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Senior High School Learners' Difficulties in General Mathematics: A Descriptive-Comparative Study

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ABSTRACT

General Mathematics is a core subject of the Philippine Senior High School curriculum, yet many learners struggle with it. This study determined the difficulties Grade 11 learners encountered in General Mathematics across four dimensions (content knowledge and pedagogy, learning environment, teacher's competence, and student motivation and attitude) and examined whether these difficulties differed by sex, academic track, junior high school of origin, and average family monthly income. A descriptive-comparative design was used with a complete enumeration of 150 Grade 11 learners at Aldersgate College Inc., Solano, Nueva Vizcaya, in School Year 2025–2026. Data were gathered through a 40-item researcher-modified questionnaire (Cronbach's $\alpha = .82-.88$ per dimension; $\alpha = .94$ overall) and analyzed using means, standard deviations, independent-samples t tests, and Cohen's d . Learners reported a moderate level of difficulty overall ($M = 2.65$, $SD = 0.41$). Difficulty was highest in the learning environment ($M = 2.85$), followed by motivation and attitude ($M = 2.75$) and content knowledge and pedagogy ($M = 2.63$), while teacher's competence was a low source of difficulty ($M = 2.36$). Female learners reported greater motivational and attitudinal difficulty than male learners ($d = 0.95$). Learners in the Technical-Vocational-Livelihood (TVL) track reported greater content difficulty than those in the Academic track ($d = 1.03$). Learners from public junior high schools reported greater learning-environment difficulty than those from private schools ($d = 0.99$), and learners from lower-income families reported greater difficulty in the learning environment ($d = 0.60$) and in motivation and attitude ($d = 0.73$). The findings suggest that support for learners should extend beyond classroom instruction to study conditions, peer climate, and learners' confidence, with targeted help for TVL, female, public-school, and lower-income learners. An intervention plan based on these findings is proposed.

Keywords: General Mathematics, learning difficulties, senior high school, mathematics anxiety, learning environment, Philippines

Introduction

Mathematics develops logical reasoning, problem solving, and critical thinking, skills that learners carry into further study, work, and daily life. In the Philippines, General Mathematics is one of the core subjects of the Senior High School (SHS) curriculum established under the Enhanced Basic Education Act of 2013 (Republic Act No. 10533). Taken in Grade 11, the subject covers functions and their graphs, including rational, exponential, and logarithmic functions, together with basic business mathematics and logic. It is intended to strengthen mathematical literacy and prepare learners for higher education and future careers.

Many learners, however, find the subject difficult. Filipino 15-year-olds were among the lowest-performing participants in mathematics in both the 2018 and 2022 cycles of the Programme for International Student Assessment (OECD, 2019, 2023), which suggests that many learners enter SHS with weak foundations. The move from junior high school mathematics to the more abstract content of General Mathematics can widen these gaps. The function concept in particular is known to be hard to master, because learners often hold partial or inconsistent mental images of it that differ from its formal definition (Tall & Vinner, 1981). Such gaps can slow academic progress and erode learners' confidence in their mathematical ability.

Difficulty in mathematics rarely has a single cause. How content is organized and taught affects comprehension, while the classroom climate and the resources available shape engagement (Fredricks et al., 2004). Teacher quality, including subject mastery and instructional delivery, is consistently linked to student achievement (Darling-Hammond, 2000). Affective factors matter as well. Learners' beliefs about their own capability (Bandura, 1997), the value they attach to a subject (Wigfield & Eccles, 2000), and their anxiety toward mathematics (Ashcraft, 2002; Hembree, 1990) all predict how much effort they invest and how well they perform. Family socioeconomic status is also associated with achievement, partly through the learning conditions available at home (Sirin, 2005).

Cotejar and Lastierre (2025) examined SHS learners' difficulties in Statistics and Probability in terms of content knowledge and pedagogy, learning environment, and teacher's competence. Comparable evidence for General Mathematics is limited, and few local studies have considered motivation and attitude alongside these factors or tested whether difficulties vary across learner groups. Locally, mathematics teachers have observed persistent struggles

among Grade 11 learners in General Mathematics, but the sources of these difficulties have not been examined systematically. Evidence of this kind is needed to design interventions that fit learners' actual needs.

This study therefore aimed to determine the difficulties encountered by Grade 11 learners in General Mathematics in terms of content knowledge and pedagogy, learning environment, teacher's competence, and student motivation and attitude, and to find out whether these difficulties differed according to the learners' profile. Specifically, it sought to answer the following questions:

1. What is the profile of the respondents in terms of sex, academic track, school of origin, and average family monthly income?
2. What is the level of difficulty encountered by the respondents in General Mathematics in terms of content knowledge and pedagogy, learning environment, teacher's competence, and student motivation and attitude?
3. Is there a significant difference in the difficulties encountered when respondents are grouped according to sex, academic track, school of origin, and average family monthly income?
4. What interventions may be proposed to reduce the identified difficulties in learning General Mathematics?

The study tested the null hypothesis that there is no significant difference in the difficulties encountered in General Mathematics when respondents are grouped according to their profile variables.

Methodology

Research Design

The study used a quantitative descriptive-comparative design. The descriptive component identified and characterized the difficulties learners experienced in General Mathematics, while the comparative component tested whether these difficulties differed across groups formed by the learners' demographic characteristics. This design suited the aims of the study because it captured both the nature and level of learners' difficulties and their variation across learner groups, without manipulating any variable.

Research Locale and Participants

The study was conducted at Aldersgate College Inc. in Solano, Nueva Vizcaya, Philippines, during School Year 2025–2026. The institution offers SHS programs in both the Academic and TVL tracks and enrolls learners from diverse socioeconomic backgrounds, which made it a suitable setting for examining differences across learner groups.

The participants were Grade 11 learners enrolled in General Mathematics during the school year. Complete enumeration was used, so all eligible learners were invited to take part, which avoided sampling error at the institutional level. A total of 150 learners returned complete questionnaires. Grade 12 learners from the same institution, who had completed General Mathematics the previous year, took part in pilot testing of the instrument and were not included in the main study.

Research Instrument

Data were gathered using a structured researcher-modified questionnaire. Its first three dimensions were adapted from the instrument of Cotejar and Lastierre (2025), which was originally developed for Statistics and Probability and was revised to reflect General Mathematics content. The fourth dimension, student motivation and attitude, was written by the researcher based on established work on self-efficacy, mathematics attitudes, motivation, and mathematics anxiety (Bandura, 1997; Fennema & Sherman, 1976; Pintrich & De Groot, 1990; Richardson & Suinn, 1972; Wigfield & Eccles, 2000).

Part I of the questionnaire gathered the respondents' profile: sex, academic track (Academic or TVL), school of origin in junior high school (public or private), and average family monthly income (below ₱30,000, or ₱30,000 and above). Part II contained 40 items, 10 for each of the four dimensions. Content knowledge and pedagogy covered understanding and applying functions, problem solving, abstract reasoning, and connecting concepts to real situations. Learning environment covered classroom distractions, resources, study space, class size, peer conditions, and the physical setup. Teacher's competence covered clarity of explanation, pacing, approachability, teaching style, and instructional resources. Student motivation and attitude covered interest, persistence, self-efficacy, anxiety, and the perceived relevance of the subject. Each item completed the stem "As a learner, I am having difficulties in..." and was rated on a four-point scale: 4 = Always (high difficulty), 3 = Often (moderate difficulty), 2 = Sometimes (low difficulty), and 1 = Never (no difficulty). Part III contained open-ended questions on learners' challenges and suggestions.

Validity and Reliability of the Instrument

A panel of experts in mathematics education, curriculum studies, and research methodology reviewed the items for relevance, alignment with the research objectives, and coverage. The revised questionnaire was then pilot-tested with Grade 12 learners to check the clarity of instructions and items and the time needed to complete it. Internal consistency was assessed using Cronbach's alpha (Cronbach, 1951), with .70 as the minimum acceptable value. In

the main sample, all dimensions exceeded this threshold: content knowledge and pedagogy, $\alpha = .87$; learning environment, $\alpha = .88$; teacher's competence, $\alpha = .82$; student motivation and attitude, $\alpha = .86$; and the full 40-item scale, $\alpha = .94$.

Data Collection Procedure

After securing approval from the school administration and ethics clearance, the researcher oriented the learners on the purpose, procedures, and safeguards of the study and obtained parental consent and learner assent. Trained facilitators administered the questionnaire under standardized conditions; it took about 20 to 30 minutes to complete. Completed questionnaires were checked for completeness before encoding.

Data Analysis

Frequencies and percentages were used to describe the respondents' profile. Means and standard deviations were used to describe the level of difficulty for each item and dimension, interpreted as no difficulty (1.00–1.75), low (1.76–2.50), moderate (2.51–3.25), or high difficulty (3.26–4.00). Because each profile variable had two categories, differences were tested using independent-samples *t* tests. Levene's test was used to check equality of variances, and Welch's correction was applied where this assumption was not met. Shapiro–Wilk tests showed no significant departure from normality for any dimension score (all $p > .05$). Effect sizes were computed as Cohen's *d* and interpreted as small (0.20), medium (0.50), or large (0.80) (Cohen, 1988). Mann–Whitney *U* tests were run as a robustness check. The level of significance was set at $\alpha = .05$. Analyses were performed using Python (SciPy library).

Ethical Considerations

Parents or guardians gave written consent and learners gave assent. Participation was voluntary, learners could skip items or withdraw at any time without effect on their grades, no names were recorded, and the data were used only for research purposes.

Results and Discussion

Profile of the Respondents

Table 1 presents the profile of the 150 respondents. Most were female (56.00%), enrolled in the Academic track (61.33%), graduates of public junior high schools (72.67%), and from families earning below ₱30,000 a month (62.00%).

Table 1

Profile of the Respondents (N = 150)

Profile variable	Frequency	Percentage
Sex		
Male	66	44.00
Female	84	56.00
Academic track		
Academic (STEM, HUMSS, GAS, ABM)	92	61.33
Technical-Vocational-Livelihood (TVL)	58	38.67
School of origin (junior high school)		
Public	109	72.67
Private	41	27.33
Average family monthly income		
Below ₱30,000	93	62.00
₱30,000 and above	57	38.00

Level of Difficulty in General Mathematics

Table 2 summarizes the level of difficulty by dimension. Overall, learners experienced a moderate level of difficulty in General Mathematics ($M = 2.65$, $SD = 0.41$). Three dimensions were rated at the moderate level: learning environment ($M = 2.85$), student motivation and attitude ($M = 2.75$), and content knowledge and pedagogy ($M = 2.63$). Teacher's competence was rated at the low level ($M = 2.36$). The four dimensions were moderately correlated with one another ($r = .41$ to $.58$), indicating that learners who struggled in one area tended to struggle in others.

Table 2

Level of Difficulty in General Mathematics by Dimension

Dimension	<i>M</i>	<i>SD</i>	Interpretation	Rank
Learning Environment	2.85	0.54	Moderate	1
Student Motivation and Attitude	2.75	0.54	Moderate	2
Content Knowledge and Pedagogy	2.63	0.54	Moderate	3
Teacher's Competence	2.36	0.44	Low	4
Overall	2.65	0.41	Moderate	

Note. Each dimension consists of 10 items rated from 1 (Never) to 4 (Always).

At the item level, the learning environment emerged as the main source of difficulty, with all 10 items at the moderate level. The highest-rated items were dealing with peer pressure or competition in class ($M = 3.12$), finding a conducive space for studying mathematics ($M = 3.05$), and concentrating in class despite noise or distractions ($M = 2.95$). These results suggest that much of what learners find difficult lies in the conditions around learning rather than in the content alone. Peer competition can heighten fear of making mistakes in front of classmates, while the lack of a quiet place to study points to conditions at home. Both are consistent with the view that engagement depends on the social and physical context of learning (Fredricks et al., 2004).

Student motivation and attitude ranked second. Learners had the most difficulty staying motivated when topics became challenging ($M = 3.06$), seeing the relevance of General Mathematics to their future careers ($M = 2.95$), and overcoming their fear of mathematics ($M = 2.90$). In expectancy-value terms, learners who do not see the usefulness of a subject and who expect to struggle with it are less likely to persist (Wigfield & Eccles, 2000). Fear of mathematics also consumes the attention learners need for problem solving (Ashcraft, 2002). Interestingly, building confidence in one's mathematical ability was rated a low difficulty ($M = 2.49$), which suggests that learners' problem is less a general lack of confidence than a loss of motivation and rising anxiety when the work gets hard.

In content knowledge and pedagogy, the most difficult items were connecting mathematical concepts to real-world situations ($M = 2.86$), solving rational functions and equations ($M = 2.79$), and graphing exponential and logarithmic functions ($M = 2.77$). These topics demand abstract reasoning and a firm grasp of the function concept, which learners often lack (Tall & Vinner, 1981). Applying previously learned concepts to new problems was the only content item rated as a low difficulty ($M = 2.31$). The difficulty in connecting concepts to real situations is consistent with the motivational finding above: if learners cannot see where the mathematics applies, they are less likely to value it.

Teacher's competence was the smallest source of difficulty. Nine of its ten items were rated at the low level, with the lowest ratings for taking notes because of fast or disorganized lectures ($M = 2.17$) and following unclear explanations ($M = 2.25$). Only one item, finding additional learning resources because the teacher has few references ($M = 2.58$), reached the moderate level. Learners therefore did not attribute their difficulties mainly to their teachers, although they did point to a need for more reference materials. This finding should be read with some caution, since learners may be reluctant to rate their own teachers critically even on an anonymous questionnaire.

Differences in Difficulty According to Profile

Table 3 presents the results of the independent-samples *t* tests. Each profile variable was associated with a significant difference in at least one dimension, but the pattern differed by variable. All significant dimension-level differences remained significant after a Bonferroni adjustment for the 16 comparisons (adjusted $\alpha = .003$), and the Mann-Whitney *U* tests led to the same conclusions for every dimension except one, noted below.

Table 3*Differences in Difficulty According to Profile: $t(p)$*

Dimension	Sex	Academic track	School of origin	Family income
Content Knowledge and Pedagogy	-0.09 (.928)	-6.15 (< .001)	0.12 (.902)	0.28 (.782)
Learning Environment	-0.16 (.871)	-1.73 (.086)	5.42 (< .001)	3.57 (< .001)
Teacher's Competence	0.93 (.356)	-1.04 (.298)	0.53 (.596)	-0.65 (.518)
Student Motivation and Attitude	-5.81 (< .001)	-0.51 (.613) ^a	0.08 (.935)	4.36 (< .001)
Overall	-1.55 (.123)	-2.88 (.005)	1.84 (.068)	2.42 (.017)

Note. Independent-samples t tests, $df = 148$. Groups compared: male vs. female; Academic vs. TVL; public vs. private; below ₦30,000 vs. ₦30,000 and above. A negative t means the second group reported greater difficulty. Significant results ($p < .05$) are in bold. ^a Welch's t test ($df = 142.31$) because of unequal variances.

Sex. Female learners ($M = 2.96$) reported significantly greater difficulty in motivation and attitude than male learners ($M = 2.50$), $t(148) = -5.81, p < .001$, with a large effect ($d = 0.95$). Male and female learners did not differ in content knowledge, learning environment, or teacher's competence. The gap is thus affective rather than cognitive: female learners did not report more trouble with the mathematics itself, but they reported more trouble with fear, anxiety, and persistence. This agrees with research showing higher mathematics anxiety among girls even when performance is comparable (Devine et al., 2012; Hembree, 1990).

Academic track. TVL learners ($M = 2.94$) reported significantly greater difficulty in content knowledge and pedagogy than Academic track learners ($M = 2.44$), $t(148) = -6.15, p < .001$, with a large effect ($d = 1.03$), as well as greater overall difficulty, $t(148) = -2.88, p = .005, d = 0.48$. The two tracks did not differ significantly in the other dimensions. For the learning environment, the t test was not significant ($p = .086$) while the Mann–Whitney test was ($p = .045$); given the small effect ($d = 0.29$), this difference is best treated as inconclusive. The content gap may reflect differences in learners' prior preparation and in the role mathematics plays in each track, since TVL programs place more emphasis on technical skills while the Academic track includes STEM learners who intend to pursue mathematics-intensive courses.

School of origin. Learners from public junior high schools ($M = 2.99$) reported significantly greater difficulty with the learning environment than those from private schools ($M = 2.50$), $t(148) = 5.42, p < .001$, with a large effect ($d = 0.99$). No differences were found in the other dimensions. Learners who came from public schools, where classes are often larger and resources more limited, may have found it harder to adjust to a new classroom setting, or may bring study habits shaped by those conditions. The overall difference was not significant by t test ($p = .068$) but was by the Mann–Whitney test ($p = .026$); this result should be interpreted with caution.

Family monthly income. Learners from families earning below ₦30,000 a month reported significantly greater difficulty in the learning environment ($M = 2.97$ vs. 2.66), $t(148) = 3.57, p < .001, d = 0.60$, and in motivation and attitude ($M = 2.90$ vs. 2.52), $t(148) = 4.36, p < .001, d = 0.73$, as well as greater overall difficulty, $t(148) = 2.42, p = .017, d = 0.41$. These results agree with evidence linking socioeconomic status to achievement (Sirin, 2005). Lower family income can limit access to a quiet study space, learning materials, and devices, which matches the highest-rated environment items, and may also weaken learners' sense that mathematics is relevant to their future.

Taken together, the null hypothesis was rejected for motivation and attitude when learners were grouped by sex and by income, for content knowledge and pedagogy when grouped by track, and for learning environment when grouped by school of origin and by income. It was not rejected for teacher's competence under any grouping.

Proposed Intervention Plan

Based on the findings, Table 4 presents an intervention plan aimed at the dimensions and learner groups with the greatest difficulty.

Table 4*Proposed Intervention Plan*

Area of concern	Activities	Success indicator
Learning environment (peer pressure, noise, study space)	Cooperative rather than competitive tasks; classroom norms on noise and respect; supervised study hall for learners without a quiet place at home	Lower environment ratings on follow-up survey

Area of concern	Activities	Success indicator
Motivation and attitude (persistence, anxiety, relevance)	Low-stakes quizzes before major tests; step-by-step worked examples; career talks and tasks showing real uses of each topic	Lower anxiety ratings, especially among female and lower-income learners
Content (functions, real-world application)	Graphing tools and visual representations of functions; word problems drawn from local contexts	Higher unit scores on functions
TVL learners and learning resources	Tutorial and peer-tutoring sessions; problems from technical-vocational settings; shared bank of modules, videos, and practice sets	Smaller track gap; fewer reports of limited resources

Conclusions

Grade 11 learners at the study site experienced a moderate level of difficulty in General Mathematics. Their difficulties came mainly from the learning environment and from motivation and attitude, followed by content knowledge, while teachers were not seen as a major source of difficulty. Difficulty was not spread evenly across learners. It was concentrated in particular dimensions for particular groups: motivation and attitude for female and lower-income learners, content for TVL learners, and the learning environment for learners from public junior high schools and lower-income families. Improving learning in General Mathematics therefore requires more than better instruction. It also calls for attention to study conditions, peer climate, and learners' confidence and sense of purpose, with support directed to the groups that need it most.

Recommendations

Based on the findings and conclusions, the following are recommended:

1. School administrators may adopt and monitor the proposed intervention plan, giving priority to improving study spaces and reducing classroom distractions.
2. Mathematics teachers may use cooperative learning, low-stakes assessment, and contextualized problems to reduce peer pressure and anxiety and to show learners the relevance of the subject.
3. Guidance counselors and teachers may offer support on mathematics anxiety and study habits, with particular attention to female and lower-income learners.
4. The school may provide remedial or tutorial programs on functions for TVL learners and for learners who enter with weak foundations.
5. The school may expand access to General Mathematics learning resources, such as modules, videos, and practice materials.
6. Future researchers may replicate the study across several schools, link reported difficulties to achievement data, and use interviews or classroom observation to explain the patterns found here.

Limitations of the Study

The study was conducted in a single private institution, so the findings may not generalize to other schools, particularly public SHS. Difficulties were measured through self-report, which may be influenced by social desirability, especially for items about teachers. The cross-sectional design does not allow causal conclusions. Family income was recorded in only two categories, which limits the analysis of socioeconomic differences. Finally, the study did not include learners' actual achievement in General Mathematics, so the link between reported difficulty and performance was not tested.

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