage consistently. Conversely, 23.33% rarely participate in such conversations, and 10% never do, indicating that some may prefer working alone or lack opportunities for structured interaction.
✓ The data indicate varied preferences among students for activities that enhance their problem-solving skills. There is a high preference for self-directed learning, as evidenced by the 27% who prefer independent assignments and research. In contrast, 23% choose workshops and seminars, indicating a preference for organized, knowledgeable-led instruction. While 17% of students prefer online classes, suggesting a desire in more adaptable, tech-driven forms, 20% of students are drawn to group projects, highlighting the importance of peer learning. Finally, 13% chose alternative activities, indicating that a greater variety of teaching strategies is required.
✓ Student feedback highlights key themes in problem-solving activities. Many seek more challenging, independent tasks to enhance their critical thinking skills. There's a strong interest in interactive and collaborative learning experiences. Additionally, students prefer self-paced digital learning, valuing the flexibility and accessibility that technology offers.
✓ Important themes in problem-solving exercises are highlighted in student responses. To improve their critical thinking abilities, many look for increasingly difficult, autonomous assignments. There's a strong interest in interactive and collaborative learning experiences. Additionally, students prefer self-paced digital learning, valuing the flexibility and accessibility that technology offers.
✓ Preferred problem-solving activities and teaching methods focus on interactive and cooperative learning, fostering independent and exploratory learning, and utilizing technology-enhanced approaches.

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➢ *Level of Problem-Solving Skills of selected Grade 11 ABM students*

- Understanding the Problem (Items 1, 3, 10): The mean score in this dimension is 3.00, with a standard deviation of 1.43 and a percentage of 47.62%.
- Developing the Problem (Items 2, 7): The mean score is 2.00, with a standard deviation of 1.37 and a percentage of 68.57%.
- Executing the Problem (Items 4, 5, 6): The mean score for this dimension is 3.00, with a standard deviation of 2.17 and a percentage of 72.38%. This also shows that students did not meet expectations.
- Verifying the Problem (Items 8, 9): The mean score is 2.00, with a standard deviation of 1.37 and a percentage of 68.57%.
- Overall (All Items): The overall mean score is 6.34, with a standard deviation of 2.26 and a percentage of 63.43%.

➢ *Problem-Solving Intervention Plan Through Improved Teaching Styles of ABM Teachers*

- Strategies like board games, hands-on activities, interactive tools, and visual aids are the most used strategies by key respondents to engage students in problem-solving, benefiting various learning styles like visual, auditory, and kinesthetic but not read/write. Read/Write methods emphasize written tasks and reflection that are vital for breaking down problems and evaluating solutions. Thus, the intervention plan should focus on those strategies, scaffolding, and reflection to improve understanding and verification of problems, ultimately enhancing overall problem-solving abilities.
- Looking at how teachers teach problem-solving skills shows a few important methods, such as encouraging students to think of more than one answer, self-evaluation, scaffolding, and working together. These methods work especially well for kinesthetic and read/write learners. Read/Write students get better at understanding and analyzing problems by doing self-evaluations and getting more than one answer. Kinesthetic learners solve problems by doing them and get more out of scaffolding and working together as a group during execution and growth. On the other hand, these techniques may not work as well for auditory learners who learn best through talking to others. The intervention plan should include problem-solving through discussion and audio tools to keep them interested throughout the process.The Socratic method is the most widely used strategy for helping pupils solve problems, according to an analysis of teachers' preferred approaches. With the help of open-ended questions, this approach encourages critical thinking while letting students figure out the solutions on their own. Because they thrive on verbal communication, it is especially beneficial for read/write and auditory learners. However, because they prefer hands-on activities, kinesthetic learners could find this method difficult, and visual learners might require more visual assistance. In order to effectively support all learners, particularly during the Executing and Developing phases, the Socratic approach should be coupled with interactive or visual tactics.
- Every major respondent has encountered difficulties when instructing students in problem-solving techniques and has come up with a number of solutions. These tactics include of (1) introducing real-world issues that are pertinent to students' interests, (2) emphasizing the need of learning from mistakes in order to foster a growth mindset, and (3) employing organized group activities to foster cooperation. Teachers increase student involvement by relating challenges to their interests. In addition to group activities that accommodate different learning styles and develop critical soft skills, encouraging a growth mindset helps students view mistakes as teaching opportunities.

B. Conclusion

This study examined students' learning preferences, interest, and problem-solving skills, as well as the effectiveness of current instructional strategies in problem-solving instruction. Student responses were examined using the VARK model to ascertain their confidence levels, preferred learning techniques, and involvement in problem-solving exercises. The study also examined instructional methods that can improve problem-solving instruction and assessed students' proficiency in various problem-solving phases. The results offer insightful information about how to enhance problem-solving exercises to better suit the learning preferences and needs of students.

- The majority of students are visual learners, followed by auditory, read/write, and kinesthetic learners. Students' learning preferences are diverse. Some pupils are neutral or uninterested in problem-solving, even though many demonstrate a tremendous interest in it. Students' degrees of confidence also differ; some believe they are capable, while others need organized assistance to develop their problem-solving skills. These results highlight the necessity of a variety of teaching approaches that accommodate various learning preferences in order to maintain the effectiveness and engagement of problem-solving education for every student.
- Students In various stages of the problem-solving process, students exhibit varying degrees of proficiency. They have a moderate ability to comprehend and solve difficulties, but they are less adept at creating and validating problems. According to the overall findings, students' problem-solving skills fell short of expectations, pointing to gaps that call for focused instructional interventions. Students' problem-solving skills can be strengthened by improving guided instruction, structured learning experiences, and critical thinking activities.
- Teachers today use a variety of teaching methods, such as hands-on, engaging, and visual ones, to help teach students who learn best through sight, sound, and touch. Read/write learners, on the other hand, get less attention in the classroom. This shows that more written-based techniques are needed, like structured problem breakdowns and reflective writing. A lot of people use the Socratic method, scaffolding, and working together, but they should be changed to fit different ways of learning

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and different steps of problem-solving. Teachers can make problem-solving lessons more interesting and useful by using a variety of teaching methods, technology-enhanced learning, and real-life situations where students have to solve problems.

There are some problems with this study that need to be thought about when figuring out what the results mean. First, the data is cross-sectional, which means it was only taken at one point in time. This makes it harder to see how people's problem-solving skills and learning styles change over time. The study sample is also made up of only a few chosen Grade 11 ABM students, so the results can't be applied to all students or all academic tracks. Differences in curriculum, instructional methods, and student backgrounds may have an effect on the results. Because of this, care must be taken when applying the results to groups other than the study group. Future study should use a longitudinal design, a larger sample size, and include students from a variety of academic streams to learn more about how students engage with problem-solving and how well they learn.

C. Recommendation

Based on the study's conclusions, the following are recommended:

- To suit the different ways that students learn, teachers should use a teaching style that includes hearing, seeing, reading and writing, and touching. For every student to be able to do well in problem-solving activities, lessons should include interactive discussions, planned writing tasks, visual aids, and hands-on activities. Additionally, real-life applications, gamified learning, and group projects should be included to boost interest and participation, especially among students who aren't interested in traditional ways of handling problems. People who don't feel confident should also be able to get organized help, which would make sure they get supervised instruction and the chance to slowly improve their skills.
- Because students have trouble making and confirming problems, targeted therapies should focus on helping them break down problems, evaluate solutions, and think logically. Giving students organized reflection tasks, step-by-step guided exercises, and real-life problem-solving situations can help them get better at being analytical. Structural learning experiences, in which tasks get harder over time, can help students build confidence in their ability to solve problems. Teachers who encourage the use of formative tests and ongoing feedback systems can help students improve their ability to solve problems.
- Read/write learning tactics should receive more attention, even when current teaching methods work well for kinesthetic, visual, and auditory learners. To help students who learn best through written materials, teachers should provide reflective writing assignments, systematic issue breakdowns, and documenting of thought processes. All learning styles will be met by incorporating technology-enhanced learning resources, group discussions, and applied problem-solving exercises into teaching strategies. Additionally, teacher training programs should be created to assist educators in modifying their teaching methods in response to the demands and difficulties of their students.
- A longitudinal study should be carried out in the future to investigate how students' problem-solving abilities change over time as a result of exposure to diverse teaching methods. A wider view of learning preferences and problem-solving skills would also be obtained by broadening the study to include students from various grade levels and academic paths. Examining the efficacy of particular intervention techniques, such as collaborative peer learning, real-world case studies, and technology-driven problem-solving, can provide more in-depth understanding of which teaching approaches produce the best outcomes. In order to create comprehensive intervention frameworks that improve student learning and teacher effectiveness, future research should also examine instructor perspectives and instructional problems.

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