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Mathematics Self-Concept, Technology-Enhanced Learning and Mathematics Literacy of Grade 10 Students

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ABSTRACT

This study examined the influence of mathematics self-concept and technology-enhanced learning on the mathematics literacy of Grade 10 students and explored the relationships among these variables. Using a descriptive-correlational design, the study involved Grade 10 students enrolled in the Science, Technology, and Vocational Education Program in a public secondary school in Negros Occidental. Data were collected through researcher-made and standardized questionnaires. Findings showed that most respondents were female, came from low-income households, and had access to digital devices and internet connectivity. Students demonstrated a high level of mathematics self-concept and technology-enhanced learning, while their mathematics literacy was at a moderate level. They performed better in interpreting and evaluating mathematical information than in formulating and applying mathematical concepts. The results further revealed a significant relationship between mathematics self-concept and mathematics literacy, whereas technology-enhanced learning was not significantly related to mathematics literacy. The findings highlight the importance of strengthening students' confidence and positive self-beliefs in mathematics while ensuring that technology is effectively integrated into instruction to enhance mathematics literacy.

INTRODUCTION

This chapter presents the background of the study, the theoretical and conceptual frameworks, the statement of the problem, the study's hypotheses, the significance of the study, the scope and limitations of the study, and the definition of terms.

Background of the Study

Mathematical literacy is an essential skill that enables learners to apply mathematical knowledge and problem-solving skills in real-life situations. Students' success in mathematics is influenced by factors such as mathematics self-concept and technology-enhanced learning, which directly affect their confidence, engagement, and conceptual understanding. Consequently, the integration of digital tools and innovative learning strategies has transformed mathematics instruction and provided learners with more interactive learning experiences.

Mathematics plays a critical role in developing learners' problem-solving, critical thinking, and reasoning skills, which are essential for academic success and real-life decision-making (OECD, 2023). In secondary education, mathematics instruction emphasizes the application of concepts in meaningful contexts to enhance students' mathematics literacy (DepEd, 2022). Despite curriculum reforms, students continue to face challenges in understanding and applying mathematical concepts effectively (Flores & Villavicencio, 2021).

Students' affective characteristics, particularly mathematics self-concept, significantly influence their learning behavior and achievement in mathematics (Marsh, Martin, & Xu, 2021). Mathematics self-concept, which includes confidence, perceived competence, and interest, affects students' engagement in problem-solving tasks (Skaalvik & Skaalvik, 2020). Learners with low mathematics self-concept tend to avoid challenging problems and achieve lower academic outcomes (Reyes & Bernardo, 2020).

The integration of technology in education has transformed mathematics teaching and learning (Bond, Bedenlier, Marín, & Händel, 2020). Technology-enhanced learning provides interactive instruction, visualization of abstract concepts, and access to a variety of learning resources (Li & Ma, 2021). Research shows that digital tools, online platforms, and multimedia resources can improve students' understanding and engagement when effectively integrated into mathematics instruction (Sarmiento & Orale, 2020).

Mathematics literacy, involving the ability to formulate, employ, and interpret mathematics in various contexts, remains a core goal of mathematics education (OECD, 2022). Developing this competency in Grade 10 students is essential as they prepare for higher education, employment, and active participation in society (CHED, 2022). However, students' self-beliefs and unequal access to technology may influence their mathematics literacy development (Tria, 2020).

Examining the relationships among mathematics self-concept, technology-enhanced learning, and mathematics literacy can provide useful descriptive and correlational evidence for understanding Grade 10 students' mathematics learning experiences (Bernardo & Mendoza, 2021).

THEORETICAL FRAMEWORK

This study was anchored primarily on Social Cognitive Theory and Constructivist Learning Theory, with the Technology Acceptance Model (TAM) retained only as a supporting framework for item development related to perceived usefulness and perceived ease of use. Social Cognitive Theory explains the role of students' self-beliefs, including confidence and perceived competence, in learning behavior and persistence. Constructivist Learning Theory explains how active, contextualized, and problem-based learning experiences can support mathematics literacy. TAM is used narrowly to inform the technology-related questionnaire items that address students' perceptions of the usefulness and ease of use of technology in mathematics learning. It is not treated as a full explanatory framework for mathematics literacy because the questionnaire also contains access- and teacher-integration items that are not themselves TAM constructs.

Social Cognitive Theory, proposed by Albert Bandura, highlights that students' self-beliefs influence learning behavior and academic performance (Bandura, 2021). Confidence and perceived competence affect motivation, persistence, and achievement in mathematics, making mathematics self-concept a key factor in learning outcomes (Marsh, Martin, & Xu, 2021). This theory was directly connected to the study because it explained how the confidence, perceived competence, and interest that make up mathematics self-concept could shape Grade 10 students' engagement with and performance in mathematics literacy tasks.

Constructivist Learning Theory, whose foundations are attributed to Jean Piaget and further developed by Lev Vygotsky, emphasizes that learners actively construct knowledge through meaningful experiences and interactions with their environment (Schunk & DiBenedetto, 2020). Problem-based and contextualized learning activities support the development of mathematics literacy. Technology-enhanced learning aligns with constructivist principles by enabling students to explore, visualize, and apply mathematical concepts (Bond, Bedenlier, Marín, & Händel, 2020). This theory was connected to the study because it explained how Grade 10 students construct mathematical understanding through active, contextualized, and technology-supported learning experiences, which in turn shape their mathematics literacy.

The Technology Acceptance Model (TAM), originally developed by Fred Davis, is retained only to inform the development and interpretation of questionnaire items concerning perceived usefulness and perceived ease of use. In this study, TAM does not serve as a causal explanation of mathematics literacy. Instead, it provides a theoretical basis for selected technology-perception items, while Social Cognitive Theory and Constructivist Learning Theory provide the broader theoretical grounding for mathematics self-concept and technology-supported learning experiences.

CONCEPTUAL FRAMEWORK

This study was conceptualized to examine the relationships among mathematics self-concept, technology-enhanced learning, and mathematics literacy of Grade 10 students. The independent variables were mathematics self-concept, measured in terms of confidence in learning mathematics, perceived competence in mathematics, and interest in mathematic and technology-enhanced learning, measured in terms of use of digital tools, accessibility of technology, and teachers' integration of technology. The dependent variable, mathematics literacy, was assessed in terms of the students' ability to formulate mathematical situations, employ mathematical concepts and procedures, and interpret and evaluate mathematical results. The Schematic Diagram of the Study illustrates the correlational relationships examined among these variables rather than causal effects.

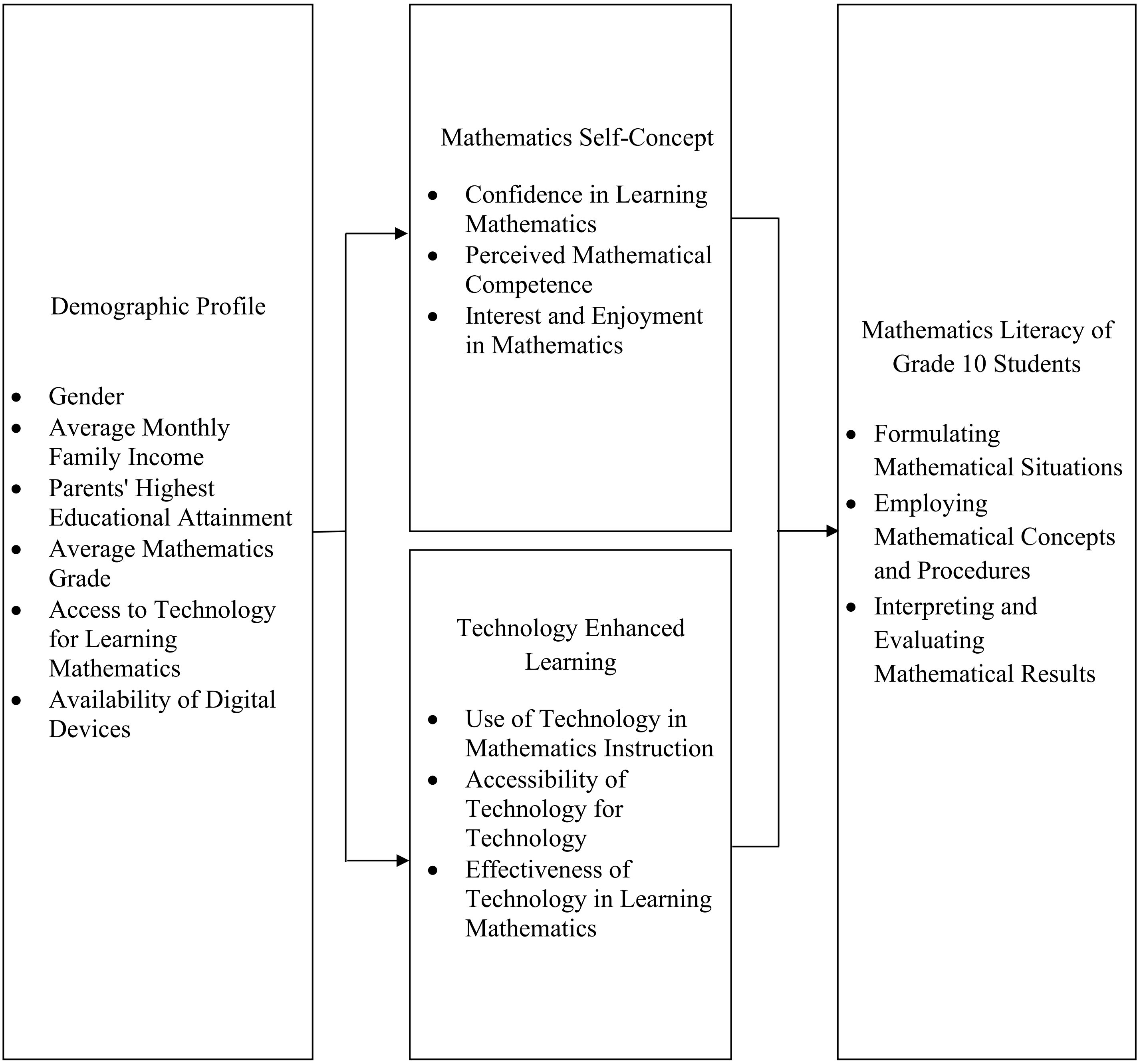

Figure1. Schematic Diagram of the Study.

Statement of the Problem

This study aimed to examine the relationships among mathematics self-concept, technology-enhanced learning, and mathematics literacy among Grade 10 students in one public secondary school in Negros Occidental during the school year 2025–2026.

Specifically, this study sought to answer the following questions:

1. What is the profile of the respondents of the Grade 10 students in terms of:

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a. gender

b. average monthly family income

c. parents' highest educational attainment

d. average mathematics grade

e. access to technology for learning mathematics

f. availability of digital devices

2. What is the level of mathematics self-concept of Grade 10 students as a whole and in terms of:

   a. confidence in learning mathematics
   b. perceived mathematical competence, and
   c. interest and enjoyment in mathematics

3. What is the extent of technology-enhanced learning experienced by Grade 10 students as a whole and in terms of:

   a. use of technology in mathematics instruction
   b. accessibility of technology for learning, and
   c. effectiveness of technology in learning mathematics

4. What is the level of mathematics literacy of Grade 10 students as a whole and in terms of:

   a. formulating mathematical situations,
   b. employing mathematical concepts and procedures, and
   c. interpreting and evaluating mathematical results

5. Is there a significant relationship between mathematics self-concept and mathematics literacy of Grade 10 students.
6. Is there a significant relationship between technology-enhanced learning and the mathematics literacy of Grade 10 students.

Hypotheses of the Study

To provide definite direction and specific analysis of data, the following hypotheses were formulated based on the foregoing specific problems.

1. There is no significant relationship between mathematics self-concept and mathematics literacy of Grade 10 students.

2. There is no significant relationship between technology-enhanced learning and the mathematics literacy of Grade 10 students.

Significance of the Study

The findings of the study would provide valuable insights into the following:

Curriculum Planners. The results of this study can help curriculum planners identify the strengths and weaknesses of Grade 10 students in mathematics literacy. This information can guide them in designing a curriculum that integrates strategies to support students' problem-solving skills, mathematical reasoning, and positive attitudes toward learning mathematics.

Division Superintendent. This study can serve as a basis for the Division Superintendent to prioritize the allocation of instructional materials and technological resources in mathematics. It can also inform the planning of professional development programs and interventions to support teachers' effectiveness in delivering mathematics instruction.

Curriculum Implementation Division (CID) Chief. The outcomes of this study can contribute to improving teaching and learning practices within the Curriculum Implementation Division. By examining the associations of mathematics self-concept and technology-enhanced learning with students' mathematics literacy, the division may use the findings as descriptive evidence when considering instructional priorities and professional development needs.

Education Program Supervisor of Mathematics. This study can guide the Division Supervisor in Mathematics to initiate training and seminars for teachers to enhance their

skills and competencies in mathematics instruction, particularly in solving real-world mathematical problems and applying technology in lessons.

Principal. The study can help school principals encourage teachers to adopt creative teaching strategies and explore innovative approaches to enhance students' learning experiences and mathematical abilities.

Mathematics Department Head. The findings can offer opportunities for the department head to explore modern pedagogical strategies, such as technology-enhanced learning, that go beyond traditional teaching approaches. This may inform teaching practices and support consideration of strategies for student engagement and mathematics literacy.

Teachers. The results of this study may serve as a guide for teachers to innovate and implement instructional strategies that facilitate easier and more effective mathematics learning. It highlights the importance of fostering students' self-concept and integrating technology to support motivation, engagement, and achievement.

Parents. The study can inform parents about the importance of supporting their children's mathematics learning by monitoring progress, providing guidance, and ensuring access to technological resources and interventions offered by the school.

Students. This study has the potential to enhance students' interest, confidence, and participation in mathematics learning. It may help them appreciate the relevance of mathematics in daily life and improve their problem-solving and analytical skills.

Present Researcher. The results enable the researcher to strengthen expertise in mathematics education, educational technology, and research methodology. Designing and implementing the study, collecting and analyzing data, and interpreting the findings will improve the researcher's knowledge and skills in pedagogy and educational research.

Future Researchers. The results of this study can serve as a foundation for future research on mathematics self-concept, technology-enhanced learning, and mathematics literacy. It may encourage other researchers to conduct similar studies that aim to enhance teaching strategies and improve students' learning outcomes.

Scope and Limitation of the Study

This study was limited to examining the relationships among mathematics self-concept, technology-enhanced learning, and mathematics literacy of Grade 10 students during the 2025–2026 school year. It focused on students' confidence in learning mathematics, perceived competence, interest in mathematics, reported

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technology-enhanced learning experiences, and performance on a 15-item mathematics literacy test. The study was conducted at a public junior high school in Negros Occidental, with Grade 10 STVEP students from five (5) sections serving as respondents.

The mathematics literacy assessments administered to the students were solely for research purposes. The study aimed to exclusively explore the relationships among mathematics self-concept, technology-enhanced learning, and mathematics literacy.

All results obtained were kept confidential to ensure the privacy of the respondents and adherence to ethical research practices. Data collection was carried out during the regular school schedule of the respondents without interfering with formal instruction.

This study is subject to several limitations. First, it was conducted in a single public secondary school in Negros Occidental and included only Grade 10 STVEP students, limiting generalizability to other schools, tracks, and grade levels. Second, mathematics self-concept and technology-enhanced learning were measured through self-report questionnaires and may therefore be affected by social desirability and recall bias. Third, the cross-sectional descriptive-correlational design does not permit causal conclusions. Fourth, the Mathematics Self-Concept–Mathematics Literacy association was statistically significant but weak, while the Technology-Enhanced Learning–Mathematics Literacy association was negligible and not statistically significant. Fifth, the Mathematics Literacy Test contained only 15 multiple-choice items, limiting the breadth of mathematical literacy that could be assessed and providing less information about students' reasoning than constructed-response tasks. Sixth, the multiple-choice-only format may not capture students' full solution processes. Seventh, the high technology-enhanced learning ratings may indicate a restricted response range or possible ceiling effects. Finally, the study cannot determine whether contextual variables such as prior Mathematics grade, income, parental education, internet access, or device availability account for differences in mathematics literacy because no multivariable model was estimated.

Definition of Terms

The terms used in this investigation are defined conceptually and operationally for the readers' better understanding.

Accessibility of Technology. It refers to students' ease of access to technological resources such as computers, tablets, or internet connectivity for learning mathematics (Sarmiento & Orale, 2020).

Operationally, it is measured through survey items evaluating students' access to the necessary digital devices and online platforms.

Confidence in Learning Mathematics. It refers to the students' belief in their ability to understand and perform mathematics tasks successfully (Skaalvik & Skaalvik, 2020).

Operationally, it is measured through the mathematics self-concept questionnaire items related to students' self-reported confidence in completing mathematics tasks.

Demographic Profile. It refers to the background characteristics of students, including gender, average monthly family income, parents' highest educational attainment, average mathematics grade, access to technology for learning mathematics, and availability of digital devices. Operationally, it is collected using a demographic questionnaire to describe the characteristics of the respondents and provide contextual information for interpreting the study findings.

Operationally, it is collected using a demographic questionnaire to describe the characteristics of the respondents and examine potential contextual influences on mathematics literacy.

Grade 10 Students. In the Philippines, Grade 10 students are in the fourth year of Junior High School following the K–12 curriculum (DepEd, 2022).

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Operationally, it refers to the officially enrolled Grade 10 students of RSB Integrated School for the academic year 2025–2026 who are the respondents of this study.

Interest in Mathematics. It refers to the degree of curiosity, enjoyment, and motivation students have toward learning mathematics (Reyes & Bernardo, 2020).

Operationally, it is measured using survey items that evaluate students' enthusiasm, engagement, and willingness to participate in mathematics activities.

Mathematics Literacy. It refers to the ability to formulate, employ, and interpret mathematics in various contexts, including real-life problem-solving, reasoning, and communication of solutions (OECD, 2022; CHED, 2022).

Operationally, it is measured using a 15-item dichotomously scored mathematics literacy test assessing students' ability to formulate mathematical situations, employ mathematical concepts and procedures, and interpret and evaluate mathematical results. Scores are reported as mean number correct out of 15, percentage correct, and standard deviation. For interpretation in this study, a criterion-referenced proficiency threshold of 60% correct was used: scores below 60% were classified as Developing, while scores of 60% or higher were classified as Proficient.

Mathematics Self-Concept. It refers to a learner's perception of their ability, confidence, and interest in learning mathematics, which affects motivation, persistence, and performance in mathematical tasks (Marsh, Martin, & Xu, 2021).

Operationally, it is defined as the mean scores obtained from the mathematics self-concept questionnaire covering the students' confidence in learning mathematics, perceived competence in mathematics, and interest in mathematics.

Perceived Competence in Mathematics. It refers to the students' self-assessment of their ability to perform mathematical tasks correctly and effectively (Marsh, Martin, & Xu, 2021).

Operationally, it is measured through questionnaire items that assess students' perception of their mathematical skills and knowledge.

Teachers' Integration of Technology. It refers to how mathematics teachers incorporate digital tools and technology into lesson delivery to enhance student learning (Howard, Tondeur, Ma, & Yang, 2022).

Operationally, it is measured through items in the survey assessing students' perceptions of their teachers' use of technology during mathematics instruction.

Technology-Enhanced Learning. It is the process of using digital tools, online platforms, and multimedia resources to facilitate and enhance learning experiences (Bond, Bedenlier, Marín, & Händel, 2020).

Operationally, it is defined as the mean scores obtained from the Technology-Enhanced Learning questionnaire covering use of technology in mathematics instruction, accessibility of technology for learning mathematics, and effectiveness/perceived usefulness of technology in learning mathematics. These dimensions are not treated as a single TAM scale.

Use of Digital Tools in Learning Mathematics. It refers to the application of software, applications, and online platforms to facilitate mathematics learning (Li & Ma, 2021).

Operationally, it is measured through questionnaire items assessing the frequency and quality of digital tool usage by students during mathematics lessons.

REVIEW OF RELATED LITERATURE AND STUDIES

This chapter presents the literature and related studies that focus on factors that affect the research variables and further elaborates on the implications of these results.

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Mathematics Self-Concept

Students' beliefs about their abilities in mathematics influence how they engage with learning tasks, persist in problem-solving, and respond to academic challenges (Marsh, Martin, & Xu, 2021). These beliefs play an important role in shaping students' classroom participation and learning experiences in secondary mathematics education (Dela Cruz & Caballes, 2021).

Confidence in learning mathematics has been associated with students' willingness to attempt challenging problems and sustain effort despite difficulty (Hwang, Chiu, & Chen, 2021). Higher levels of confidence are linked to increased participation in mathematics activities and improved academic performance among junior high school learners (Reyes & Bernardo, 2020).

Students' perceptions of their competence in mathematics affect their academic effort and achievement, with learners who view themselves as capable demonstrating stronger problem-solving skills and higher levels of engagement (Schukajlow & Rakoczy, 2021). Learners who perceive themselves as competent are also more likely to engage in higher-order thinking tasks and complex mathematical reasoning (Garcia & Hernandez, 2022). Sustained interest in mathematics contributes to deeper engagement and long-term academic persistence, especially when students find mathematical tasks meaningful and enjoyable (Lazarides & Dietrich, 2020). Increased interest in mathematics has been associated with positive learning attitudes and improved reasoning skills among junior high school students (Flores & Villavicencio, 2021).

Overall, studies emphasize the important role of mathematics self-concept in shaping students' motivation, learning behaviors, and academic outcomes in secondary education (Skaalvik & Skaalvik, 2020; DepEd, 2022).

Technology-Enhanced Learning in Mathematics

The integration of digital tools into mathematics instruction has gained prominence as schools seek to enhance student engagement and learning outcomes in both traditional and flexible learning environments (Bond, Bedenlier, Marín, & Händel, 2020). Educational initiatives have further reinforced the use of technology to support continuity and quality of learning in mathematics instruction (DepEd, 2021).

The use of digital tools such as interactive software, online platforms, and multimedia resources supports students' understanding of abstract mathematical concepts by enabling visualization and active exploration (Li & Ma, 2021). The use of video-based lessons and online learning platforms has been shown to clarify procedures and strengthen conceptual understanding in mathematics (Sarmiento & Orale, 2020).

Access to technological resources plays a critical role in determining the effectiveness of technology-enhanced learning, as students with reliable access to devices and internet connectivity are more able to participate actively in digital learning activities (OECD, 2021). Limited access to technology has been shown to restrict opportunities for meaningful engagement in mathematics learning (Tria, 2020).

Teachers' ability to integrate technology effectively into mathematics instruction significantly influences student learning outcomes, particularly when digital tools are aligned with instructional goals and pedagogical strategies (Howard, Tondeur, Ma, & Yang, 2022). Students demonstrate higher engagement and improved performance when teachers use technology to support problem-solving and conceptual understanding (Laguador & Chavez, 2021).

Overall, research highlights that technology-enhanced learning is most effective when supported by adequate access, teacher competence, and sound instructional design (CHED, 2022).

Mathematics Literacy

The ability to use mathematics meaningfully in real-life and academic contexts has become a central goal of modern mathematics education, particularly in response to the demands of global assessments and workforce readiness (OECD, 2022). Curriculum frameworks emphasize problem-solving and real-world applications as key outcomes of mathematics instruction (DepEd, 2022).

Students often experience difficulty when translating real-world situations into mathematical representations, especially when problems require identifying relevant variables and relationships (Stillman & Brown, 2020). Learners frequently struggle with modeling and reasoning tasks that go beyond routine procedures (Tan & Balagtas, 2021).

Effective application of mathematical concepts and procedures depends on students' ability to select appropriate strategies and apply them accurately in varied contexts (Pugalee & Choppin, 2020). Instruction that emphasizes contextualized and problem-based approaches has been shown to improve students' ability to apply mathematical procedures and enhance overall understanding (Malabago & Ganal, 2021).

Interpreting and evaluating mathematical solutions require students to explain their reasoning and connect results to the original problem context, which remains a challenge for many learners (Stacey, 2020). Difficulties in justification and interpretation highlight the need for instructional strategies that strengthen reasoning and mathematical communication (Rivera & Santos, 2021).

Research consistently underscores the importance of mathematics literacy in developing students' critical thinking and problem-solving skills (Gravemeijer et al., 2020; CHED, 2022).

Mathematics Self-Concept and Mathematics Literacy

Positive beliefs about mathematical ability are associated with better performance in tasks requiring reasoning, problem formulation, and interpretation of solutions (Zhang, Solheim, & Kaiser, 2020). Learners with stronger mathematics self-concept demonstrate higher levels of mathematics literacy in secondary school settings (Bernardo & Mendoza, 2021).

Higher confidence and perceived competence contribute to increased persistence and accuracy in solving complex mathematical problems (Kim & Hodges, 2021). Strong self-beliefs support improved performance in literacy-oriented mathematics tasks (Reyes & Castillo, 2021).

Interest in mathematics further strengthens the relationship between self-concept and mathematics literacy by motivating students to engage more deeply with learning tasks (Lazarides & Dietrich, 2020). Increased interest has been linked to improved engagement and mathematics literacy outcomes (Flores & Villavicencio, 2021).

Technology-Enhanced Learning and

Mathematics Literacy

Exposure to technology-enhanced learning environments has been linked to improvements in students' ability to apply mathematical concepts and interpret solutions effectively (Li, 2022). Technology-supported instruction has been associated with stronger mathematics literacy skills among secondary school students (Sarmiento & Orale, 2020).

Digital learning environments promote engagement with contextualized problems and support active learning through interactive and inquiry-based activities (Santos-Trigo & Reyes-Rodríguez, 2020). Students benefit most when digital tools are integrated with problem-based instructional strategies (Manalansan & Mercado, 2022).

Despite these benefits, the effectiveness of technology-enhanced learning depends on teacher competence, instructional design, and equitable access to technological resources (Howard et al., 2022; Tria, 2020).

RESEARCH METHODOLOGY

This chapter discussed the research design, the subject and respondents of the study, population and sample size, sampling technique, the data gathering instrument, validity and reliability of the research instrument, data gathering procedure, and the data analyses that were used in this study.

Research Design

This study utilized a descriptive-correlational research design to determine the relationship between mathematics self-concept, technology-enhanced learning, and mathematics literacy among Grade 10 students. Descriptive-correlational research was appropriate for examining naturally occurring variables without manipulation and for identifying the strength and direction of relationships between independent and dependent variables (Ahn & Kang, 2021; Curtis et al., 2022). This design allowed the researcher to analyze existing conditions and explore associations among variables as they occur in real educational settings.

The study focused on measuring the level of mathematics self-concept, the extent of technology-enhanced learning, and the level of mathematics literacy of the participants. Statistical analyses were employed to determine the relationships between these variables. This design was appropriate as it allowed the researcher to analyze associations between students' self-concept, technology experiences, and mathematics literacy without any experimental manipulation.

Subject and Respondents of the Study

The subject and respondents of this study were the Grade 10 students from one of the public schools in Negros Occidental for the school year 2025–2026. The respondents were selected from the Grade 10 STVEP to provide a representative sample of the population. A total of 140 students, comprising both male and female learners, participated in the study.

Demographic information such as gender, parents' highest educational attainment, average monthly family income, average Mathematics grade, access to technology, and primary digital-device availability was collected to contextualize the findings. The participants were officially enrolled in Grade 10, with no restrictions based on mathematics achievement level.

Population and Sample Size

The population of the study consisted of all Grade 10 STVEP students enrolled during the school year 2025–2026 at one of the public schools of Negros Occidental. There were five (5) sections with a total population of 140 students.

Due to the manageable size of the population, the study employed total enumeration, wherein all 140 Grade 10 STVEP students were included as respondents. Thus, the sample size of the study was also 140 students, representing one hundred percent (100%) of the population.

By including the entire population, the study ensured complete representation of all Grade 10 STVEP students, thereby increasing the accuracy, reliability, and validity of the research findings.

Sampling Technique

The study utilized a total enumeration sampling technique. The researcher employed complete enumeration since the study focuses on all 140 Grade 10 STVEP students from one of the public schools in Negros Occidental. All students were included as respondents in the study.

Total enumeration was used because the population size was manageable and relatively small. This method ensured that every member of the population participates in the study, thereby eliminating sampling bias and increasing the accuracy and reliability of the findings.

Data Gathering Instrument

The primary data-gathering instrument used in this study was a researcher-made questionnaire developed based on the variables and indicators presented in the Statement of the Problem and the Schematic Diagram of the Study. The questionnaire was adapted and structured according to existing literature on mathematics self-concept, technology-enhanced learning, and mathematics literacy, and was contextualized to suit Grade 10 students.

The questionnaire consisted of four (4) major parts, as follows:

Part I: Demographic Profile

The digital-device item asked respondents to identify their primary digital device for learning mathematics and was analyzed as a mutually exclusive categorical variable because respondents were represented in one primary-device category in Table 1. The demographic variables were included to describe the respondents and provide contextual information for interpreting the study findings.

Part II: Mathematics Self-Concept Questionnaire

This section measured the mathematics self-concept of Grade 10 students in terms of confidence in learning mathematics, perceived mathematical competence, and interest in mathematics. It consisted of fifteen (15) statements, with five (5) items for each sub-variable. Responses were rated using a five-point Likert scale: 5 – Always/Strongly Agree, 4 – Often/Agree, 3 – Sometimes/Neutral, 2 – Rarely/Disagree, and 1 – Never/Strongly Disagree.

The Technology-Enhanced Learning Questionnaire was researcher-made and contextualized to the Grade 10 mathematics-learning setting. It was not adapted from the PISA mathematics self-beliefs framework. Its three dimensions were mapped to their actual conceptual sources: (a) Use of Technology in Mathematics Instruction reflects technology integration in teaching and is informed by the UNESCO ICT Competency Framework for Teachers and the ISTE Standards for Educators; (b) Accessibility of Technology for Learning reflects contextual access to digital devices, internet connectivity, and online learning resources; and (c) Effectiveness of Technology in Learning Mathematics contains selected perceived-usefulness items informed by the Technology Acceptance Model (TAM), together with contextual items on engagement and self-paced learning. Because the latter two dimensions are not pure TAM constructs, the questionnaire is treated as a broader Technology-Enhanced Learning measure rather than a TAM scale.

Part III: Technology-Enhanced Learning Questionnaire

This part assessed the extent of technology-enhanced learning experienced by the respondents in terms of use of digital tools in mathematics instruction, accessibility of technology for learning mathematics, and teachers' integration of technology in mathematics instruction. It also contained fifteen (15) statements, with responses measured using the same five-point Likert scale.

The instrument was adapted from the mathematics self-beliefs framework of the Programme for International Student Assessment (PISA) developed by the Organisation for Economic Co-operation and Development (OECD, 2022). The items were modified to suit the context of Grade 10 students while maintaining alignment with the constructs measured by the PISA mathematics self-concept framework.

The questionnaire was adapted from the Technology Acceptance Model (TAM) by Davis (1989) and was further aligned with the UNESCO ICT Competency Framework for Teachers (2018) and the ISTE Standards for Educators (2017). The items were contextualized to assess students' experiences with technology-enhanced mathematics learning in the secondary school setting.

Part IV: Mathematics Literacy Test

This section consisted of a researcher-made multiple-choice Mathematics Literacy Test containing 15 final items. The test measured three components: formulating mathematical situations, employing mathematical concepts and procedures, and interpreting and evaluating mathematical results. Each correct answer received one (1) point and each incorrect answer received zero (0) points, giving a total possible score of 15. The test was developed with reference to the OECD PISA 2022 Mathematics Literacy Framework and aligned with the Grade 10 Mathematics curriculum. The 15 final items were selected from an initial pool of 30 candidate items that underwent expert content validation using Lawshe's CVR procedure. After validation, 15 items were retained to provide balanced coverage of the three literacy components, with five items per component and an appropriate distribution of item difficulty. Thus, the 30-item figure refers to the candidate pool submitted for validation, whereas the 15-item figure refers to the final test administered to the 140 respondents.

The questionnaire was written in clear and simple language to ensure that the respondents can easily understand and answer each item accurately.

Validity and Reliability of the Research Instrument

The research instruments consisted of a researcher-made questionnaire and a mathematics literacy test developed based on the study variables and the Schematic Diagram of the Study. The items were aligned with the DepEd K to 12 Mathematics 10 Learner's Module, Teacher's Guide, and relevant literature on mathematics self-concept, technology-enhanced learning, and mathematics literacy.

Prior to validation, a Table of Specifications was developed for the Mathematics Self-Concept Questionnaire, the Technology-Enhanced Learning Questionnaire, and the Mathematics Literacy Test to ensure that the items were proportionally distributed across the sub-variables and cognitive levels identified in the Schematic Diagram of the Study. This table guided the construction of items and served as the basis against which the validators checked content coverage and balance. To ensure validity, the instruments were subjected to face and content validation by three (3) Master Teachers in Mathematics from the Division of La Carlota City and two (2) validators from La Carlota City College using the Lawshe Validation Form, which required the validators to rate each item as essential, useful but not essential, not necessary in relation to the construct being measured. The validators assessed clarity, relevance, content coverage, organization, and alignment with the study objectives. Comments and suggestions were incorporated before finalizing the instruments for pilot testing.

A pilot test was conducted with Grade 10 students who were not part of the actual respondents. The internal consistency of the Likert-scale items was measured using Cronbach's Alpha, and the reliability of the mathematics literacy test was analyzed. A Cronbach's Alpha of 0.70 or higher was considered acceptable, confirming that the instruments were reliable and suitable for data collection.

The research instruments were evaluated by five (5) expert validators to determine their content validity. The Mathematics Self-Concept Questionnaire and the Technology-Enhanced Learning Questionnaire obtained overall Scale-level Content Validity Index (S-CVI) scores of 0.94 and 0.92, respectively, both exceeding the recommended minimum value of 0.80 (Polit & Beck, 2021). These results indicate that the questionnaire items were clear, relevant, and aligned with the objectives of the study. Based on the validators' recommendations, minor revisions, such as simplifying the wording and improving the age-appropriateness of some items, were made before the pilot testing. The Mathematics Literacy Test was also validated by the same panel of five experts using Lawshe's (1975) Content Validity Ratio (CVR). All 30 items were rated as essential, resulting in a Mean CVR of 1.00, which is higher than the required 0.99 for five validators. This indicates that the test has strong content validity, confirming that all items are appropriate for measuring students' mathematics literacy. Therefore, all research instruments were considered valid and suitable for use in the study.

For the Mathematics Literacy Test, reliability was established using test–retest reliability. The same thirty (30) pilot respondents answered the 15-item dichotomous test on two occasions one week apart, producing a Pearson correlation of $r = 0.698$, $p < .001$, indicating acceptable temporal stability. KR-20 would be the appropriate internal-consistency coefficient for dichotomous items, but the available manuscript does not contain the item-level pilot response matrix required to compute it; therefore, no KR-20 value is reported without supporting data.

Data Gathering Procedures

Prior to the actual conduct of the study, the researcher sought and secured the necessary permissions from the Schools Division Office and other relevant authorities. Coordination with the school was done to ensure that the data collection process would not disrupt classes and would follow school policies and ethical standards. After

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approval, the researcher prepared the validated questionnaire and finalized the schedule for administration in coordination with the subject teachers.

Before the distribution of the questionnaire, the respondents were formally oriented regarding the purpose, objectives, and significance of the study. The researcher emphasized that participation was voluntary and that they could decline or withdraw at any point without any form of penalty or academic consequence. An informed consent process was conducted to ensure that all respondents understood their rights and the nature of their participation in the study.

The researcher personally administered the questionnaires in a controlled and conducive classroom setting to ensure uniformity of administration. Standardized instructions were provided to minimize confusion and to ensure that all respondents had a clear understanding of how to answer the instrument. Adequate time was allotted for the completion of the questionnaire to allow respondents to carefully reflect on their answers without pressure. Clarifications were addressed only when necessary, ensuring that the researcher did not influence the responses.

After the administration, the questionnaires were retrieved immediately and checked for completeness, consistency, and proper completion. Any unclear or incomplete responses were reviewed for possible clarification when feasible. The data were then systematically encoded, organized, and prepared for statistical treatment using appropriate analytical tools.

Throughout the entire data gathering process, strict confidentiality and anonymity were maintained. All collected information was securely stored and accessed only by the researcher for academic purposes. Ethical considerations were strictly observed to ensure the integrity of the research process and the protection of the respondents' rights.

Data Analyses

The data were retrieved, encoded, tabulated, and statistically analyzed using appropriate descriptive and inferential statistical tools.

For statement of the problem 1, which sought to determine the profile of respondents of grade 10 frequency and percentage distributions were used.

f = number of respondents in a category

The formula for percentage distribution was:

$$\% = \frac{f}{N} \times 100$$

Where:

% = percentage

f = frequency of the category

N = total number of respondents

For statement of the problem 2, which sought to determine the level of mathematics self-concept of Grade 10 students in terms of confidence in learning mathematics, perceived competence in mathematics, and interest in mathematics, the mean and standard deviation were used.

The formula for solving the mean and standard deviation was:

Where:

$$\bar{x} = \frac{\sum x}{n}$$

Where:

$$\delta = \frac{\sum (x-\bar{x})^2}{n-1}$$

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$\sum$ = summation notation

x = responses of the respondents

n = sample size

$\bar{x}$ = mean

δ = standard deviation

x = scores/values

$\bar{x}$ = mean

n = sample size

To interpret the mean level of mathematics self-concept, the interpretation guide is presented below was used.

Scale	Adjectival Value	Mean Score Range	Interpretation	Verbal Description
5	Strongly Agree	4.21 – 5.00	Very High	Students have a very strong confidence, perceived competence, and interest in learning mathematics.
4	Agree	3.41 – 4.20	High	Students have strong confidence, perceived competence, and interest in learning mathematics.
3	Neutral	2.61 – 3.40	Moderate	Students have a moderate level of confidence, perceived competence, and interest in learning mathematics.
2	Disagree	1.81 – 2.60	Low	Students have low confidence, perceived competence, and interest in learning mathematics.
1	Strongly Disagree	1.00 – 1.80	Very Low	Students have very low confidence, perceived competence, and interest in learning mathematics.

For statement of the problem 3, which sought to determine the extent of technology-enhanced learning experienced by Grade 10 students in terms of use of digital tools in mathematics learning, accessibility of technology for learning mathematics, and teachers' integration of technology in mathematics instruction, the mean and standard deviation were used.

To interpret the extent of technology-enhanced learning, the interpretation guide presented below was used:

Scale	Adjectival Value	Mean Score Range	Interpretation	Verbal Description
5	Strongly Agree	4.21 – 5.00	Very High	Students frequently use digital tools, have good access to technology, and experience effective teacher integration of technology.
4	Agree	3.41 – 4.20	High	Students often use digital tools, have adequate access to technology, and experience teacher integration of technology.
3	Neutral	2.61 – 3.40	Moderate	Students moderately use digital tools, have some access to technology, and occasionally experience teacher integration of technology.
2	Disagree	1.81 – 2.60	Low	Students rarely use digital tools, have limited access to technology, and experience minimal teacher integration of technology.
1	Strongly Disagree	1.00 – 1.80	Very Low	Students almost never use digital tools, lack access to technology, and experience little or no teacher integration of technology.

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For statement of the problem 4, which sought to determine the level of mathematics literacy of Grade 10 students in terms of formulating mathematical situations, employing mathematical concepts and procedures, and interpreting mathematical solutions, the mean and standard deviation were used.

To interpret the mean score of each mathematics literacy category (Formulating Mathematical Situations, Employing Mathematical Concepts and Procedures, and Interpreting and Evaluating Mathematical Results), the interpretation guide presented below was used:

Scale	Adjectival Value	Mean Score Range	Interpretation	Verbal Description
5	Strongly Agree	4.21 – 5.00	Very High	Students are highly capable of formulating mathematical situations, applying concepts and procedures, and interpreting solutions accurately.
4	Agree	3.41 – 4.20	High	Students are capable of formulating mathematical situations, applying concepts and procedures, and interpreting solutions correctly.
3	Neutral	2.61 – 3.40	Moderate	Students are moderately capable of formulating mathematical situations, applying concepts and procedures, and interpreting solutions.
2	Disagree	1.81 – 2.60	Low	Students have low ability in formulating mathematical situations, applying concepts and procedures, and interpreting solutions.
1	Strongly Disagree	1.00 – 1.80	Very Low	Students have very low ability in formulating mathematical situations, applying concepts and procedures, and interpreting solutions.

To interpret the overall mathematics literacy score of the respondents, the separate interpretation guide presented below was used:

Scale	Adjectival Value	Mean Score Range	Interpretation	Verbal Description
5	Strongly Agree	4.21 – 5.00	Very High	Students possess a very high overall level of mathematics literacy.
4	Agree	3.41 – 4.20	High	Students possess a high overall level of mathematics literacy.
3	Neutral	2.61 – 3.40	Moderate	Students possess a moderate overall level of mathematics literacy.
2	Disagree	1.81 – 2.60	Low	Students possess a low overall level of mathematics literacy.
1	Strongly Disagree	1.00 – 1.80	Very Low	Students possess a very low overall level of mathematics literacy.

For statement of the problem 5, which sought to determine whether there was a significant relationship between mathematics self-concept and mathematics literacy of Grade 10 students, the Spearman Rank-Order Correlation Coefficient (r_s) was used.

The formula for Spearman's rho was:

$$r_s = 1 - \frac{6\sum d^2}{\mathrm{n}(n^2 - 1)}$$

Where:

rs = Spearman rank order correlation coefficient

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d = difference between the ranks of paired scores (x and y)

n = number of respondents

In this study:

x = mathematics self-concept

y = mathematics literacy

n = number of respondents

For statement of the problem 6, which sought to determine whether there was a significant relationship between technology-enhanced learning and mathematics literacy of Grade 10 students, the Spearman Rank-Order Correlation Coefficient (rs) was used.

Presentation, Analysis and Interpretation of Data

This chapter presents the gathered data on the Mathematics Self-Concept, Technology-Enhanced Learning, and Mathematics Literacy of Grade 10 students. The results are organized and presented using appropriate statistical tools.

The analysis and interpretation aim to explain the findings based on the data collected. The study also examines the relationship between mathematics self-concept, technology-enhanced learning, and mathematics literacy.

Demographic Profile of the Respondents

The table 1 below shows the demographic profile of the respondents.

Table 1. Frequency and Percentage Distribution of the Demographic Profile of the Respondents.

Profile	Category	F	%
Gender	Male	60	42.86
	Female	80	57.14
	Total	140	100.00
Average Monthly Family Income	Below ₱10,000	72	51.43
	₱10,000 – ₱29,999	45	32.14
	₱30,000 – ₱49,999	11	7.86
	₱50,000 – ₱69,999	9	6.43
	₱70,000 – ₱89,999	3	2.14
	Total	140	100.00
Parental Education	Elementary Graduate	18	12.86
	High School Graduate	61	43.57
	College Graduate	60	42.86
	Postgraduate (Master's /	1	.71
	Total	140	100.00
	90-100	70	50.00
Average Mathematics	85-89	56	40.00
Grade	80-84	14	10.00
	Total	140	100.00
Access to Technology	With internet access	118	84.29
to Learning	Without internet access	22	15.71
Mathematics	Total	140	100.00
Availability of	Smartphone	132	94.29

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Digital Devices	Tablet	4	2.86
	Laptop/Computer	4	2.86
	Total	140	100.00

As shown in Table 1, the majority of the respondents are female (f=80, 57.14%), while (f=60, 42.86%) are male. In terms of family income, most respondents belong to families earning below ₱10,000 (f=72, 51.43%), followed by those earning ₱10,000–₱29,999 (f=45, 32.14%).

Regarding parental education, most parents are high school graduates (f=61, 43.57%), followed closely by college graduates (f=60, 42.86%). In terms of academic performance, (f=70, 50%) of the students obtained grades ranging from 90–100, indicating high academic achievement.

Moreover, (f=118, 84.29%) of the respondents have internet access, and (f=132, 94.29%) own smartphones, showing that most students have access to technology that can support their learning.

The demographic profile of the respondents reveals important contextual characteristics that help explain their learning environment in mathematics. The slight predominance of female students (f=80, 57.14%) aligns with national enrollment patterns in Philippine public schools and provides a relevant background variable, as gender has been linked in some studies to differences in mathematics self-concept and attitudes toward learning.

In terms of socioeconomic status, most respondents come from low-income households, with (f=72, 51.43%) earning below ₱10,000 monthly and (f=45, 32.14%) earning ₱10,000–₱29,999. This indicates that a large proportion of students face economic constraints that may limit access to learning resources, tutoring, and other academic support systems. Such conditions are widely recognized as influential factors in educational outcomes, particularly in mathematics achievement and technology access.

Parental educational attainment shows a relatively balanced distribution between high school graduates (f=61, 43.57%) and college graduates (f=60, 42.86%), suggesting moderate to relatively high educational backgrounds among parents. This factor is important because higher parental education is often associated with stronger academic support, guidance, and positive influence on students' motivation and learning attitudes.

Finally, students generally demonstrate strong academic performance in mathematics, with (f=70, 50%) achieving grades of 90–100 and (f=56, 40%) in the 85–89 range. In addition, most respondents have access to technology, particularly smartphones (f=132, 94.29%) and internet connectivity (f=118, 84.29%), although access to more advanced devices like laptops remains very limited (f=4, 2.86%). These findings indicate that while students are academically performing well and are largely digitally connected, limitations in economic resources and device quality may still affect the depth of their technology-enhanced learning experiences and overall mathematics literacy.

Level of Mathematics Self-Concept

Table 2 below presents the confidence in learning mathematics of Grade 10 Students.

Table 2. Level of Mathematics Self-Concept.

Level of Mathematics Self-Concept	Mean	SD	Interpretation
Confidence in Learning Mathematics	**3.58**	**.49**	**High**
1. I feel confident when learning new mathematics topics.	3.62	.75	High
2. I am comfortable answering mathematics questions in class.	3.40	.73	Moderate
3. I do not easily feel nervous during mathematics lessons.	3.32	.77	Moderate
4. I believe I can learn mathematics well if I put in effort.	4.06	.83	High
5. I feel confident solving mathematics problems on my own.	3.49	.76	High

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Perceived Competence in Mathematics	**3.30**	**.51**	**Moderate**
1. I believe I am good at mathematics.	3.30	.68	Moderate
2. I can understand most mathematics lessons without difficulty.	3.14	.63	Moderate
3. I can solve mathematics problems as well as most of my classmates.	3.26	.76	Moderate
4. I perform well in mathematics tests and activities.	3.40	.76	Moderate
5. I consider mathematics as one of my academic strengths.	3.40	.78	Moderate
Interest in Mathematics	**3.60**	**.67**	**High**
1. I enjoy studying mathematics.	3.66	.88	High
2. I find mathematics lessons interesting.	3.75	.95	High
3. I look forward to mathematics classes.	3.57	.93	High
4. I am willing to spend extra time learning mathematics.	3.53	.85	High
5. I like solving mathematics problems.	3.51	.90	High
Mathematics Self-Concept as a whole	3.49	.47	**High**

Legends:(4.21-5.0)-Very High;(3.41 – 4.20)-High;(2.61-3.40) Moderate (1.81 – 2.60)-Low;(1.00 – 1.80)-Very Low

As reflected in Table 2, the overall mean of mathematics self-concept is 3.49, interpreted as High. Among its components, confidence in learning mathematics (3.58) and interest in mathematics (3.60) are both rated as High, while perceived competence (3.30) is interpreted as Moderate.

Table 2 shows that the respondents generally have a high level of mathematics self-concept, with an overall mean of 3.49. This indicates that Grade 10 students perceive themselves positively as learners of mathematics. Among the three components, Interest in Mathematics obtained the highest mean (3.60), suggesting that students are genuinely motivated and enjoy learning mathematics. This strong interest is important because it supports sustained engagement and better learning outcomes.

The second component, Confidence in Learning Mathematics (M = 3.58), also reflects a high level, indicating that students believe they can learn mathematics well, especially when effort is applied. This shows a growth-oriented mindset among learners. However, some moderate ratings in items related to nervousness and classroom participation suggest that a portion of students still experience mathematics anxiety and hesitation in expressing their ideas in class.

On the other hand, Perceived Competence in Mathematics obtained the lowest mean (3.30, Moderate), implying that although students are interested and generally confident, they are less certain about their actual mastery of mathematical skills. This gap between interest and perceived competence suggests a need for instructional strategies that strengthen students' conceptual understanding and performance feedback. Overall, the findings highlight the importance of enhancing both students' affective engagement and their actual mathematical competence to improve their overall mathematics self-concept and learning outcomes.

In addition to the mean scores, the standard deviation values provide information about the consistency of the respondents' responses. A lower standard deviation indicates that the responses are closely clustered around the mean, suggesting that the respondents generally share similar perceptions regarding their mathematics self-concept. Conversely, a higher standard deviation indicates greater variability in responses, reflecting differences in students' experiences and perceptions.

The standard deviation values for the three dimensions of mathematics self-concept indicate that the respondents' responses were generally consistent. This suggests that most Grade 10 students shared similar views regarding their confidence in learning mathematics, interest in mathematics, and perceived competence. Although there were slight variations in individual responses, the relatively low dispersion of scores implies that the computed mean values accurately represent the overall perceptions of the respondents.

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The moderate variation in the Perceived Competence dimension suggests that while many students believed they were capable in mathematics, others were less confident in their abilities. This supports the moderate mean score and shows that students differ more in how they view their mathematical skills than in their confidence or interest. This finding agrees with Schukajlow and Rakoczy (2021), who stated that students' perceived competence is influenced by their learning experiences and affects their mathematics performance. Likewise, Skaalvik and Skaalvik (2020) found that students who believe they are competent in mathematics are more likely to stay engaged and perform better. Overall, the low standard deviation indicates that the students' responses were generally consistent, making the findings a reliable representation of their mathematics self-concept.

Extent of Technology-Enhanced Learning

Table 3 presents the Extent of Technology-Enhanced Learning experienced by Grade 10 students.

Table 3. Extent of Technology-Enhanced Learning.

Extent of Technology-Enhanced Learning	Mean	Standard Deviation	Interpretation
Use of Technology in Mathematics Instruction	**3.60**	**.60**	
1. My mathematics teacher uses digital tools during lessons.	3.65	.92	High
2. Online presentations or videos are used in teaching mathematics.	3.61	.93	High
3. Technology is integrated into mathematics classroom activities.	3.56	.81	High
4. Digital platforms are used	3.50	.84	High
for mathematics assignments or tasks.			
5. Technology is regularly used to support mathematics instruction.	3.66	.83	High
Accessibility of	**3.71**	**.63**	**High**
Technology for Learning			
1. I have access to a digital device for learning mathematics.	3.74	.79	High
2. I can access the internet when studying mathematics.	3.72	.90	High
3. I have access to online mathematics learning resources.	3.61	.87	High
4. I can use technology at home for mathematics learning.	3.84	.91	High
5. Lack of technology does not prevent me from studying mathematics.	3.62	.82	High
Effectiveness of Technology in Learning Mathematics	**3.65**	**.92**	**High**
1. Technology helps me understand mathematics concepts better.	3.69	.83	High
2. Digital tools make mathematics lessons more engaging.	3.56	.78	High
3. Technology helps me practice mathematics skills effectively.	3.63	.76	High
4. Technology allows me to learn mathematics at my own pace.	3.71	.76	High
5. Using technology improves my performance in mathematics.	3.68	.76	High
Extent of Technology-Enhanced Learning as a whole	**3.65**	**.49**	**High**

Legends:(4.21-5.0)-Very High;(3.41 – 4.20)-High;(2.61-3.40) Moderate (1.81 – 2.60)-Low;(1.00 – 1.80)-Very Low

Table 3 reveals that Grade 10 students have a consistently high level of technology-enhanced learning, with an overall mean of 3.65. This indicates that technology is not only accessible to learners but is also actively integrated into their mathematics learning experiences. Despite the respondents' generally low-income background, the findings suggest that access to smartphones and internet connectivity has enabled meaningful engagement with digital learning tools both inside and outside the classroom.

Among the three components, Accessibility of Technology for Learning obtained the highest mean (3.71), followed by Effectiveness of Technology in Learning Mathematics (3.65) and Use of Technology in Mathematics Instruction (3.60). This indicates that students are highly capable of accessing digital tools, particularly at home, where most respondents reported using technology for mathematics learning. This supports the idea that mobile devices and internet access have become key enablers of flexible and self-directed learning.

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In terms of instructional practice, students reported that their teachers regularly integrate digital tools into mathematics lessons, reflecting a high reported level of technology use in the sample. Students also reported positive perceptions of technology for understanding concepts and learning at their own pace. These descriptive perceptions should not be interpreted as evidence that technology use caused better mathematics learning outcomes.

The descriptive pattern may be considered alongside literature emphasizing that the educational value of technology depends on how digital tools are integrated with instructional goals and learning activities (Organisation for Economic Co-operation and Development, 2023). The present study, however, did not test whether particular technology practices caused differences in mathematics literacy.

Overall, the results show that technology-enhanced learning was highly reported by the respondents. Its relationship with mathematics literacy should be interpreted separately from these descriptive ratings because the correlation between the two variables was negligible and not statistically significant in this sample.

Level of Mathematics Literacy

Table 4 below presents the level of mathematics literacy of Grade 10 Students.

Table 4. Level of Mathematics Literacy of Grade 10 Students.

Mathematics Literacy Component	N	Mean Correct	SD	Interpretation
Formulating Mathematical Situations	140	2.99 / 5	1.28	59.8% correct — Developing
Employing Mathematical Concepts and Procedures	140	3.17 / 5	1.38	63.4% correct — Proficient
Interpreting and Evaluating Mathematical Results	140	3.59 / 5	1.27	71.8% correct — Proficient
Overall Mathematics Literacy Test	140	9.75 / 15	2.19	65.0% correct — Proficient

Among the three components, Formulating Mathematical Situations obtained the lowest percentage correct (59.8%, Developing), indicating that this was the least successfully answered domain in the assessment. Employing Mathematical Concepts and Procedures obtained 63.4% correct (Proficient), while Interpreting and Evaluating Mathematical Results obtained the highest percentage correct at 71.8% (Proficient). These descriptive differences identify relative areas of performance in this sample but should not be interpreted as evidence of causal instructional effects.

The second component, Employing Mathematical Concepts and Procedures (63.4% correct, Proficient), showed somewhat stronger performance than formulating mathematical situations. Interpreting and Evaluating Mathematical Results (71.8% correct, Proficient) was the strongest of the three assessed domains. These results suggest that students answered interpretation and evaluation items correctly more often than formulation items in this particular 15-item assessment.

Overall, the findings are consistent with the OECD PISA 2022 Mathematics Framework in treating mathematics literacy as the ability to formulate, employ, and interpret mathematics in real-life situations. In this sample, the lowest percentage correct was observed for formulating mathematical situations, while the highest was observed for interpreting and evaluating mathematical results. These results describe the relative performance of the respondents on the 15-item test and should be interpreted in light of the test's limited length and multiple-choice format.

Relationship Between Mathematics

Self-Concept and Mathematics Literacy

Table 5 below shows the relationship between mathematics self-concept and mathematics literacy of Grade 10 students

Table 5. Relationship Between Mathematics Self-Concept and Mathematics Literacy.

Variables	Test Statistics (r_s)	p-value	Decision for Ho	Interpretation
Mathematics Self-Concept VS Mathematics Literacy	0.214	0.01	Reject Ho	Significant

The computed Spearman's rho was $r_s = .214$ with $p = .01$. Because $p < .05$, the null hypothesis was rejected. A statistically significant but weak positive association was found between Mathematics Self-Concept and Mathematics Literacy ($r_s = .214$, $p = .01$). The small effect size is central to the interpretation: the variables were related in this sample, but the association was weak and does not establish that mathematics self-concept causes higher mathematics literacy performance.

The result indicates a statistically significant but weak positive association. Students with higher mathematics self-concept tended, on average, to have somewhat higher mathematics literacy scores in this sample. However, the magnitude of the association was small, and the correlational design does not support causal conclusions.

This finding is supported by Ahmed Alkhateeb (2021), who found that students with higher mathematics self-concept demonstrate better academic performance and problem-solving abilities. The study emphasized that confidence in one's ability plays a crucial role in enhancing learning outcomes in mathematics.

Relationship Between Technology-Enhanced

Learning and Mathematics Literacy

Table 6 below shows the relationship between technology-enhanced learning and mathematics literacy of Grade 10.

Table 6. Relationship Between Technology-Enhanced Learning and Mathematics Literacy.

Variables	Test Statistics (r_s)	p-value	Decision for Ho	Interpretation
Technology-Enhanced Learning VS Mathematics Literacy	0.060	0.481	Failed to Reject Ho	Not Significant

Table 6 presents the relationship between Technology-Enhanced Learning and Mathematics Literacy among Grade 10 students. The Spearman's rho test obtained a correlation coefficient of $r_s = 0.060$ with a p-value of 0.481. The correlation coefficient indicates a very weak positive relationship, meaning that students with greater exposure to technology-enhanced learning tended to have slightly higher mathematics literacy, but the association was extremely small and practically negligible.

Since the p-value of 0.481 is greater than the 0.05 level of significance, the null hypothesis is failed to be rejected. Therefore, there is no statistically significant relationship between technology-enhanced learning and mathematics literacy. This means that the high extent of technology-enhanced learning reported by the students did not necessarily correspond to higher mathematics literacy performance. The finding suggests that access to and use of technology alone may not be sufficient to improve students' mathematical literacy.

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Technology alone does not guarantee improved mathematics literacy because its effectiveness depends on how it is used in instruction. Digital tools, online resources, and videos should be purposefully integrated into activities that develop critical thinking, mathematical reasoning, problem-solving, modeling, and real-life application, rather than simply providing information.

Overall, Technology-Enhanced Learning was not significantly related to Mathematics Literacy ($r_s = 0.060$, $p = 0.481$). Thus, the null hypothesis was not rejected. Technology should be combined with contextualized problems, problem-solving, mathematical modeling, and meaningful feedback to strengthen students' mathematical understanding and literacy.

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents the summary of the findings, conclusions, and recommendations of the study

Summary of Findings

Based on the results of the study, the following findings were obtained:

1. The majority of the respondents were female (f=80, 57.14%), while (f=60, 42.86%) were male. Most of them belonged to families earning below ₱10,000 (f=72, 51.43%), and a large percentage had internet access (f=118, 84.29%) and smartphones (f=132, 94.29%), indicating that students generally have access to digital learning resources.

2. The overall level of mathematics self-concept of Grade 10 students obtained a mean score of 3.49 (SD = 0.47), interpreted as high. Specifically, students demonstrated high levels of confidence in learning mathematics (M = 3.58, SD = 0.49) and interest and enjoyment in mathematics (M = 3.60, SD = 0.67), while their perceived mathematical competence (M = 3.30, SD = 0.51) was interpreted as moderate. These findings indicate that although students generally possessed positive self-beliefs and interest in mathematics, they were comparatively less certain about their mathematical competence.

3. The extent of technology-enhanced learning obtained an overall mean of 3.65 (SD = 0.49), interpreted as high. This describes the respondents' reported frequency, access, and perceived technology-related learning experiences in mathematics. The descriptive result does not establish an educational effect of technology use.

4. The Mathematics Literacy Test yielded an overall mean of 9.75 correct answers out of 15 (65.0%, SD = 2.19), interpreted as Proficient. By component, Formulating Mathematical Situations had a mean of 2.99 out of 5 (59.8%, Developing), Employing Mathematical Concepts and Procedures had a mean of 3.17 out of 5 (63.4%, Proficient), and Interpreting and Evaluating Mathematical Results had a mean of 3.59 out of 5 (71.8%, Proficient).

5. A statistically significant but weak positive association was found between mathematics self-concept and mathematics literacy (rs = .214, p = .011). The result supports rejection of the null hypothesis, while the weak effect size indicates that the association was limited in magnitude.

6. No statistically significant association was found between technology-enhanced learning and mathematics literacy (rs = .060, p = .481). Therefore, the null hypothesis was not rejected.

CONCLUSIONS

Based on the findings, the following conclusions were drawn:

1. The respondents generally reported access to digital resources for learning mathematics, with 84.29% reporting internet access and 94.29% reporting a smartphone as their primary available digital device category. These descriptive results provide context for the technology-enhanced learning findings but do not by themselves establish the quality or educational effectiveness of technology use.

2. The respondents demonstrated a generally positive mathematics self-concept, characterized by confidence and interest in learning mathematics. However, their perceptions of their own mathematical competence require further enhancement. This implies that mathematics instruction should not only develop students' knowledge and skills but also strengthen their self-belief and confidence in solving mathematical tasks to promote sustained engagement and achievement.

3. The respondents reported a high extent of technology-enhanced learning ($M = 3.65$, $SD = .49$). This describes the frequency and perceived availability/effectiveness of technology-related learning experiences in the sample. Because the technology measure was not significantly associated with mathematics literacy, the result should be interpreted descriptively rather than as evidence of an educational effect.

4. The respondents exhibited an adequate but still developing level of mathematics literacy. While they were more capable of interpreting and evaluating mathematical information, they encountered greater difficulty in formulating mathematical situations and applying appropriate mathematical concepts to solve problems. This suggests the need for instructional approaches that provide authentic, contextualized, and problem-based learning experiences to strengthen students' mathematical reasoning and application skills.

5. A statistically significant but weak positive association was observed between mathematics self-concept and mathematics literacy. This finding supports the relevance of students' self-beliefs as a correlate of mathematics literacy in this sample, while the small effect size and correlational design require cautious interpretation and do not establish causation.

6. Despite the high reported extent of technology-enhanced learning, it was not significantly associated with mathematics literacy in this sample ($r_s = .060$, $p = .481$). The result indicates that the measured technology-enhanced learning experiences were not statistically related to literacy performance in this study. It should not be interpreted as evidence that technology has no educational value; rather, the study did not detect a statistically significant association under the measures and conditions used.

RECOMMENDATIONS

Based on the conclusions, the following recommendations are proposed:

1. Schools and educators are encouraged to sustain students' access to technology and to examine how digital resources are used during mathematics instruction. Technology use may be aligned with meaningful mathematics tasks, problem solving, visualization, and feedback, while recognizing that the present study did not establish a significant association between technology-enhanced learning and mathematics literacy.
2. Mathematics teachers of Doña Hortencia Salas Benedicto National High School may implement specific instructional strategies to enhance students' mathematics self-concept within the current school year, particularly by strengthening students' perceived competence, which was found to be the lowest-rated component. This may include providing consistent positive reinforcement, giving regular formative feedback on students' mathematical performance, fostering a supportive classroom environment, encouraging active student participation, and designing engaging and moderately challenging learning tasks that build confidence and a stronger sense of mathematical competence.
3. Mathematics teachers may explore purposeful technology-enhanced activities that support visualization, exploration, practice, and problem solving. Such activities should be evaluated through classroom-based evidence rather than assuming that technology use itself produces higher mathematics literacy.
4. The Mathematics Department Head, in collaboration with the mathematics teachers, may be responsible for planning instructional interventions within the school year that prioritize the development of higher-order mathematical skills, particularly in formulating mathematical situations, applying appropriate concepts and procedures, and analyzing real-life problems. Emphasis should be placed on contextualized and problem-based learning activities.

5. Schools may develop targeted programs that strengthen students' interest, confidence, and positive mathematics self-concept, while monitoring whether these efforts are associated with changes in mathematics learning outcomes through appropriate assessment.
6. The School Head, in coordination with the Division Education Program Supervisor for Mathematics, may provide continuous professional development and training for mathematics teachers at least once every school year to enhance their competence in integrating technology effectively into mathematics instruction.

7. Future researchers are encouraged to conduct studies with larger and more diverse samples and to consider multiple regression or another appropriate multivariable analysis, if measurement and statistical assumptions permit. Such analyses could examine whether mathematics self-concept and technology-enhanced learning are independently associated with mathematics literacy while accounting for contextual variables such as prior Mathematics grade, family income, parental education, internet access, and device availability.

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APPENDICE

Appendix C.

Research Instrument Validation Form

RESEARCH INSTRUMENT VALIDATION FORM

Using the content Validity (CVR) devise by C.H. Lawshe (1975), kindly rate each item in the instrument by responding to the question for each of the items. Is the skill or knowledge measured by this item (a) Essential, (b) Useful but not essential, or (c) Not necessary to the **Mathematics Self-Concept, Technology-Enhanced Learning and Mathematics Literacy of Grade 10 Students. of Grade 10 Students.**

Kindly check the appropriate rating scale on the blank that corresponds to your response.

ITEMS	Essential	Useful but not Essential	Not Necessary	Comment
Mathematics Self-Concept **A. Confidence in Learning Mathematics**				
I feel confident when learning new Mathematics topics.				
I am comfortable answering Mathematics questions in class.				
I do not easily feel nervous during Mathematics lessons.				
I believe I can learn Mathematics well if I put in effort.				
I feel confident solving Mathematics problems on my own.				
I believe I am good at Mathematics.				
B. Perceived Mathematical Competence				
I can understand most Mathematics lessons without difficulty.				
I can solve Mathematics problems as well as most of my classmates.				
I perform well in Mathematics tests and activities.				
I consider Mathematics as one of my academic strengths.				
C. Interest and Enjoyment in Mathematics				
I enjoy studying Mathematics.				
I find Mathematics lessons interesting.				
I look forward to Mathematics classes.				
I am willing to spend extra time learning Mathematics.				
I like solving Mathematics problems.				
Technology-Enhanced Learning **A. Use of Technology in Mathematics Instruction**				
My Mathematics teacher uses digital tools during lessons.				
Online presentations or videos are used in teaching Mathematics.				

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Technology is integrated into Mathematics classroom activities.				
Digital platforms are used for Mathematics assignments or tasks.				
Technology is regularly used to support Mathematics instruction.				
B. Accessibility of Technology for Learning				
I have access to a digital device for learning Mathematics.				
I can access the internet when studying Mathematics.				
I have access to online Mathematics learning resources.				
I can use technology at home for Mathematics learning.				
Lack of technology does not prevent me from studying Mathematics.				
C. Effectiveness of Technology in Learning Mathematics				
Technology helps me understand Mathematics concepts better.				
Digital tools make Mathematics lessons more engaging.				
Technology helps me practice Mathematics skills effectively.				
Technology allows me to learn Mathematics at my own pace.				
Using technology improves my performance in Mathematics.				
Mathematics Literacy Test **A. Formulating Mathematical Situations**				
A family plans to travel 180 kilometers. Their car uses 1 liter of fuel for every 12 kilometers. Which mathematical expression represents the total fuel needed? A. 180 × 12 C. 12 ÷ 180 B. 180 ÷ 12 D. 180 + 12				
A student saves ₱50 each week. Which equation represents the total savings (S) after *w* weeks? A. S = 50 + w C. S = 50w B. S = 50 – w D. S = w ÷ 50				
A water tank holds 500 liters. Each hour, 45 liters are used. Which situation can be solved using subtraction? A. Finding the total water used in 10 hours B. Finding the remaining water after several hours				

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C. Finding the average water used per hour D. Finding the ratio of water used				
A recipe requires 2 cups of flour for every 3 cups of sugar. What mathematical concept is needed to solve this problem? A. Percentage C. Probability B. Ratio D. Graphing				
A school cafeteria sells lunch for ₱75 each. Which equation can be used to find the total cost (C) for *n* lunches? A. C = 75 – n C. C = 75n B. C = 75 ÷ n D. C = n ÷ 75				
Employing Mathematical Concepts and Procedures				
A pair of shoes costs ₱2,400 and is discounted by 25%. What is the discounted price? A. ₱1,800 C. ₱2,100 B. ₱2,000 D. ₱2,300				
The average of 4 numbers is 15. What is the sum of the numbers? A. 19 C. 45 B. 30 D. 60				
A rectangle has a length of 10 cm and a width of 6 cm. What is its area? A. 16 cm² C. 60 cm² B. 32 cm² D. 120 cm²				
4. Solve: 3(x + 4) = 21 A. x = 3 C. x = 5 B. x = 4 D. x = 7				
A bag contains 3 red balls and 5 blue balls. What is the probability of picking a red ball? A. 3/5 C. 3/8 B. 5/8 D. 8/3				
Interpreting and Evaluating Mathematical Results				
A student calculated that buying 3 notebooks at ₱45 each costs ₱90. What can you conclude? A. The answer is correct B. The answer is too high C. The answer is too low D. The problem cannot be solved				
A graph shows that the temperature increased from 25°C to 35°C. What is the change in temperature? A. 5°C C. 15°C B. 10°C D. 60°C				
A phone plan costs ₱599 per month. A student says the yearly cost is ₱6,000. Is the answer reasonable? A. Yes, exactly correct B. No, it should be higher C. No, it should be lower				

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D. Cannot be determined				
A student calculated the area of a room as 2,500 square meters. What is the best evaluation? A. Reasonable for a classroom. B. Too small for a room C. Too large for a room D. Correct regardless of size				
A student solved a problem and got a negative answer for the distance. What does this most likely mean? A. The solution is reasonable B. The units are incorrect C. There is an error in the solution D. Distance can be negative				

Comments/Suggestions and Modifications:

____

____

____

Validator:

____
Signature over Printed Name

Appendix D.

Questionnaire

Mathematics Self-Concept, Technology-Enhanced Learning and Mathematics Literacy of Grade 10 Students

Part I. Demographic Profile

Name: (Optional) ___________________________________

Gender: ☐ Male ☐ Female

Average Monthly Family Income

☐ Below ₱10,000 ☐ ₱50,000 – ₱69,999

☐ ₱10,000 – ₱29,999 ☐ ₱70,000 – ₱89,999

☐ ₱30,000 – ₱49,999 ☐ ₱90,000 and above

Parental Education: Please check (✓) the highest level completed by your parent/guardian:

☐ Elementary Graduate ☐ College Graduate

☐ High School Graduate ☐ Postgraduate (Master's / Doctorate)

Average Mathematics Grade (Previous Quarter)

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☐ 90-100

☐ 85-89

☐ 80-84

☐ 75-79

☐ Below 75

Access to Technology for Learning Mathematics

☐ With internet access ☐ Without internet access

Availability of Digital Devices

☐ Smartphone ☐ Laptop/Computer

☐ Tablet ☐ None

Direction: Please read each statement carefully. Using the scale below, select the number that best describes your level of agreement. For each agreement statement, please check (✓) one option.

Scale:
5 – Always / Strongly Agree
4 – Often / Agree
3 – Sometimes / Neutral
2 – Rarely / Disagree
1 – Never / Strongly Disagree

Part II. Mathematics Self-Concept

No.	Statement	(5)	(4)	(3)	(2)	(1)
Confidence in Learning Mathematics						
1	I feel confident when learning new mathematics topics.					
2	I am comfortable answering mathematics questions in class.					
3	I do not easily feel nervous during mathematics lessons.					
4	I believe I can learn mathematics well if I put in effort.					
5	I feel confident solving mathematics problems on my own.					
Perceived Mathematical Competence						
1	I believe I am good at mathematics.					
2	I can understand most mathematics lessons without difficulty.					
3	I can solve mathematics problems as well as most of my classmates.					

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4	I perform well in mathematics tests and activities.					
5	I consider mathematics as one of my academic strengths.					
Interest and Enjoyment in Mathematics						
1	I enjoy studying mathematics.					
2	I find mathematics lessons interesting.					
3	I look forward to mathematics classes.					
4	I am willing to spend extra time learning mathematics.					
5	I like solving mathematics problems.					

Part III. Technology-Enhanced Learning

No.	Statement	(5)	(4)	(3)	(2)	(1)
Use of Technology in Mathematics Instruction						
1	My mathematics teacher uses digital tools during lessons.					
2	Online presentations or videos are used in teaching mathematics.					
3	Technology is integrated into mathematics classroom activities.					
4	Digital platforms are used for mathematics assignments or tasks.					
5	Technology is regularly used to support mathematics instruction.					
Accessibility of Technology for Learning						
1	I have access to a digital device for learning mathematics.					
2	I can access the internet when studying mathematics.					
3	I have access to online mathematics learning resources.					
4	I can use technology at home for mathematics learning.					
5	Lack of technology does not prevent me from studying mathematics.					
Effectiveness of Technology in Learning Mathematics						
1	Technology helps me understand mathematics concepts better.					
2	Digital tools make mathematics lessons more engaging.					

3	Technology helps me practice mathematics skills effectively.					
4	Technology allows me to learn mathematics at my own pace.					
5	Using technology improves my performance in mathematics.					

Part IV. Mathematics Literacy Test

Directions: Read each problem carefully and choose the best answer. This test measures how well you can use mathematics in real-life situations.

Formulating Mathematical Situations

1. A family plans to travel 180 kilometers. Their car uses 1 liter of fuel for every 12 kilometers. Which mathematical expression represents the total fuel needed?

A. 180 × 12

B. 180 ÷ 12

C. 12 ÷ 180

D. 180 + 12

2. A student saves ₱50 each week. Which equation represents the total savings (S) after *w* weeks?

A. S = 50 + w

B. S = 50 – w

C. S = 50w

D. S = w ÷ 50

3. A water tank holds 500 liters. Each hour, 45 liters are used. Which situation can be solved using subtraction?

A. Finding the total water used in 10 hours

B. Finding the remaining water after several hours

C. Finding the average water used per hour

D. Finding the ratio of water used

4. A recipe requires 2 cups of flour for every 3 cups of sugar. What mathematical concept is needed to solve this problem?

A. Percentage

B. Ratio

C. Probability

D. Graphing

5. A school cafeteria sells lunch for ₱75 each. Which equation can be used to find the total cost (C) for *n* lunches?

A. C = 75 – n

B. C = 75 ÷ n

C. C = 75n

D. C = n ÷ 75

Employing Mathematical Concepts and Procedures

1. A pair of shoes costs ₱2,400 and is discounted by 25%. What is the discounted price?

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A. ₱1,800 C. ₱2,100

B. ₱2,000 D. ₱2,300

2. The average of 4 numbers is 15. What is the sum of the numbers?

A. 19 C. 45

B. 30 D. 60

3. A rectangle has a length of 10 cm and a width of 6 cm. What is its area?

A. 16 cm^2 C. 60 cm^2

B. 32 cm^2 D. 120 cm^2

4. Solve: $3(x + 4) = 21$

A. $x = 3$ C. $x = 5$

B. $x = 4$ D. $x = 7$

5. A bag contains 3 red balls and 5 blue balls. What is the probability of picking a red ball?

A. 3/5 C. 3/8

B. 5/8 D. 8/3

Interpreting and Evaluating Mathematical Results

1. A student calculated that buying 3 notebooks at ₱45 each costs ₱90. What can you conclude?

A. The answer is correct C. The answer is too low

B. The answer is too high D. The problem cannot be solved

2. A graph shows that the temperature increased from 25°C to 35°C. What is the change in temperature?

A. 5°C C. 15°C

B. 10°C D. 60°C

3. A phone plan costs ₱599 per month. A student says the yearly cost is ₱6,000. Is the answer reasonable?

A. Yes, exactly correct C. No, it should be lower

B. No, it should be higher D. Cannot be determined

4. A student calculated the area of a room as 2,500 square meters. What is the best evaluation?

A. Reasonable for a classroom C. Too large for a room

B. Too small for a room D. Correct regardless of size

5. A student solved a problem and got a negative answer for the distance. What does this most likely mean?

A. The solution is reasonable C. There is an error in the solution

B. The units are incorrect D. Distance can be negative

Appendix E.

Table of Specification

Mathematics Literacy Test

Learning Competency / Component	**No. of Teaching Days**	**% of Total Time**	**No. of Test Items**	**Item Placement**	**Easy (60%)**	**Average / Difficult (40%)**
A. Formulating Mathematical Situations	5	33.33 %	5	Items 1–5	Items 1, 2, 3	Items 4, 5
1. Translate real-world problems into mathematical expressions or equations				Items 1, 2		
2. Identify mathematical concepts applicable to real-life situations				Items 3		
3. Formulate appropriate mathematical models or expressions				Items 4, 5		
B. Employing Mathematical Concepts and Procedures	5	33.33 %	5	Items 6–10	Items 6, 7, 8	Items 9, 10
1. Apply arithmetic and algebraic operations correctly				Items 6, 7		
2. Use geometric formulas and probability concepts				Items 8, 9		
3. Perform computations involving percentages, discounts, and real-world data				Items 10		
C. Interpreting and Evaluating Mathematical Results	5	33.33 %	5	Items 11–15	Items 11, 12	Items 13, 14, 15
1. Verify the reasonableness of computed answers				Items 11, 12		
2. Identify errors or inconsistencies in given solutions				Items 13		
3. Evaluate and justify mathematical conclusions in context				Items 14, 15		
TOTAL	**15**	**100%**	**15**	**Items 1–15**	**9 items**	**6 items**

Notes:

• Total number of test items: 15 (multiple-choice)

• Each component covers 5 items (33.33% each)

• Difficulty distribution: 60% Easy (9 items), 40% Average/Difficult (6 items)

• Scoring: 1 point per correct answer; 0 for incorrect

• Aligned with DepEd K–12 Mathematics 10 Curriculum Guide and OECD PISA 2022 Mathematics Literacy Framework

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Appendix G.

Result of Reliability Test

MATHEMATICS SELF-CONCEPT

Reliability Statistics

Cronbach's Alpha	N of Items
.739	15

Item Statistics

	Mean	Std. Deviation	N
Item 1	4.3000	.53498	30
Item 2	4.2667	.63968	30
Item 3	3.9667	.61495	30
Item 4	4.5667	.50401	30
Item 5	4.6000	.49827	30
Item 1	4.1000	.75886	30
Item 2	4.0333	.76489	30
Item 3	4.1000	.71197	30
Item 4	4.2667	.44978	30
Item 5	3.9667	.85029	30
Item 1	4.5000	.50855	30
Item 2	4.3000	.65126	30
Item 3	4.2667	.58329	30
Item 4	4.3333	.80230	30
Item 5	4.3667	.55605	30

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item 1	59.6333	17.895	.355	.724
Item 2	59.6667	17.747	.303	.729
Item 3	59.9667	17.895	.291	.730
Item 4	59.3667	18.516	.235	.734
Item 5	59.3333	16.920	.639	.702
Item 1	59.8333	15.040	.709	.678
Item 2	59.9000	17.059	.339	.726
Item 3	59.8333	16.626	.457	.712
Item 4	59.6667	18.230	.353	.726
Item 5	59.9667	15.344	.559	.696
Item 1	59.4333	19.633	-.023	.754
Item 2	59.6333	17.689	.306	.729
Item 3	59.6667	17.954	.302	.729
Item 4	59.6000	18.662	.070	.759
Item 5	59.5667	18.185	.273	.731

TECHNOLOGY-ENHANCED LEARNING

Reliability Statistics

Cronbach's Alpha	N of Items
.826	15

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Item Statistics

	Mean	Std. Deviation	N
Item 1	3.8333	.98553	30
Item 2	3.8000	.84690	30
Item 3	3.7000	.70221	30
Item 4	3.8667	.86037	30
Item 5	3.9333	.73968	30
Item 1	4.0000	.74278	30
Item 2	3.7000	.59596	30
Item 3	3.6333	.88992	30
Item 4	3.7667	.85836	30
Item 5	3.9333	.94443	30
Item 1	3.9667	.88992	30
Item 2	3.8667	.89955	30
Item 3	3.9000	.71197	30
Item 4	3.8667	.73030	30
Item 5	3.8000	.76112	30

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item 1	53.7333	36.271	.544	.808
Item 2	53.7667	35.771	.712	.797
Item 3	53.8667	39.913	.372	.820
Item 4	53.7000	39.321	.337	.823
Item 5	53.6333	37.551	.618	.805
Item 1	53.5667	37.771	.589	.807
Item 2	53.8667	39.154	.562	.811
Item 3	53.9333	38.133	.435	.816
Item 4	53.8000	39.476	.324	.824
Item 5	53.6333	38.309	.385	.820
Item 1	53.6000	38.524	.397	.819
Item 2	53.7000	38.286	.414	.818
Item 3	53.6667	38.920	.481	.814
Item 4	53.7000	40.976	.235	.828
Item 5	53.7667	39.771	.349	.821

MATHEMATICS LITERACY TEST

Correlations

		MATHEMATICS LITERACY PRE-TEST	MATHEMATICS LITERACY POST-TEST
MATHEMATICS LITERACY PRE-TEST	Pearson Correlation	1	.698**
	Sig. (2-tailed)		<.001
	N	30	30
MATHEMATICS LITERACY POST-TEST	Pearson Correlation	.698**	1
	Sig. (2-tailed)	<.001	
	N	30	30

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

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Appendix H.

Results for Data Distribution Normality

NORMALITY

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Overall Mean_Mathematics Self-Copncept	.149	140	<.001	.945	140	<.001
Overall Mean_Technology Enhanced Learning	.088	140	.010	.977	140	.017
Overall Scores_Mathematics Literacy Test	.074	140	.061	.986	140	.164

a. Lilliefors Significance Correction

SPSS Data Analysis Report

SOP 1

Sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	60	42.86	42.86	42.86
	Female	80	57.14	57.14	100.00
	Total	140	100.00	100.00	

Family Monthly Income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below ₱10,000	72	51.43	51.43	51.43
	₱10,000 – ₱29,999	45	32.14	32.14	83.57
	₱30,000 – ₱49,999	11	7.86	7.86	91.43
	₱50,000 – ₱69,999	9	6.43	6.43	97.86
	₱70,000 – ₱89,999	3	2.14	2.14	100.00
	Total	140	100.00	100.00	

Parental Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Elementary Graduate	18	12.86	12.86	12.86
	High School Graduate	61	43.57	43.57	56.43
	College Graduate	60	42.86	42.86	99.29
	Postgraduate (Master's / Doctorate)	1	.71	.71	100.00
	Total	140	100.00	100.00	

Average Mathematics Grades

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	90-100	70	50.00	50.00	50.00
	85-89	56	40.00	40.00	90.00
	80-84	14	10.00	10.00	100.00
	Total	140	100.00	100.00	

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Appendix I.

Result of Statistical Data Analysis

Access to Technology for Learnig Mathematics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	With internet access	118	84.29	84.29	84.29
	Without internet access	22	15.71	15.71	100.00
	Total	140	100.00	100.00	

Availability of Digital Devices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Smartphone	132	94.29	94.29	94.29
	Tablet	4	2.86	2.86	97.14
	Laptop/Computer	4	2.86	2.86	100.00
	Total	140	100.00	100.00	

SOP 2

Descriptive Statistics

	N	Mean	Std. Deviation
Mean_Confidence in Learning Mathematics	**140**	**3.58**	**.49**
1. I feel confident when learning new mathematics topics.	140	3.62	.75
2. I am comfortable answering mathematics questions in class.	140	3.40	.73
3. I do not easily feel nervous during mathematics lessons.	140	3.32	.77
4. I believe I can learn mathematics well if I put in effort.	140	4.06	.83
5. I feel confident solving mathematics problems on my own.	140	3.49	.76
Mean_Perceived Mathematical Competence	**140**	**3.30**	**.51**
1. I believe I am good at mathematics.	140	3.30	.68

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Descriptive Statistics

	N	Mean	Std. Deviation
2. I can understand most mathematics lessons without difficulty.	140	3.14	.63
3. I can solve mathematics problems as well as most of my classmates.	140	3.26	.76
4. I perform well in mathematics tests and activities.	140	3.40	.76
5. I consider mathematics as one of my academic strengths.	140	3.40	.78
Mean_Interest and Enjoyment in Mathematics	**140**	**3.60**	**.67**
1. I enjoy studying mathematics.	140	3.66	.88
2. I find mathematics lessons interesting.	140	3.75	.95
3. I look forward to mathematics classes.	140	3.57	.93
4. I am willing to spend extra time learning mathematics.	140	3.53	.85
5. I like solving mathematics problems.	140	3.51	.90
Overall Mean_Mathematics Self-Concept	**140**	**3.49**	**.47**
Valid N (listwise)	140		

SOP 3

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Descriptive Statistics

	N	Mean	Std. Deviation
Mean_Use of Technology in Mathematics Instruction	**140**	**3.60**	**.60**
1. My mathematics teacher uses digital tools during lessons.	140	3.65	.92
2. Online presentations or videos are used in teaching mathematics.	140	3.61	.93
3. Technology is integrated into mathematics classroom activities.	140	3.56	.81
4. Digital platforms are used for mathematics assignments or tasks.	140	3.50	.84
5. Technology is regularly used to support mathematics instruction.	140	3.66	.83
Mean_Accessibility of Technology for Learning	**140**	**3.71**	**.63**
1. I have access to a digital device for learning mathematics.	140	3.74	.79
2. I can access the internet when studying mathematics.	140	3.72	.90
3. I have access to online mathematics learning resources.	140	3.61	.87
4. I can use technology at home for mathematics learning.	140	3.84	.91
5. Lack of technology does not prevent me from studying mathematics.	140	3.62	.82
Mean_Effectiveness of Technology in Learning Mathematics	**140**	**3.65**	**.60**
1. Technology helps me understand mathematics concepts better.	140	3.69	.83
2. Digital tools make mathematics lessons more engaging.	140	3.56	.78

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Descriptive Statistics

	N	Mean	Std. Deviation
3. Technology helps me practice mathematics skills effectively.	140	3.63	.76
4. Technology allows me to learn mathematics at my own pace.	140	3.71	.76
5. Using technology improves my performance in mathematics.	140	3.68	.76
Overall Mean_Technology Enhanced Learning	**140**	**3.65**	**.49**
Valid N (listwise)	140		

SOP 4

Descriptive Statistics

	N	Mean	Std. Deviation
Scores_Formulating Mathematical Situations	140	2.99	1.28
Scores_Employing Mathematical Concepts and Procedures	140	3.17	1.38
Scores_Interpreting and Evaluating Mathematical Result	140	3.59	1.27
Overall Scores_Mathematics Literacy Test	140	3.25	.73
Valid N (listwise)	140		

SOP 5

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Correlations

			Overall Mean_Mathematics Self-Copncept	Overall Scores_Mathematics Literacy Test
Spearman's rho	Mathematics Self-Concept	Correlation Coefficient	1.000	.214*
		Sig. (2-tailed)	.	.011
		N	140	140
	Mathematics Literacy Test	Correlation Coefficient	.214*	1.000
		Sig. (2-tailed)	.011	.
		N	140	140

*. Correlation is significant at the 0.05 level (2-tailed).

SOP 6

Correlations

			Overall Mean_Technology Enhanced Learning	Overall Scores_Mathematics Literacy Test
Spearman's rho	Technology Enhanced Learning	Correlation Coefficient	1.000	.060
		Sig. (2-tailed)	.	.481
		N	140	140
	Mathematics Literacy Test	Correlation Coefficient	.060	1.000
		Sig. (2-tailed)	.481	.
		N	140	140