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## RESEARCH ARTICLE

### Needs Assessment of Senior High School Teachers in Mathematics Instruction

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#### Abstract

This study explores the needs of Senior High School (SHS) Mathematics Teachers in Cabanatuan City's Schools Division Office, focusing on professional qualifications, familiarity with essential Mathematics knowledge, and employed pedagogical strategies. Using descriptive research approach, the study examines the correlation between respondent profiles, Mathematics knowledge, pedagogical approaches, and the adequacy of educational infrastructure. Results indicate that most respondents demonstrate excellent familiarity with essential Mathematics knowledge, predominantly employing assessment as a pedagogical strategy. No significant relationship exists between respondent profiles and General Mathematics essential knowledge competence. Respondents highly rate the DepEd-issued Teacher's Guide, and Mathematics materials' availability and sufficiency in classrooms are satisfactory. The study recommends providing more usable Mathematics tools and materials, emphasizing targeted Mathematics-related seminars for SHS Mathematics teachers in public secondary schools within Cabanatuan City.

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## INTRODUCTION

The main thrust of the Department of Education is to provide access to quality basic education. It formulates and implements vital programs and projects to enable every citizen to acquire essential preparation that will make him an enlightened, disciplined, nationalistic, self-reliant, God-loving, creative, versatile, and productive member of the national community. In 2011, the Department of Education (DepEd) administered a shift to a fresh learning scheme — the K to 12 basic education programs. Many people were resistant to the new education system. Despite this, the government is keen on revolutionizing Philippine education. The Department of Education's K-12 education system strives to improve students' fundamental abilities, generate more competent citizens, and prepare graduates for lifetime learning and jobs. "K" stands for Kindergarten, while "12" refers to the next 12 years of primary education (6 years of elementary, four years of junior high, and two years of senior high). Senior High School (SHS) encompasses the latter two years of the K-12 program, including Grades 11 and 12. Students in SHS will complete a core curriculum as well as

topics related to their chosen track. At the moment, the Philippines is the last country in Asia and one of only three in the world with a 10-year pre-university program (UNESCO, 2012).

It is generally agreed that mathematics must be taught during primary education, but this does not mean that mathematics education is not a subject of debate. Both national and international evaluations show that, upon completing primary education, many pupils' mathematics knowledge and competencies fall short of the expected level. Moreover, the disparities observed between and within countries give cause for concern. Even among pupils who obtain satisfactory evaluation results, many do not like mathematics and do not see the point of spending so much school time on the subject. These findings indicate that the goals stated in the introduction are far from being achieved and that the large number of young people who lack access to education is not the only obstacle to their attainment, even though it is a real obstacle. Mathematics is one subject that pervades life at any age and in any circumstance (Pentang, 2019). Therefore, mathematics as a school subject must be learned comprehensively and deeply.

According to the Science Education Institute, Department of Science and Technology (SEI-DOST, 2011), the many challenges that mathematics teachers and educators face today make mathematics teaching especially difficult. Foremost among these challenges is the amount and depth of mathematics content that teachers ought to master. For example, an elementary mathematics teacher's belief that any number divided by zero is also zero shows that a deep understanding of mathematics content is sorely lacking among our mathematics teachers. Directly linked to this is our mathematics teachers' poor preparation in identifying effective pedagogies for teaching specific content material to particular groups of learners. It is not uncommon to observe poorly trained mathematics teachers who either teach deficient skills to more able students or teach advanced skills to students lacking prerequisite knowledge or skills. Mathematics teachers also find it daunting to implement general learning strategies, such as cooperative learning, and manage their students engaged in such learning activities.

On top of these expectations, mathematics teachers must display encouraging behaviors and attitudes and engage in a lifelong professional development program (Mariano-Dolesh et al., 2022). In consonance with Section 12 of RA 10533, the Department of Education (DepEd) has conducted teacher training to ensure that the enhanced basic education program meets the demand for quality teachers and school leaders. The DepEd, CHED, and TESDA shall conduct teacher education and training programs in collaboration with relevant partners in government, academia, industry, and non-governmental organizations. Such professional development programs shall be initiated, conducted, and evaluated regularly throughout the year to ensure constant upgrading of teacher skills. Despite these efforts, other teachers must meet the demand for quality mathematics teachers and instruction. As Al-Qahtani (2015) emphasized, teachers' professional development improves student performance and learning outcomes in mathematics.

In the light of the above scenario, the researcher, being the Education Program Supervisor in Mathematics observed teachers struggle in teaching Mathematics. Hence, this study found significance and relevance and may serve as baseline data for future programs and projects in Senior High School Mathematics Education at SDO Cabanatuan City. This study aimed to evaluate the needs of Senior High School (SHS) Teachers in Mathematics instruction, addressing specific inquiries. Firstly, the study described the professional qualifications of the respondents in terms of educational attainment, length of teaching experience, the number of training sessions attended in the last five years, teaching assignments, and non-teaching assignments. Secondly, the research examined the respondents' familiarity with essential Mathematics knowledge. Thirdly, it analyzed the pedagogical strategies employed by the respondents in Mathematics instruction. Fourthly, the study investigated the existence of a significant relationship between the profile of the respondents and their familiarity with Mathematics essential knowledge, as well as the pedagogical strategies employed. Finally, the research explored the educational infrastructure of the respondents concerning the Teacher's Guide and the adequacy of Mathematics materials for instruction. Each

aspect contributes to a comprehensive understanding of the needs of SHS Mathematics teachers, providing valuable insights for future improvements and development in Mathematics education.

## METHODOLOGY

This research employed a descriptive approach to offer a static portrayal of situations. The research utilized a survey questionnaire adapted from Guillermo (2018), comprising five sections. The initial section evaluates the respondents' familiarity with Mathematics essential knowledge, referencing the Mathematics Curriculum Guide by the Department of Education (2016). The second section explores the pedagogical strategies employed by the respondents, adapted from "Effective K to 12 Mathematics Instruction". The third section assesses the respondents' views on the Mathematics Teacher's Guide, while the final section gauges their perceptions of the availability and sufficiency of Mathematics materials within the classroom. The researcher modified the instrument to align with the study's objectives and will undergo evaluation by a Mathematics expert for validity. Additionally, a pilot test will be conducted with respondents not involved in the study to ensure the instrument's reliability.

The study began with approval from the School Division Superintendent and School Administrators—the data gathering involved distributing questionnaires to respondents, collected after an hour. The researcher then conducted tabulation, analysis, and interpretation using statistical measures such as frequency counts and percentages. Findings led to the formulation of remediation activities for addressing student challenges in Patterns Algebra and Geometry. Statistical analysis included presenting respondent profiles through Percentages and using Weighted Mean to assess agreements on familiarity with Mathematics essential knowledge, pedagogical strategies, assessment of the Mathematics DepEd-issued Teacher's Guide, and availability of Mathematics materials. Ethical considerations ensured participants received Informed Consent detailing the research's purpose and methodology. Emphasis was placed on voluntary participation, with participants expressing understanding through signed consent forms. Privacy was strictly maintained, and personal information was confidential. Upon completion, study results were transparently presented to participants, upholding a commitment to transparency and confidentiality.

## RESULTS AND DISCUSSIONS

### Familiarity with Mathematics Essential Knowledge

The respondents exhibited a commendable level of familiarity with Mathematics Essential Knowledge on Function and Their Graph, as reflected in the computed weighted mean of 4.48, interpreted as excellent. The highest-rated indicator was "evaluates a function," achieving a weighted mean of 4.64, signifying an Excellent interpretation. Conversely, the indicator "Represents real-life situations using functions, including piece-wise functions" obtained the lowest weighted mean of 4.18, categorized as very satisfactory. Notably, this study's findings differ from Canzis et al.'s (2011) observations, which revealed students' misconceptions about function. Canzis et al. noted students' challenges in discerning function graphs, correlating verbal expressions with the function concept, and understanding algebraic expressions. The present study, in contrast, underscores the respondents' overall firm grasp of essential knowledge related to functions and their graphs.

Table 1. Distribution of Responses on the Familiarity with Mathematics Essential Knowledge of Function

Indicators	Weighted Mean	Verbal Description
1. Represents real-life situations using functions, including piece-wise functions.	4.18	Very Satisfactory
2. Evaluate a function.	4.73	Excellent
3. Performs addition, subtraction, multiplication, division, and composition of functions	4.64	Excellent
4. Solves problems involving functions.	4.55	Excellent

5. Represents real-life situations using rational functions.	4.27	Excellent
6. Distinguish rational function, rational equation, and rational inequality.	4.45	Excellent
7. Solves rational equations and inequalities.	4.45	Excellent
8. distinguishes rational function, rational equation, and rational inequality.	4.64	Excellent
9. Find the domain and range of a rational function.	4.36	Excellent
10. determines the (a) intercepts, (b) zeroes, and (c) asymptotes of rational functions	4.55	Excellent
11. graphs rational functions.	4.45	Excellent
12. Solves problems involving rational functions, equations, and inequalities.	4.45	Excellent
Average Weighted Mean	4.48	Excellent

Legend: 4.20-5.00 = Excellent; 3.40-4.19 = Very Satisfactory; 2.6-3.39 = Satisfactory; 1.80-2.59 = Poor; 1.00-1.79 = Needs Improvement

### Distribution of Responses on the Familiarity with Mathematics Essential Knowledge of Basic Business Math

Table 2 indicates that respondents were familiar with concepts such as “how to compute interest, maturity value, future value, and present value in simple interest and compound interest environments,” with the highest weighted mean of 4.73. On the contrary, indicator no.19, involving the representation of a logarithmic function through its table of values, graph, and equation, achieved a very satisfactory weighted mean of 4.09. Respondents’ overall familiarity with essential knowledge of Business Mathematics garnered an outstanding average mean of 4.35, affirming an excellent level of comprehension across the various indicators.

Table 2. Distribution of Responses on the Familiarity with Mathematics Essential Knowledge of Business Mathematics

Indicators	Weighted Mean	Verbal Description
1. represents real-life situations using one-to-one function	4.18	Very Satisfactory
2. determines the inverse of a one-to-one function.	4.18	Very Satisfactory
3. represents an inverse function through its (a) table of values and (b) graph.	4.18	Very Satisfactory
4. Find the domain and range of an inverse function.	4.20	Very Satisfactory
5. Graph inverse functions.	4.00	Very Satisfactory
6. solves problems involving inverse functions.	4.18	Very Satisfactory
7. represents real-life situations using exponential functions.	4.18	Very Satisfactory
8. distinguishes between exponential function, exponential equation, and exponential inequality.	4.70	Excellent
9. Solve exponential equations and inequalities.	4.27	Excellent
10. represents an exponential function through its (a) table of values, (b) graph, and (c) equation.	4.36	Excellent
11. finds the domain and range of an exponential function.	4.36	Excellent
12. determines an exponential function’s intercepts, zeroes, and asymptotes.	4.36	Excellent
13. graphs exponential functions.	4.18	Very Satisfactory
14. solves problems involving exponential functions, equations, and inequalities.	4.27	Excellent
15. represents real-life situations using logarithmic functions.	4.09	Very Satisfactory
16. distinguishes logarithmic function, logarithmic equation, and logarithmic inequality	4.45	Excellent
17. Illustrates the laws of logarithms.	4.45	Excellent
18. Represents a logarithmic function through its (a) table of values, (b) graph, and (c) equation.	4.36	Excellent
18. Represents a logarithmic function through its (a) table of values, (b) graph, and (c) equation.	4.36	Excellent
19. represents a logarithmic function through its (a) table of values, (b) graph, and (c) equation.	4.09	Very Satisfactory
20. finds the domain and range of a logarithmic function.	4.27	Excellent
21. determines the intercepts, zeroes, and asymptotes of logarithmic functions.	4.27	Excellent
22. graphs logarithmic functions.	4.18	Very Satisfactory

23. solves problems involving logarithmic functions, equations, and inequalities.	4.82	Excellent
24. illustrate simple and compound interest	4.82	Excellent
25. distinguishes between simple and compound interests.	4.64	Excellent
26. computes interest, maturity, future, and present values in simple interest and compound interest environments.	4.73	Excellent
27. solves problems involving simple and compound interests.	4.55	Excellent
28. illustrates simple and general annuities.	4.64	Excellent
29. distinguishes between simple and general annuities.	4.64	Excellent
30. finds the future value and present value of both simple annuities and general annuities.	4.27	Excellent
31. calculates the fair market value of a cash flow stream that includes an annuity.	4.36	Excellent
32. Calculate the present value and period of deferral of a deferred annuity.	4.55	Excellent
33. illustrates stocks and bonds	4.45	Excellent
34. distinguishes between stocks and bonds.	4.36	Excellent
35. Describe the different markets for stocks and bonds.	4.00	Very Satisfactory
36. Analyze the different market indices for stocks and bonds.	4.00	Very Satisfactory
37. interprets the theory of efficient markets.	4.36	Excellent
38. illustrate business and consumer loans	4.45	Excellent
39. distinguishes between business and consumer loans.	4.36	Excellent
40. solves problems involving business and consumer loans (amortization, mortgage).	4.46	Excellent
Average Weighted Mean	4.35	EXCELLENT

Legend: 4.20-5.00 = Excellent; 3.40-4.19 = Very Satisfactory, 2.6-3.39 = Satisfactory; 1.80-2.59 = Poor; 1.00-1.79 = Needs Improvement

### Distribution of Responses on the Familiarity with Mathematics Essential Knowledge of Logic

Table 3 shows the indicator with the highest computed mean for the essential knowledge in Logic. As can be seen, the item “symbolizes propositions” obtained the highest mean of 4.55 and was described as “excellent.” In contrast, item “establishes the validity and falsity of real-life arguments using logical propositions, syllogisms, and fallacies” obtained the lowest weighted mean of 3.36 and is described as “very satisfactory”.

Table 3. Distribution of Responses on the Familiarity with Mathematics Essential Knowledge of Business Mathematics

Logic Indicators	Weighted Mean	Verbal Description
1. Illustrate a proposition	4.36	Excellent
2. Symbolizes propositions	4.55	Excellent
3. Distinguishes between simple and compound propositions	4.27	Excellent
4. Performs the different types of operations on propositions	4.00	Very Satisfactory
5. Determines the truth values of propositions	4.09	Very Satisfactory
6. Illustrates the different forms of conditional propositions	4.00	Very Satisfactory
7. Illustrates different types of tautologies and fallacies	3.82	Very Satisfactory
8. Determines the validity of categorical syllogisms	3.45	Very Satisfactory
9. Establishes the validity and falsity of real-life arguments using logical propositions, syllogisms, and fallacies	3.36	Very Satisfactory
10. Illustrates the different methods of proof (direct and indirect) and disproof (indirect and by counterexample)	3.45	Very Satisfactory
11. Justifies mathematical and real-life statements using the different methods of proof and disproof	3.45	Very Satisfactory
Average Weighted Mean	3.88	Very Satisfactory

Legend: 4.20-5.00 = Excellent; 3.40-4.19 = Very Satisfactory, 2.6-3.39 = Satisfactory; 1.80-2.59 = Poor; 1.00-1.79 = Needs Improvement

### Pedagogical Strategies

Table 4 presents a concise summary of respondents’ feedback on Pedagogical Strategies, yielding an overall weighted mean of 4.03, corresponding to an interpretation of “Often.” Notably, “Assessment Strategies” emerged as the most favored, securing the highest weighted mean of 4.49, indicative of a consistent and highly acceptable application. On the other hand, “Collaborative Grouping Strategies” obtained the lowest weighted mean of 3.53, signaling a frequency of “Often”

or a very acceptable level. This analysis underscores the strong endorsement of Assessment Strategies, suggesting a widespread preference for their frequent use while indicating a slightly less frequent but acceptable implementation of Collaborative Grouping Strategies. The nuanced variations in these weighted means provide valuable insights into the perceived effectiveness and acceptance levels of different pedagogical strategies among the respondents.

Table 4. Summary of Respondents' Responses on Pedagogical Strategies

Instructional Technology Strategies	Weighted Mean	Verbal Description
1. Enhanced Context Strategies	4.24	Always
2. Collaborative Grouping Strategies	3.80	Often
3. Questioning Strategies	4.16	Often
4. Manipulation Strategies	3.53	Often
5. Assessment Strategies	4.49	Always
6. Instructional Technology Strategies	3.96	Often
Average Weighted Mean	4.03	Often

Legend: 4.20-5.00 = Always; 3.40-4.19 = Often, 2.6-3.39 = Sometimes; 1.80-2.59 = Rarely; 1.0-1.79 = Never

### Respondents' Assessment of the Teachers' Guide in General Mathematics

Table 5 provides a comprehensive overview of the respondents' assessment of the teachers' guide in general mathematics, with distinct aspects analyzed. The highest-rated component is Organization, attaining a noteworthy weighted mean of 4.53, indicating a robust level of effectiveness. Conversely, Ease of Use received the least weighted mean of 4.13, signifying a slightly lower but still commendable assessment. The grand weighted mean for all aspects is 4.30, reflecting an overall positive evaluation. Additional facets of the teacher's guide, such as content, achieved a robust weighted mean of 4.23. At the same time, readability and presentation garnered weighted means of 3.45 and 3.44, respectively, all under the verbal description of "Strongly agree." This suggests a collective consensus among respondents regarding the guide's favorable attributes. The narrative emphasizes the pivotal role of the teacher's guide as a guiding resource, likening it to a "bible" for educators, illuminating the purpose of their service to learners. While recognizing the guide's significance, it also underscores the importance of teachers going beyond the guide to ensure effective lesson delivery, fostering a holistic teaching-learning environment for students and educators.

Table 5. Summary of the Respondents' Assessment of the Teachers' Guide in General Mathematics

Assessment of the Teachers' Guide in General Mathematics	Average Weighted Mean	Verbal Interpretation
Content	4.35	Strongly Agree
Presentation	4.23	Strongly Agree
Organization	4.53	Strongly Agree
Readability	4.23	Strongly Agree
Ease of Use	4.13	Agree
Grand Weighted Mean	4.30	Strongly Agree

### Adequacy of Mathematics Materials in Terms of Instruction

Table 6 delves into the comprehensive assessment of the availability and sufficiency of mathematics materials, encompassing learning, traditional, and technological tools, and evaluating their adequacy for student use. The overall responses garnered an average weighted mean of 2.90, indicating that these resources are available but need more for students' use. A closer examination reveals that traditional and technological tools share the same weighted mean of 2.80, corresponding to the verbal description of available but insufficient for students' use. These consistent findings underscore the prevalent issue of insufficiency in various types of mathematics materials, signaling a need for increased availability and accessibility to better support the diverse needs of students in the learning environment. In the long run, this calls for teachers to develop materials to address the needs of the learners and provide them with learning satisfaction through these materials (Hamora et al., 2022).

Table 6. Availability and Sufficiency of Math Materials

Availability and Sufficiency of Mathematics Materials	Weighted Mean	Verbal Description
1. Traditional Tool	2.80	Available but not sufficient for the class population
2. Technological Tool	2.80	Available but not sufficient for the class population
Over-all WM	2.90	Available but not sufficient for the class population

Legend: 4.20-5.00 = Available and more than sufficient for the class population; 3.40-4.19 = Available and sufficient for the class population, 2.60-3.39 = Available but not sufficient for the class population; 1.80-2.59 = Available but not for student use; 1.0-1.79 = Not Available

## CONCLUSIONS

The mathematics teachers demonstrate excellent familiarity with essential knowledge in Mathematics Instruction, employing assessment as the primary pedagogical strategy, followed by Enhanced Context and Questioning. While no significant relationship exists between respondent profiles and competence in General Mathematics essential knowledge, non-teaching assignments and the highest educational attainment are related to specific pedagogical strategies. The DepEd-issued Teacher's Guide is highly rated, and the availability of Mathematics materials in classrooms is considered satisfactory. Consequently, addressing the needs of SHS Mathematics teachers should focus on providing more usable and sufficient Mathematics tools and materials, alongside organizing Mathematics-related seminars focusing on content. Recommendations include encouraging post-graduate studies, conducting professional development activities, providing additional resources, and strengthening the educational infrastructure in alignment with the DepEd Issued Teacher's guide. This approach aims to enhance SHS Mathematics instruction's overall effectiveness in Cabanatuan City.

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