PROFILE-BASED ANALYSIS AND PERFORMANCE IN SCIENCE HIGH SCHOOL MATHEMATICS TEST OF FUNDAMENTAL ACADEMIC SKILLS

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ABSTRACT: *This study analyzed the 2023 TOFAS pretest performance of 420 junior science high school students at RTPM-DSHS using quantitative descriptive methods. Results were examined across grade levels, mathematical domains, and student profiles such as section, sex, GPA in math, residence, and elementary school category. Grades 7 and 8 showed weak performance in fractions, while grades 9 and 10 demonstrated improvement, especially in basic operations, but still needed support in algebraic equations. GPA was the strongest predictor, while section, school type, and sex had moderate influence; residence showed negligible impact. A conceptual framework was proposed for ICT-based remediation and enrichment. Grounded in cognitive and constructivist theories, the study supports personalized digital interventions to enhance math learning and equity.*

Keywords: TOFAS, ICT-based intervention, mathematics assessment, foundational skills, digital literacy, TPACK.

INTRODUCTION

Mathematical proficiency plays a crucial role in students' academic success and long-term achievement. Early mastery of fundamental math skills is a strong predictor of performance across subjects throughout elementary education and beyond [1]. Students with a solid mathematical foundation are better equipped to progress through more advanced concepts without significant learning gaps. In the field of science, a strong foundation in mathematical proficiency with the effective use of scientific reasoning and metacognitive skills were found to be key determinants of success in Physics. This suggests that educational institutions craft Physics curricula considering the development of students in mathematical proficiency, scientific reasoning skills, and metacognitive skills, while teachers develop activities that refine the direct and indirect effects of these variables to target a better academic performance in Physics [2]. Those who struggle with basic skills require timely and structured interventions. Well-designed interventions, when applied in appropriate educational contexts, can significantly enhance student outcomes [3]. To address these learning gaps, comprehensive, data-driven assessments are essential. One such tool is the Test of Fundamental Academic Skills (TOFAS), developed by SPRIX Ltd., an online assessment, which evaluates students' proficiency in core mathematical concepts and computation. In November 2023, TOFAS was administered as a pretest to junior high school students at Ramon Teves Pastor Memorial Dumaguete Science High School (RTPM-DSHS), a highly selective science high school known for its rigorous academic standards. Students are expected to maintain a minimum grade of 85% in Mathematics, Science, and English, and at least 83% in other subjects, reinforcing the need for a strong foundation in math. Currently, there are no, or probably few but not published, studies yet concerning performance of students in the TOFAS. This study analyzes TOFAS pretest results in Levels 3 and 4, in relation to students' profiles, including sex, GPA in mathematics, residential location, and elementary school background. The goal is to identify key areas requiring support and to design ICT-based intervention programs, since TOFAS is an online assessment, tailored to students' specific learning needs. By targeting these foundational gaps, the study aims to enhance students' readiness for the demands of a science-oriented curriculum. Beyond its local implications, this research contributes to broader educational discussions on improving mathematics instruction and intervention strategies. The findings may inform policy and practice, providing a model for using diagnostic assessments to promote equitable and effective learning outcomes.

Review of Related Literature and Studies

The Test of Fundamental Academic Skills (TOFAS) is an international, online diagnostic assessment designed to evaluate core academic competencies such as calculation and programming across grade levels. Developed by SPRIX Ltd. in collaboration with the SPRIX FAS Laboratory, TOFAS aims to measure foundational skills that are essential for success in mathematics and related disciplines. It offers a comprehensive, level-based assessment aligned with students' academic stages, enabling educators, students, and parents to identify skill gaps and monitor progress [4]. Accessible via multiple devices and languages, TOFAS uses a 40-minute online test format composed of multiple-choice and numerical input items. Students scoring at least 80% receive digital certificates and global rankings, fostering academic motivation through international benchmarking [5]. In the Philippines, the Department of Education has formally adopted TOFAS to support mathematics improvement efforts, especially in response to the country's low performance in international assessments like PISA [6]. Studies underscore the value of formative assessments like TOFAS in shaping learning outcomes. Effective assessments provide data that inform instruction and enhance student learning [7,8]. Tracking progress and offering personalized feedback significantly contributes to academic growth [9]. Global benchmarking is important in preparing students for a competitive, knowledge-driven workforce [10]. Level 3 TOFAS considers the following mathematical skills: Multiplication and Division, Adding and Subtracting Decimals, Adding and Subtracting Fractions, Order of Operations, Multiplying and Dividing Decimals, and Multiplying and Dividing Fractions. Level 4 TOFAS, on the other hand, considers the following mathematical skills: Adding and Subtracting Fractions, Positive and Negative Numbers, Equations, Multiplying and Dividing Fractions, and Algebraic Equations. It is notable that the mathematical skills considered in the Level 3 and Level 4 TOFAS are actually more of arithmetic skills which are indeed foundational or fundamental skills. Since there is no research yet related to TOFAS performance, the review of related studies shall focus on the performance of students in the fundamental arithmetic skills. Research consistently shows that fundamental academic skills are critical for academic success. Widespread deficiencies in arithmetic, even among higher-grade students, noting a decline in basic skills over generations [11,12]. Post-pandemic recovery in math has been slow [13]. Studies from higher education (e.g., Ghent University and general chemistry courses) reveal that inadequate arithmetic skills often impede performance in STEM subjects [14]. Despite the prevalence of digital tools like calculators, arithmetic fluency remains essential for mastering advanced concepts such as algebra, geometry, and calculus. Moreover, it is linked to long-term academic achievement, higher earnings, and success in science disciplines [15]. In the case of Regional Science High Schools (RSHS), foundational arithmetic is particularly important. It underpins success in physics, chemistry, and other science subjects that demand quantitative reasoning and data analysis. Integration of real-world problem-solving and arithmetic fluency enhance STEM readiness [16, 17]. Physicist Eugene Wigner, in his "The Unreasonable Effectiveness of Mathematics in the Natural Sciences" observes that mathematical theories often have predictive power in describing nature. He argues that mathematical concepts have applicability far beyond the context in which they were originally developed. He adds that the laws of nature are written in the language of mathematics, properly made by Galileo three hundred years ago, and this is now truer than ever before [18]. Recent studies in cognitive science have found that to solve well-structured problems in the sciences, students must first memorize fundamental facts and procedures in mathematics and science until they can be recalled with automaticity, then practice applying those skills in a variety of distinctive contexts. Actions are suggested to improve US STEM graduation rates by aligning US Math and Science curricula with the recommendations of cognitive science [19]. In addition, the profile of the students, such as section, sex or gender, grade point average in mathematics, location of residence, and category of elementary school, can be factors of the students' performance in TOFAS. It is essential to investigate this in order to identify key areas for improvement or enhancement. Peer influence plays a vital role: collaborative learning, peer tutoring, and social-emotional support improve arithmetic proficiency and reduce math anxiety [20,21]. Gender-related studies present nuanced findings. While early research indicated minor differences, such as boys performing better in arithmetic and girls in geometry [22,23], recent studies affirm that overall performance is not significantly influenced by gender [24,25]. These findings suggest that supportive, inclusive environments can help both male and female learners succeed equally in mathematics. The correlation between mathematics proficiency and overall academic achievement is well-documented. High performance in math often translates to success in science, social studies, and standardized assessments [26]. GPA in mathematics is also a reliable predictor of academic potential, though weighted GPAs may not always reflect true proficiency. Another key factor is residential location. Urban students often outperform their rural peers due to better access to resources, technology, and qualified teachers [27,28]. Studies show that this gap is exacerbated by disparities in digital access, as noted during the COVID-19 pandemic [29]. Addressing the rural-urban divide through targeted support, infrastructure investment, and teacher training is essential for educational equity [30,31]. The elementary school category, whether public science, public regular, or private, also influences foundational math development. Students from public science schools often outperform their peers due to more rigorous instruction and specialized resources [32,33]. Others argue that while school type matters, demographic and socioeconomic factors play a larger role in shaping achievement, especially in disadvantaged contexts [9, 34].

Theoretical Framework

This study is grounded in several key educational theories that provide a lens for understanding the patterns and trends observed in the TOFAS pretest results. The analysis of student performance is informed by theories of cognitive development, social constructivism, academic achievement, and educational stratification, which together offer insights into the factors influencing mathematical proficiency and student success. ***1. Cognitive Development Theory (Piaget, 1952)*** - Jean Piaget's theory of cognitive development suggests that students progress through stages of cognitive growth, influencing their ability to grasp mathematical concepts [35]. The difficulties observed in fractions among Grades 7 and 8 students align with Piaget's assertion that abstract thinking begins to develop in early adolescence. Younger students may still be transitioning from concrete operational thinking to formal operational thinking, impacting their ability to perform operations involving fractions. This developmental perspective underscores the need for targeted instructional strategies to scaffold learning and ease the transition to more complex mathematical reasoning. ***2. Vygotsky's Social Constructivism (1978)*** - Lev Vygotsky's theory of social constructivism emphasizes the role of social interactions and scaffolding in learning [36]. The significant performance disparity between homogeneous and heterogeneous sections can be interpreted through this lens, as students in homogeneous sections likely benefit from peer collaboration and a more structured learning environment. Additionally, the impact of prior educational background, such as students from Public Science Elementary Schools outperforming their peers, supports Vygotsky's notion that learning is deeply influenced by social and environmental factors. ***3. Zone of Proximal Development (ZPD) and Scaffolding*** - The persistent gaps in foundational skills, particularly in fractions, suggest that students in lower grade levels may be operating below their Zone of Proximal Development (ZPD) [37]. Effective interventions, such as differentiated instruction and scaffolded learning, can help bridge these gaps. Teachers play a crucial role in guiding students from their current level of understanding to higher proficiency through structured support and gradual release of responsibility. ***4. Educational Stratification and Grouping Theories*** - The performance differences between homogeneous and heterogeneous sections can also be understood through theories of educational stratification. Tracking and ability grouping may contribute to the observed achievement patterns, as students in homogeneous sections receive tailored instruction that meets their advanced needs. However, the variability within these sections suggests that while grouping can enhance performance, additional efforts are needed to ensure consistency in learning outcomes [38]. ***5. Academic Achievement Theories -*** The positive correlation between GPAs and TOFAS pretest scores supports existing models of academic achievement, such as Tinto's (1993) Student Integration Model, which posits that academic and social integration contribute to student success. The study's findings indicate that students with strong foundational knowledge in mathematics, as reflected in their GPAs, perform better in standardized assessments, reinforcing the importance of continuous academic engagement [39]***. 6. Gender and Educational Performance -*** Gender disparities in performance, particularly in Grade 8, align with research on gender differences in learning styles and cognitive development [40]. The temporary advantage of male students in arithmetic tasks suggests that developmental and motivational factors may play a role in mathematical achievement. These findings highlight the importance of considering gender-responsive teaching strategies to address fluctuations in performance across grade levels. ***7. Socioeconomic and Environmental Influences on Learning -*** The impact of elementary school background and residential location on student performance aligns with Bronfenbrenner's (1979) Ecological Systems Theory [41]. The superior performance of students from Public Science Elementary Schools suggests that early educational experiences shape academic trajectories. Additionally, the minimal long-term impact of residential location on Grade 10 performance indicates that as students progress, intrinsic factors such as study habits and instructional quality become more influential than external environmental factors.

The administration of TOFAS through digital platforms reflects the growing trend of leveraging Information and Communication Technology (ICT) in educational assessment. The theoretical grounding for this integration draws from frameworks in technology-enhanced learning, digital assessment literacy, and assessment for learning within digital environments. ***8. Technological Pedagogical Content Knowledge (TPACK) Framework (Mishra & Koehler, 2006) -*** TPACK highlights the importance of aligning technology use with pedagogical strategies and content knowledge [42]. In the context of TOFAS, the integration of online assessment tools requires that educators not only understand mathematics content and pedagogy but also how to effectively utilize technology to assess students' skills. The success of TOFAS as an online diagnostic tool depends on this synergy among technology, pedagogy, and content. ***9. Digital Assessment Literacy (Pellegrino et al., 2001; Redecker et al., 2012) -*** Digital assessment literacy refers to the ability of educators and learners to effectively use digital tools to design, implement, and interpret assessments. [43]. The use of TOFAS online demands familiarity with user interfaces, navigation of platforms, and interpretation of real-time results, skills essential for both students and teachers in a 21st-century learning environment. ***10. Cognitive Load Theory in Online Assessment (Sweller, 1988) -*** Online assessments must be designed to minimize extraneous cognitive load [44]. A well-structured digital interface for TOFAS ensures that students' mental efforts are directed toward problem-solving rather than navigating confusing formats or instructions. This design principle is critical in ensuring the reliability of test data gathered through online administration. ***11. Assessment for Learning (AfL) in Digital Environments (Black & Wiliam, 1998) -*** The online implementation of TOFAS also aligns with Assessment for Learning principles, wherein assessment is not merely for grading but for identifying learning gaps and informing instruction. Through automated feedback, analytics, and performance reports, TOFAS serves as a formative assessment tool that can help teachers tailor ICT-based remediation strategies more effectively [45]. ***12. Universal Design for Learning (UDL) and Accessibility in Online Assessments -*** Online administration of TOFAS is also guided by UDL principles, which advocate for flexible assessment formats that cater to diverse learners. Digital assessments can provide multiple means of engagement and expression (e.g., interactive items, visual representations, audio instructions), making the test more inclusive and accessible [46].

This theoretical framework provides a foundation for understanding the factors influencing student performance on the TOFAS pretest. By integrating cognitive development theories, social constructivism, educational stratification, academic achievement models, and ICT-related theories, this study highlights the importance of targeted interventions, structured learning environments, and early academic preparation in fostering mathematical success. Moving forward, these insights can inform policy decisions, curriculum development, and instructional strategies aimed at enhancing student outcomes in mathematics.

Significance of the Study

This study holds considerable significance for students, educators, school administrators, and education policymakers. Mathematics plays a foundational role in academic achievement and long-term educational success. Early proficiency in mathematics is a strong predictor of students' performance throughout their academic journey, particularly in advanced subjects. This research aims to uncover strengths and weaknesses in students' foundational mathematical skills. Given RTPM-DSHS's rigorous academic standards and selective admission process, students must possess a solid foundation in mathematics to thrive. The insights derived from this study will inform the development of evidence-based intervention programs tailored to the specific needs of *students, particularly those who struggle with basic mathematical concepts.* By considering students' profiles - including sex, grade point average in Mathematics, residential location, and elementary school category - the study will provide a nuanced understanding of performance disparities and learning gaps. *For educators,* the findings will serve as a guide in designing targeted instructional strategies and timely interventions that can address students' individual learning needs. *For school administrators and policymakers,* the results will contribute to the formulation of effective educational programs and policies aimed at improving mathematics education outcomes. Furthermore, the study has the potential to contribute to the broader discourse on academic intervention strategies by offering a model for using diagnostic assessments like TOFAS to drive data-informed decision-making in schools. Ultimately, this research supports the overarching goal of ensuring that all students, regardless of background, are equipped with the essential mathematical skills required for academic and professional success.

Methodology

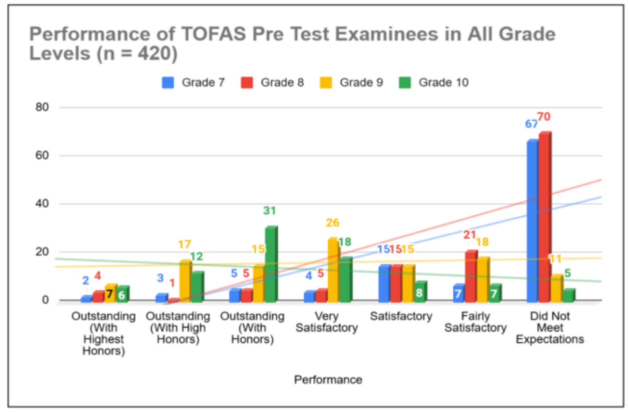
This study employed a quantitative descriptive research design to analyze the performance of grades 7, 8, 9, and 10 junior high school students at Ramon Teves Pastor Memorial Dumaguete Science High School in the 2023 Test of Fundamental Academic Skills (TOFAS) Pretest, and determine difference and relationship of the students' profile on section, sex, grade point average in mathematics, location of residence, and category of elementary school. This study employed a complete enumeration approach, wherein all members of the population were included as respondents. 420 students took the 2023 TOFAS at RTPM-DSHS, across all grade levels 7 to 10. RTPM-DSHS is the sole regional science high school in the Dumaguete City Division of the Department of Education. It is also the sole regional science high school in the province of Negros Oriental. Descriptive statistics were used to analyse the collected data, obtained from the school as approved by the Department of Education - Dumaguete City Division, which included the computation of frequencies, percentages, means, and standard deviations to interpret students' performance and profile characteristics. Comparative and relationship analyses were conducted to determine patterns and disparities in performance when grouped according to their profiles using mean, standard deviation, contingency coefficient, and Pearson moment correlation coefficient. Visual representations such as bar graphs and diagrams were utilised to illustrate performance trends and the conceptual framework. Tabular data provided detailed numerical insights, allowing for more in-depth examination of student performance and group comparisons. Student identities were anonymised to ensure confidentiality and to observe proper ethical considerations in research. Data was used solely for research and educational development purposes. This methodology allows for an in-depth understanding of students' mathematical strengths and weaknesses. It also facilitates the identification of performance trends based on various students' characteristics, which is crucial for the design of targeted and effective intervention programs to enhance academic outcomes at RTPM-DSHS.

RESULTS AND DISCUSSIONS

Figure 1 revealed that most grades 7 and 8 students did not meet expectations, with relatively low numbers achieving high performance. Indeed, there is a need for intervention in foundational mathematical skills.

Figure 1

Performance of 2023 TOFAS Examinees in RTPM-DSHS



Urgent attention is needed. Early intervention strategies (e.g., diagnostic assessments, targeted remediation) should be implemented in Grade 7 to prevent learning gaps from widening. On the other hand, grades 9 and 10 students marked an increase in high-performing students and a significant decline in underperformers, pointing to improved instruction, learning retention, or student adaptation. Grade 9 students consistently perform well, implying that it is a pivotal year for academic consolidation. Grade 10 shows the highest number of students achieving "Outstanding (With Honours)", revealing their readiness for more advanced mathematics. Grades 9 and 10 demonstrate the success of prior learning continuity and could benefit from enrichment programs to further extend competencies. Providing training on digital literacy and incorporating user-friendly interface improvements could help mitigate the technical difficulties students encounter in online tests. Ensuring that students are equipped with both computational and digital skills is essential for success in online assessments and modern learning environments. Implementing these targeted interventions would align with broader educational goals, ensuring that all students receive the necessary support to succeed in math and other key academic subjects. Ultimately, the TOFAS platform can play a central role in reducing performance gaps and preparing students for more rigorous academic environments by providing personalised, structured digital learning support while addressing the challenges of technology use in assessments. The findings from the TOFAS pretest emphasise the need for early, structured interventions in Grades 7 and 8, where most students underperformed. Theories of cognitive development and ZPD support the use of diagnostic tools and scaffolded instruction at this stage. In contrast, the higher performance in Grades 9 and 10 demonstrates the benefits of instructional continuity, digital familiarity, and academic maturity, strengthening the role of TPACK, AfL, and digital literacy. Integrating ICT-based assessment and remediation through TOFAS not only enhances data-driven instruction but also helps reduce learning gaps by delivering timely, personalised, and accessible learning experiences. Ensuring that students are equipped with both computational and digital skills will be essential for success in modern learning environments.

Table 1 shows that in Level 3 (grades 7 and 8), *Multiplication and Division* is the highest among all Level 3 skills, showing relative strength in basic computational fluency; and *Order of Operations* indicates understanding, though Grade 7's performance is widely dispersed/varied. On the other hand, *Multiplying and Dividing Fractions* is the lowest performing skill in both grades, showing a clear need for remediation, which is also true with *Adding and Subtracting Fractions*. The persistent challenge in all fraction-related operations signals foundational gaps that could hinder future algebraic success.

Table 1

Performance of 2023 Level 3 and Level 4 TOFAS Pretest Examinees

Mathematical Skills of TOFAS Pretest	Transmuted Mean	SD	Transmuted Mean	SD
LEVEL 3	**Grade 7**		**Grade 8**	
Multiplication, Division	85.90 - VS	10.57 - D	89.28 - VS	10.10 - D
Adding and Subtracting Decimals	84.10 - S	12.10 - MrD	83.73 - S	10.54 - D
Adding and subtracting Fractions	74.01 - DNME	10.00 - D	71.73 - DNME	8.86 - LtD
Order of Operations	86.86 - S	30.42 - MsD	87.22 - S	11.94 - MD
Multiplying and Dividing Decimals	73.79 - DNME	9.47 - LD	77.63 - FS	10.33 - D
Multiplying and Dividing Fractions	71.11 - DNME	10.68 - D	69.65 - DNME	9.52 - LsD
LEVEL 4	**Grade 9**		**Grade 10**	
Adding and Subtracting Fractions	91.75 - O	9.81 - LsD	93.16 - O	8.94 - LsD
Positive and Negative Numbers	87.67 - VS	7.90 - LtD	91.41 - O	5.84 - LtD
Equations	82.57 - S	10.06 - D	85.76 - VS	10.06 - D
Multiplying and Dividing Fractions	89.27 - VS	12.58 - MrD	90.54 - O	10.76 - D
Algebraic Equations	85.40 - VS	10.52 - D	88.16 - VS	9.90 - LsD

Note: *O - Outstanding - 90 to 100; VS - Very Satisfactory - 85 to 89; S - Satisfactory - 80 to 84; FS - Fairly Satisfactory - 75 to 79; and DNME - Did Not Meet Expectations - Below 75; LtD - Least Dispersed; LsS - Less Dispersed; D - Dispersed; MrD - More Dispersed; MsD - Most Dispersed;*

Multiplying and Dividing Decimals are also weak spots, with Grade 7 not meeting expectations and Grade 8 barely reaching Fairly Satisfactory. In Level 4 (grades 9 and 10), *adding and Subtracting Fractions,* and *multiplying and Dividing Fractions* as skills with higher means, shows that foundational mastery has solidified, and this reversal from Level 3 emphasizes the effectiveness of learning continuity and skill consolidation. Their performance in *Positive and Negative Numbers* indicates strong number sense and fluency with integers and signs. However, the areas they need to focus on are *Equations and Algebraic Equations,* which consistently rank lowest in Level 4 performance. These are the most conceptually complex skills, and students' performance, while competent, suggests room for deeper conceptual enrichment. Most scores fall into Dispersed or Less Dispersed categories. Grade 7's *Order of Operations* has the highest variation/dispersion, signalling inconsistent mastery. Grade 10 scores are more stable, suggesting greater academic maturity and consistent performance, especially since they are enrolled in a regional science high school. Focused remediation on fractions and decimals, especially multiplying/dividing, and scaffolded ICT-based drills and visuals may help build conceptual understanding. There is a need to strengthen equation-solving skills through problem-based learning and enrichment, and to provide tasks that promote deeper algebraic reasoning and application. Across all grades, there is a need to leverage strengths (e.g., basic operations and integer fluency) as springboards for more complex tasks, and to continue using TOFAS-style diagnostics to track progress and personalise support. Theoretical insights from developmental psychology, constructivism, educational technology, and assessment literacy together validate the need for a two-pronged intervention strategy: Remediation in foundational skills (particularly fraction operations) for grades 7 to 8, using scaffolded, developmentally aligned digital tools; and Enrichment and focused in algebraic reasoning (especially equations) for grades 9 to 10, using ICT platforms that promote conceptual depth and real-time feedback. This approach ensures that digital assessment not only diagnoses gaps but also becomes a vehicle for meaningful, equitable, and sustained learning in mathematics.

Table 2

Performance of the Examinees When Grouped According to Section

Grade Level	Section vs Performance in TOFAS Pretest	Section A	Section B	Section C	Section D	Contingency Coefficient and Interpretation in terms of Degree of Association
	Mean	74.42 - DNME	78.69 - FS	73.97 - DNME	N/A	
	Median	72 - DNME	79 - FS	72 - DNME	N/A	
	Mode	71 (6) - DNME	70 (5) - DNME	70 (9) - DNME	N/A	
Grade 7	Standard Deviation	7.20 - LD	8.63 - MD	7.66 - D	N/A	0.288 Low Association
	Mean	83.13 - S	73.29 - DNME	73.08 - DNME	N/A	
	Median	82 - S	71 - DNME	71 - DNME	72.50 - DNME	
	Mode	82 (5) -S	70 (7) - DNME	71 (5) - DNME	70, 72 (5) - DNME	
Grade 8	Standard Deviation	8.59 - MD	5.85 - D	5.85 - D	4.98 - LD	0.516 Moderate Association
	Mean	89.86 - O	84.19 - S	84.04 - S	84.81 - VS	
	Median	91 - O	86.50 - VS	83.50 - S	83 - S	
	Mode	87, 91, 94, 98 (4) - VS to O	75 (3) - DNME	89 (3) - VS	74, 83 (4) - FS to S	
Grade 9	Standard Deviation	5.90 - LD	8.04 - D	7.98 - D	8.35 - MD	0.306 Low Association
	Mean	92.86 - O	87.25 - VS	86.17 - VS	N/A	
	Median	93 - O	87 - VS	88.50 - VS	N/A	
	Mode	94 (5) - O	87, 97, 88.50 (3) - VS to O	91 (4) - O	N/A	
Grade 10	Standard Deviation	3.31 - LD	7.34 - D	7.58 - D	N/A	0.464 Moderate Association

Note: *O - Outstanding - 90 to 100; VS - Very Satisfactory - 85 to 89; S - Satisfactory - 80 to 84; FS - Fairly Satisfactory - 75 to 79; and DNME - Did Not Meet Expectations - Below 75; Below 0.400 - Negligible to Low Association; 0.400 to 0.600 - Moderate Association; Above 0.600 - High to Very High Association; LS - Less Dispersed; D - Dispersed; MD - More Dispersed;*

Table 2 provides a comparative analysis of TOFAS pretest scores by class section (A to D) across grades 7 to 10. It examines measures of central tendency (mean, median, mode), variability/dispersion (standard deviation), and the contingency coefficient to determine the strength of association between section assignment and performance. In Grade 7, means across sections fall below 80, indicating "Did Not Meet Expectations" or "Fairly Satisfactory." Standard deviations are relatively high, indicating moderate dispersion and variability in student performance within sections. Contingency Coefficient disclosed that sectioning has minimal predictive power on performance at Level 3. Grade 7 students perform relatively uniformly across sections. This supports the need for whole-grade remediation rather than section-based remediation. In Grade 8, performance diverges. Section A shows the highest mean, median and mode. Contingency Coefficient indicates a stronger influence of sectioning, possibly due to ability grouping or teacher effectiveness. Grade 8 shows greater performance variability by section. Intervention may be section-specific, particularly focusing on weaker sections (B-D). In Grade 9, all sections perform well. Standard deviations are lower, especially in Section A, indicating stronger, more uniform performance. Contingency coefficient indicates that performance is relatively stable across sections, suggesting that curricular and instructional strategies may have levelled student outcomes. Grade 9 appears to benefit from cumulative instruction. Continue grade-wide enrichment, especially for equations and reasoning tasks. Finally, Grade 10 examinees have the highest overall performance. Standard deviation shows a greater spread in Sections B-D, but Section A remains the least dispersed. The contingency coefficient indicates that the section still influences performance, but not strongly. While performance has improved across the board, Section A students outperform others, possibly due to teacher quality, peer effects, or resource access. Lower grades (grades 7-8) require targeted support, especially in lower-performing sections. Sectioning is not a strong determinant of performance in grades 7 and 9, revealing that individualised remediation is more effective than section-wide approaches. Higher grades (grades 9-10) reflect instructional consolidation, but disparities across sections remain, especially in Grade 10. Equitable access to quality instruction must be ensured across sections to close the remaining gaps. Grounded in developmental theory, educational stratification, the Zone of Proximal Development, and ICT integration, the findings affirm that sectioning alone is not a reliable determinant of student performance, particularly in grades 7 and 9, where associations are weak. While moderate section-based differences emerge in grades 8 and 10, these are not consistent enough to justify uniform, section-specific instruction. Instead, the study advocates for targeted, data-driven, and developmentally appropriate interventions that respond to actual learning needs identified through diagnostic tools such as TOFAS. ICT-based platforms offer scalable and equitable solutions by enabling personalized learning pathways, ensuring that all students, regardless of section, receive timely support and enrichment aligned with their competencies.

Table 3

Performance of the Examinees When Grouped According to Sex

Grade Level	Sex vs Performance in TOFAS Pretest	Male	Female	Contingency Coefficient and Interpretation in terms of Degree of Association
	Mean	77.42 - FS	74.64 - FS	
	Median	73.50 - DNME	73 - DNME	
	Mode	70, 72 (5)	70 (11)	0.141
Grade 7	Standard Deviation	9.46 - MrD	6.93 - LsD	Low Association
	Mean	78.70 - FS	74.69 - FS	
	Median	76 - FS	72 - DNME	
	Mode	74 (6)	70 (15)	0.174
Grade 8	Standard Deviation	8.59 - MrD	6.93 - LsD	Low Association
	Mean	87.71 - (VS)	84.95 - (VS)	
	Median	89 - (VS)	86 - (VS)	
	Mode	74, 89 (4)	91, 94 (6)	0.108
Grade 9	Standard Deviation	7.86 - MrD	7.79 - LsD	Very Low Association
	Mean	89.25 - VS	88.51 - VS	
	Median	90 - O	91 - O	
	Mode	85, 94, 95, 98 (3)	91 (7)	0.094
Grade 10	Standard Deviation	6.87 - LsD	7.07 - MrD	Negligible Association

Note: *O - Outstanding - 90 to 100; VS - Very Satisfactory - 85 to 89; S - Satisfactory - 80 to 84; FS - Fairly Satisfactory - 75 to 79; and DNME - Did Not Meet Expectations - Below 75; Below 0.400 - Negligible to Low Association; 0.400 to 0.600 - Moderate Association; Above 0.600 - High to Very High Association; LS - Less Dispersed; D - Dispersed; MD - More Dispersed;*

Table 3 explores the relationship between students' sex and TOFAS pretest performance across grades 7 to 10. The analysis is based on measures of central tendency (mean, median, and mode), variability (standard deviation), and the contingency coefficient, which reflects the strength of association between sex and performance. In Grade 7, male students performed slightly better on average than females. However, both groups had median scores below 75, indicating that the majority of the students did not meet expectations. The performance of the males is more dispersed compared to the females. The contingency coefficient showed a low association. Performance differences exist but are minor, and male students show greater score variability, implying inconsistent skill levels. In Grade 8, males outperform females again in terms of mean. Males had a higher median than females also. Standard deviation patterns are similar to those of Grade 7, as well as the contingency coefficient. Grade 8 reflects the largest observable sex gap, favouring males. This refers to a potential need for targeted support for females at this grade level. Grade 9 performance gap significantly narrows in terms of mean. Medians and standard deviations are nearly identical, and the contingency coefficient shows a very low association. The performance gap by sex diminishes significantly in Grade 9, indicating a levelling effect possibly due to curriculum consistency or academic maturity. Performance in Grade 10 is almost equal between males and females. The contingency coefficient shows a negligible association. By Grade 10, sex-based differences are negligible. Both sexes show strong and consistent performance with only minor variability. No consistent sex-based performance trend is evident, particularly beyond Grade 8. The observed male advantage in Grade 8 reveals the need to investigate learning environments, instructional methods, or confidence gaps for female students. The decrease in variability among female scores and narrowing gaps in higher grades suggest a maturing effect and curriculum alignment. Instructional strategies may remain inclusive and equitable, without assuming innate performance differences between sexes. TOFAS and ICT-based tools can be valuable in detecting individual learning needs beyond demographic categories like sex. Although minor performance gaps exist between male and female students, particularly in Grade 8, these differences are not statistically strong or consistent across grade levels. As students progress to grades 9 and 10, the gap diminishes and performance converges, with both sexes achieving "Very Satisfactory" to "Outstanding" levels. Contingency coefficients indicate negligible to low associations, affirming that sex is not a strong determinant of mathematical performance in this context. Instruction may thus remain inclusive, data-informed, and responses to individual learning profiles rather than demographic generalisations. These results support existing literature showing minimal overall gender differences in math performance, though subtle variations can occur by grade level and content area. For example, Grade 8 shows a temporary male advantage in arithmetic, consistent with studies by Pati *et al.* [22], which link such trends to developmental factors. However, by Grade 9, the gap disappears, with both genders performing similarly, reflecting findings by Cabuquin and Abojejo [25] on narrowing gender disparities in later grades. In Grade 10, males again slightly outperformed females, but higher variability among female scores suggests individual factors like confidence and engagement may influence outcomes. These trends affirm that gender differences in math are often small, context-dependent, and diminish over time, reinforcing the need for inclusive learning environments that support all learners [24]. Sex-based differences in math performance, while observable at specific grade levels (notably Grade 8), are not consistent or predictive across the high school years. Instead, these differences reflect a combination of developmental timing, learning environments, and individual factors. Through the lens of developmental and social learning theories, and supported by empirical evidence, these findings reinforce the importance of inclusive, differentiated, and ICT-enhanced instruction, particularly in early high school, to ensure that both male and female students are equally supported in building foundational mathematical competencies.

Table 4

Performance of the Examinees When Grouped According to GPA in Math

Grade Level	Math GPA vs Performance in TOFAS Pretest	High Outstanding	Outstanding	Very Satisfactory	Satisfactory	Pearson Moment Correlation Coefficient and Interpretation in terms of Degree of Correlation
	Mean	82.81 - S	78.45 - FS	71.17 - DNME	71.62 - DNME	
	Median	84 - S	78.50 - FS	71 - DNME	70 - DNME	
	Mode	70, 84, 85 (2)	70 (5)	72 (8)	66,67,70, 73 (2)	
Grade 7	Standard Deviation	9.46 – MrD	7.72 - D	3.121 – LtD	7.73 - D	0.455 Moderate Correlation
	Mean	94.38 - O	80.15 - S	73.15 - DNME	70.57 - DNME	
	Median	95 - O	80 - S	72 - DNME	70 - DNME	
	Mode	100 (2)	82 (4)	72 (11)	70 (7)	
Grade 8	Standard Deviation	5.85 - LsD	6.79 - D	3.91 - LtD	3.03 - LtD	0.707 High Correlation
	Mean	94.50- O	90.04 - O	81.59 - S	71.00 - DNME	
	Median	94.50- O	90 - O	79 - FS	71 - DNME	
	Mode	None	89 - VS	74 - DNME	71 - DNME	
Grade 9	Standard Deviation	4.95 - LtD	5.16 - LsD	7.51 - D	N/A	0.495 Moderate Correlation
	Mean	95.00 - O	90.92 - O	82.32 -S	N/A	
	Median	94 - O	92 - O	84 - S	N/A	
	Mode	None	91 - O	85 - VS	N/A	
Grade 10	Standard Deviation	3.56 - LtD	5.10 - LsD	7.01 - D	N/A	0.530 Moderate Correlation

Note: *O - Outstanding - 90 to 100; VS - Very Satisfactory - 85 to 89; S - Satisfactory - 80 to 84; FS - Fairly Satisfactory - 75 to 79; and DNME - Did Not Meet Expectations - Below 75; Below 0.400 - Negligible to Low Association; 0.400 to 0.600 - Moderate Association; Above 0.600 - High to Very High Association; LS - Less Dispersed; D - Dispersed; MD - More Dispersed;*

Table 4 provides a detailed analysis of the relationship between students' GPA in mathematics and their TOFAS pretest performance across Grades 7 to 10. The table includes central tendency measures (mean, median, mode), standard deviations, and Pearson correlation coefficients to assess the degree of correlation between GPA and math proficiency as measured by TOFAS. In Grade 7, students with higher GPA in math scored much better on TOFAS. Performance declines sharply with lower GPAs. The Pearson correlation coefficient shows moderate correlation. GPA in math moderately predicts performance in Grade 7. While high-GPA students perform better, many lower-GPA students do not meet expectations, highlighting the need for early diagnostic intervention. Grade 8 has a stronger relationship than in Grade 7. GPA in math is a strong predictor of TOFAS performance in Grade 8. This supports the use of GPA in math as an early indicator for intervention planning. In Grade 9, all GPAs in the math categories performed well, and the Pearson correlation coefficient shows moderate correlation. Despite strong overall performance, GPA in math remains a moderate predictor. Those with lower GPAs in math brackets still underperform, suggesting some learning gaps remain and require reinforcement. Grade 10 has consistently high performance, yet the Pearson correlation coefficient shows moderate correlation only. GPA in math continues to predict performance moderately. The reduced variation reflects academic consolidation and stronger alignment between GPA in math and math test readiness. GPA in math is a valid and practical indicator of mathematical proficiency, especially in Grades 8 to 10. Grade 8 shows the strongest alignment between GPA and TOFAS performance, making it an ideal level for GPA-informed intervention and enrichment. Lower GPA students consistently underperform, especially in early grades, indicating a need for remedial support focused on foundational competencies. ICT-based tools like TOFAS can supplement GPA insights by diagnosing specific skill gaps such as fractions, decimals, and equations. Teachers and administrators can use GPA not just for reporting, but as a predictive and diagnostic tool for personalised instruction. The results in Table 4 confirm that GPA in mathematics is a reliable predictor of TOFAS performance, especially in Grades 8 to 10, where moderate to high correlations are observed. Students with higher GPAs consistently outperform those in lower categories, particularly in critical math areas. However, lower-GPA students frequently fall below expectations, emphasising the need for targeted, ICT-supported interventions. These findings validate the use of GPS not only as an evaluative metric but also as a strategic basis for early identification, remediation, and enrichment planning in mathematics instruction. These findings emphasise the importance of strengthening early numeracy and supporting students' transition into a more rigorous curriculum. Over time, alignment between GPA and test performance improves, reinforcing the predictive value of math achievement for broader academic success [26]. Theoretical insights from academic achievement models, cognitive development, and ICT-enhanced learning frameworks support the recommendation to use GPA for early identification and to design customised, technology-supported reinforcement programs that address both skill gaps and academic transitions.

Table 5 compares TOFAS pretest scores between students living within Dumaguete City and those from outside Dumaguete City, across Grades 7 to 10. It reports central tendency measures (mean, median, mode), variability (standard deviation), and contingency coefficients, which indicate the degree of association between geographic residence and academic performance.

Table 5

Performance of the Examinees When Grouped According to Location of Residence

Grade Level	Location of Residence vs Performance in TOFAS Pretest	Within Dumaguete City	Outside Dumaguete City	Contingency Coefficient and Interpretation in terms of Degree of Association
	Mean	74.83 - FS	76.91 - FS	
	Median	72 - DNME	74 - DNME	
	Mode	70 (10)	70 (6)	
Grade 7	Standard Deviation	7.94 - LsD	8.19 - MrD	0.161 Low Association
	Mean	75.14 - FS	77.67 - FS	
	Median	72 - DNME	75 - FS	
	Mode	70 (14)	71 (8)	
Grade 8	Standard Deviation	7.90 - MrD	7.17 - LsD	0.186 Very Low Association
	Mean	85.74 - VS	85.97 - VS	
	Median	87 - VS	88 - VS	
	Mode	89 (7)	79, 88, 91, 94 (3)	
Grade 9	Standard Deviation	7.80 - LsD	8.15 - MrD	0.106 Very Low Association
	Mean	88.42 - VS	89.15 - VS	
	Median	90 - O	92 - O	
	Mode	91 (6)	93 (4)	
Grade 10	Standard Deviation	6.51 - LsD	7.57 - MrD	0.133 Very Low Association

Note: *O - Outstanding - 90 to 100; VS - Very Satisfactory - 85 to 89; S - Satisfactory - 80 to 84; FS - Fairly Satisfactory - 75 to 79; and DNME - Did Not Meet Expectations - Below 75; Below 0.400 - Negligible to Low Association; 0.400 to 0.600 - Moderate Association; Above 0.600 - High to Very High Association; LS - Less Dispersed; D - Dispersed; MD - More Dispersed;*

In Grade 7, mean scores disclosed a "Fairly Satisfactory" description. Median scores show "Did Not Meet Expectations" for both groups. There was a slight performance edge for students from outside the city. The contingency coefficient shows a low association. Residence has minimal impact on Grade 7 performance. Regardless of location, most students struggle with foundational skills, confirming the need for early remediation programs. In Grade 8, students outside the city perform slightly better. The contingency coefficient shows a very low association. A small performance gap exists in favour of rural students, but the association is very weak. Other factors (e.g., school quality, instruction style) may explain this. In Grade 9, both

Table 6

Performance of the Examinees When Grouped According to Category of Elementary School

Grade Level	Category of Elementary School vs Performance in TOFAS Pretest	Public Science Elementary School	Public Regular Elementary School	Private Elementary School	Pearson Moment Correlation Coefficient Interpretation in terms of Degree of Correlation
	Mean	78.39 - FS	73.81 - DNME	73.59 - DNME	
	Median	78 - FS	72 - DNME	72.50 - DNME	
	Mode	70 (7)	70, 72 (5)	70, 73 (4)	0.313
Grade 7	Standard Deviation	8.98 - MrD	6.67 - LsD	7.04 - D	Low Association
	Mean	77.70 - FS	72.72 - DNME	78.43 - FS	
	Median	76.50 - FS	72 - DNME	76 - FS	
	Mode	70, 71, 74, 79 (4)	70 (10)	71, 72 (4)	0.300
Grade 8	Standard Deviation	7.65 - D	5.01 - LsD	9.27 - MrD	Low Association
	Mean	85.60 - VS	86.47 - VS	85.82 - VS	
	Median	87 - VS	87.50 - VS	87.50 - VS	
	Mode	89 (4)	79, 86, 89, 91 (3)	74, 80, 83, 87 (3)	0.155
Grade 9	Standard Deviation	8.11 - D	8.18 - MrD	7.42 - LsD	Very Low Association
	Mean	90.55 - O	86.62 - VS	88.82 - VS	
	Median	92 - O	87 - VS	90.50 - O	
	Mode	91 (5)	87 (4)	85, 94 (3)	0.270
Grade 10	Standard Deviation	6.05 - LsD	7.08 - D	7.36 - MrD	Low Association

Note: *O - Outstanding - 90 to 100; VS - Very Satisfactory - 85 to 89; S - Satisfactory - 80 to 84; FS - Fairly Satisfactory - 75 to 79; and DNME - Did Not Meet Expectations - Below 75; Below 0.400 - Negligible to Low Association; 0.400 to 0.600 - Moderate Association; Above 0.600 - High to Very High Association; LS - Less Dispersed; D - Dispersed; MD - More Dispersed;*

groups scored similarly. The contingency coefficient shows a very low association. Residence does not predict performance at Level 4. The minimal difference highlights academic stabilisation and curriculum alignment. In Grade 10, there is a continued trend of near parity based on their means. Median and mode scores are nearly identical. The contingency coefficient also showed a very low association. Like Grade 9, students perform equally well regardless of residence. Disparities seen in early grades diminish by Grade 10. Location of residence is not a significant determinant of TOFAS performance across all grade levels, especially in Grades 9 and 10. Although slight differences favour students outside Dumaguete City, the associations are weak, implying that other factors (instructional quality, resource availability, student effort) matter more. These findings challenge common assumptions that urban students always outperform rural ones. Instructional planning should not generalise based on residence but instead focus on individual needs identified through diagnostic assessment. These findings revealed the importance of focusing on student-specific learning needs rather than geographic generalisations, and reaffirm that ICT-based, diagnostic-driven interventions liege TOFAS can provide equitable academic support regardless of residence. The Grade 8 findings warrant further investigation into contextual factors outside Dumaguete, such as smaller class sizes or instructional methods, that may contribute to higher scores. While previous studies [26-28] highlight urban advantages in math due to better resources, this study suggests that such effects may be grade-specific and diminish by Grade 10, likely due to student adjustment and skill development. These findings identified the importance of early, targeted interventions, especially in rural areas, and support addressing individual learning needs beyond geographic location. Theoretical perspectives from ecological systems, constructivism, and academic achievement reinforce the importance of addressing students' individual learning environments, regardless of the location of residence. ICT tools like TOFAS can play a pivotal role in diagnosing needs, identifying strengths, and delivering targeted, equitable support that transcends urban-rural divides.

Table 6 compares TOFAS pretest performance across three categories of elementary school, Public Science, Public Regular, and Private Schools, from grades 7 to 10. It includes statistical measures (mean, median, mode, standard deviation) and the contingency coefficient to determine the strength of association between school category and math performance. In Grade 7, Public Science elementary schools outperform others, though only marginally, as shown by the contingency coefficient that implies low association. There's a slight advantage for students from Public Science Schools, but the relationship between school category and performance is weak. Instructional and environmental variables may play a stronger role than elementary school type alone.

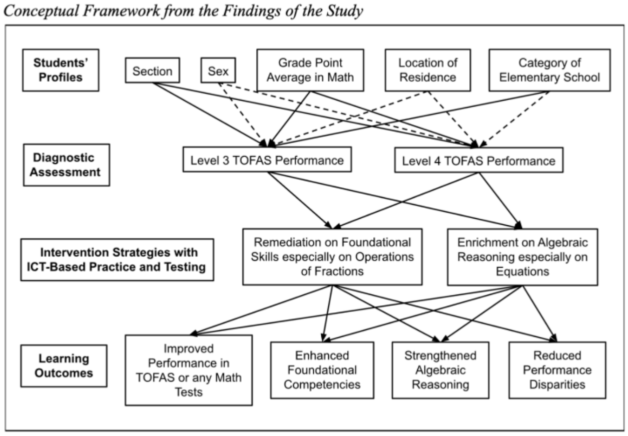
In Grade 8, students from Public Regular elementary schools consistently underperform, while Private and Public Science school students score better, yet the contingency coefficient still shows low association. Public Regular School graduates face more learning gaps in early secondary math. Targeted remediation in foundational skills (e.g., fractions, decimals) is essential in Grades 7–8, especially for these learners. In Grade 9, all groups performed well. Means and medians are nearly identical, and the contingency coefficient shows a very low association. Initial disparities seen in earlier grades are reduced by Grade 9, suggesting instructional alignment and student adaptation to the high school curriculum. Grade 10 performance revealed a strong performance across all categories. Public Science students lead, but differences are modest. Pearson correlation shows a low association. By Grade 10, school background has little predictive power over performance. Gains from high school instruction help to equalise prior gaps. School category influences early math performance, with Public Regular school students underperforming in grades 7-8. Public Science school students consistently perform well, possibly due to better preparation, instruction, or resources. Private school students show varied results, performing comparably by Grade 10. Differences diminish in grades 9-10, indicating the equalising role of secondary education. Interventions (remediation or enrichment) should focus on actual diagnostic data rather than the elementary school category alone. Elementary school background should not solely determine placement or instructional strategies. These findings, consistent with others [32, 33], underscore the importance of early math proficiency as a predictor of future success. Theoretical perspectives from educational stratification, constructivism, ecological systems theory, and academic achievement models reinforce the need for early, targeted interventions, particularly for students from Public Regular Schools. As students progress, effective ICT-based secondary instruction can help level the playing field, offering all learners the opportunity to succeed regardless of their initial academic background.

The conceptual framework derived from the study illustrates a systematic, data-driven model aimed at enhancing students' performance in mathematics, particularly in the Test of Fundamental Academic Skills (TOFAS), through targeted ICT-based interventions. The framework is grounded on student profile variables, including section, sex, grade point average in mathematics, location of residence, and category of elementary school, which serve as predictors of student performance at Level 3 or Level 4 in TOFAS as the diagnostic assessment. Solid lines in the diagram represent moderate association, while dashed lines indicate low association. The diagnostic assessment component identifies specific performance levels: Level 3, indicating gaps in foundational mathematical skills, especially in operations involving fractions, and Level 4, suggesting readiness for more advanced algebraic reasoning, particularly in equations.

These identified needs inform the design of differentiated ICT-based practice and Testing interventions, utilising digital tools for practice, formative assessment, and feedback. The two main types of interventions that emerge are Remediation targeting foundational competencies (notably for Level 3 TOFAS examinees) and Enrichment focusing on algebraic reasoning (for those examinees of Level 4 TOFAS). These interventions are strategically designed to achieve four core outcomes: improved performance in TOFAS and other mathematics assessments, enhanced foundational competencies, strengthened algebraic reasoning, and reduced performance disparities across diverse student profiles. The framework reflects a differentiated instruction approach, where interventions are personalised based on diagnostic data and student characteristics. It emphasises early remediation for grades 7 and 8 and academic enrichment for grades 9 and 10, aligning with the performance trends observed in the TOFAS results. ICT integration is central, not supplemental, providing scalable, engaging, and assessment-driven learning

Figure 2

Conceptual Framework from the Findings of the Study



experiences. The model embodies several theoretical underpinnings. Academic Achievement Theory and Educational Stratification theories explain how GPA and elementary school category relate to academic outcomes. Gender and Educational Performance Theory and Socioeconomic and Environmental Influences on Learning help interpret the impact of sex and residence on performance. The framework also incorporates Assessment for Learning in Digital Environments, promoting formative, feedback-rich assessment practices. The intervention strategies are anchored in Cognitive Development Theory and Vygotsky's Social Constructivism (including the Zone of Proximal Development and Scaffolding), which justify targeted, scaffolded support, Constructivist Learning theory, emphasizing learner-centered, context-driven instruction, and ICT-related frameworks such as TPACK, Digital Assessment Literacy, Cognitive Load Theory in Online Assessment, and Universal Design for Learning (UDL), which support accessible, inclusive, and effective digital learning interventions. This conceptual framework offers a robust, theory-informed approach that can guide mathematics intervention programs, especially in science high schools and STEM-focused curricula, toward reducing learning gaps and promoting mathematical proficiency across diverse student populations.

CONCLUSION

The results of the 2023 TOFAS pretest at RTPM-DSHS reveal significant learning gaps in Grades 7 and 8, particularly in fraction operations, with most students not meeting expectations. Conversely, students in Grades 9 and 10 demonstrated stronger performance, especially in number sense and algebraic reasoning, indicating instructional continuity and learning adaptation over time. Among all profile variables examined, GPA in mathematics emerged as the strongest predictor of TOFAS performance, followed by section and type of elementary school, although all associations were generally low to moderate. Sex and residence showed limited and inconsistent effects on performance. These findings validate the need for a differentiated intervention strategy, focused remediation of foundational skills in the lower grades and conceptual enrichment in the upper grades. Furthermore, results confirm that sectioning, sex, and school background alone should not dictate instructional approaches. Instead, data-informed, ICT-integrated strategies such as TOFAS should guide personalised support, aligned with developmental readiness, content mastery, and digital fluency. Ultimately, the study affirms the value of integrating diagnostic assessments and technology-enhanced instruction to foster inclusive, equitable, and effective mathematics learning across junior high school levels.

Recommendation

Based on the findings of this study, it is strongly recommended that targeted remediation be implemented for Grades 7 and 8 students, with a focus on addressing foundational mathematical weaknesses, particularly in fraction operations and decimal computations at Level 3. These areas consistently showed low performance and must be prioritised through scaffolded, ICT-integrated strategies. At the same time, enrichment programs should be developed for Grades 9 and 10 to further strengthen algebraic reasoning and conceptual understanding, capitalizing on students' demonstrated readiness and increasing proficiency at Level 4. The use of students' GPA in mathematics may also be institutionalised as a key diagnostic indicator for identifying those who require immediate academic support. While differences in performance were observed across variables such as section, sex, residence, and elementary school background, these factors demonstrated low to moderate associations with TOFAS outcomes, suggesting that they may not be the sole basis for designing instructional interventions. Instead, educational planning may prioritise data-driven, developmentally appropriate, and inclusive approaches that cater to individual learning needs. Furthermore, enhancing digital and assessment literacy among students and teachers is essential to ensure equitable access and competence in online assessments. Schools may incorporate regular low-stakes digital testing and feedback mechanisms to build confidence and familiarity with ICT-based tools. Finally, the proposed conceptual framework of this study may guide institutional policies and school-level programs, particularly in science high schools, by aligning digital diagnostic practices with theoretical foundations such as cognitive development, constructivist pedagogy, and digital assessment design. This comprehensive approach will ensure that all students are equipped with the mathematical and digital competencies necessary for academic success in an increasingly technology-driven learning environment. Additionally, future research employing a different methodology may be undertaken to explore other factors influencing online mathematics assessments among students in grades 7-10.

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