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Foundational Arithmetic Proficiency and Mathematics Performance Among Grade 10 Students: Predictors, Differences, and Stakeholder Perceptions

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Abstract

This study investigated the relationship between foundational arithmetic proficiency and mathematics performance among Grade 10 learners at Taft National High School in Eastern Samar, Philippines. Anchored on Cognitive Load Theory, Constructivist Learning Theory, Gagné's Hierarchical Learning Theory, Information Processing Theory, Social Cognitive Theory, and Ecological Systems Theory, the study examined how arithmetic deficiencies and selected learner variables influence mathematics achievement. A convergent parallel mixed-methods design was employed, integrating quantitative and qualitative data for comprehensive analysis. The respondents included all 271 Grade 10 learners enrolled during School Year 2025–2026, while selected students and mathematics teachers participated in interviews. Data were gathered using an adapted questionnaire, a 20-item Arithmetic Proficiency Test aligned with DepEd MELCs, students' mathematics grades, and structured interview guides. Quantitative data were analyzed using descriptive statistics, Pearson's Product-Moment Correlation, t-tests, and one-way ANOVA, while qualitative data were examined through thematic analysis. Findings revealed that most learners demonstrated moderate foundational arithmetic proficiency, with substantial difficulties in fractions, decimals, and integer operations. A strong and statistically significant positive relationship was found between arithmetic proficiency and mathematics performance, indicating that students with stronger arithmetic skills achieved higher mathematics grades. Significant differences in mathematics performance were observed according to economic status, attendance, section, parental involvement, and self-perceived math ability, while sex showed no significant difference. Qualitative findings further revealed that arithmetic deficiencies contributed to math anxiety, avoidance behaviors, low confidence, and instructional challenges. Teachers implemented remediation and differentiated instructional strategies, although persistent conceptual gaps remained evident among some learners. The study concluded that foundational arithmetic proficiency is a critical determinant of mathematics achievement and that mathematics learning is shaped by interconnected cognitive, emotional, motivational, and contextual factors. The study recommends targeted remediation programs, strengthened school–parent partnerships, improved attendance monitoring, and instructional practices that support learners' self-efficacy and reduce math anxiety. This study aligns with Sustainable Development Goal (SDG) 4: Quality Education by promoting foundational numeracy and equitable mathematics learning opportunities. It also relates to SDG 10: Reduced Inequalities through its examination of socio-economic and contextual factors affecting academic achievement. The study contributes to educational and socio-economic sustainability by supporting evidence-based interventions that strengthen foundational numeracy, improve learner engagement, and promote inclusive and context-sensitive mathematics instruction in rural and semi-urban educational settings.

Keywords: Arithmetic Proficiency, Attendance, Foundational Numeracy, Mathematics Achievement, Math Anxiety, Parental Involvement, Self-Efficacy, Socio-Economic Status, Student Performance, Sustainable Education

1. Introduction

Mathematics plays a critical role in science, technology, engineering, economics, and everyday problem-solving. Foundational arithmetic proficiency serves as the basis for higher-order mathematical learning, yet many students continue to struggle with basic operations that are essential for advanced mathematical reasoning. Global and national assessments consistently reveal low mathematics performance among Filipino learners, indicating persistent weaknesses in arithmetic fluency, number sense, and problem-solving skills. International and local studies further suggest that deficiencies in arithmetic contribute to difficulties in algebra, geometry, statistics, and other advanced mathematical domains (Henkel et al., 2024; Mullis et al., 2020; OECD, 2023). At Taft National High School, recurring arithmetic difficulties among Grade 10 students have been reflected in low mathematics achievement and National Achievement Test (NAT) scores. These challenges are further influenced by learner variables such as sex, economic status, attendance, parental involvement, class sectioning, and self-perceived math ability. Despite educational reforms and intervention programs in the Philippines, limited empirical studies have examined how foundational arithmetic deficiencies interact with these learner variables in rural or semi-urban secondary school settings. This study therefore investigates the relationship between foundational

arithmetic proficiency and mathematics performance among Grade 10 students at Taft National High School while examining the influence of selected learner characteristics and stakeholder perceptions.

1.1 Foundational Arithmetic Deficiencies and Mathematics Proficiency of Grade 10 Students at Taft National High School

Arithmetic is widely recognized as the foundation of mathematics education because it supports the development of advanced mathematical concepts and problem-solving abilities. Research demonstrates that students with weak arithmetic skills experience greater difficulty in algebra, geometry, and statistics (Mullis et al., 2020). A meta-analysis conducted in Ghana showed that targeted reinforcement of foundational arithmetic significantly improved mathematics achievement among learners (Henkel et al., 2024). International assessments reveal persistent mathematics underperformance among Filipino learners. The TIMSS 2019 results showed that Filipino fourth graders ranked lowest among participating countries in mathematics, while PISA 2022 reported mathematics scores far below the OECD average, with only a small percentage of learners achieving minimum proficiency levels (Julia Mari Ornedo, GMA News, 2020; Rappler, Dec 2023; OECD, 2023). These findings indicate that inadequate mastery of arithmetic operations, number sense, and procedural fluency continues to hinder the development of higher-order mathematical competencies. At Taft National High School, Grade 10 learners consistently demonstrated low mathematics achievement, with Mean Percentage Scores ranging from 32% to 41% in the National Achievement Test from 2020 to 2024. Teachers also observed recurring errors involving fractions, decimals, multiplication, and other basic operations that negatively affect students' understanding of abstract mathematical concepts. Educational reforms in the Philippines have emphasized foundational numeracy recovery. The EDCOM 2 commission identified literacy and numeracy deficiencies as part of a national learning crisis (EDCOM 2, 2025). The implementation of the ARAL Act (RA 12028), the Basic Education Development Plan 2030, and the MATATAG curriculum likewise prioritized foundational mathematics competencies and remediation programs (DepEd, 2022; DepEd Order No. 010, s. 2024). However, empirical evidence examining arithmetic deficiencies at the local secondary level remains limited, particularly in rural contexts such as Eastern Samar.

1.2 Themes and Insights on Arithmetic Proficiency, Learner Variables, and Mathematics Performance

The reviewed literature consistently establishes a strong relationship between foundational arithmetic proficiency and mathematics achievement. Studies found that arithmetic fluency predicts readiness for algebra and higher-level mathematical reasoning (Garcia & Villanueva, 2022; Jordan & Hansen, 2020; Spitzer & Moeller, 2023). Learners with weak numeracy foundations often struggle with abstract reasoning and multistep problem-solving (Geary & Hoard, 2021; Siegler et al., 2012). Research also highlights widening numeracy gaps caused by socioeconomic inequalities, limited instructional resources, and pandemic-related disruptions (Igarashi & Suryadarma, 2023; De Guzman et al., 2022; Kuhfeld et al., 2022). Rural and underserved learners were disproportionately affected by learning losses due to poor internet connectivity, limited parental support, and restricted access to educational materials (Marope et al., 2021; Liu et al., 2023). Several studies emphasize the value of diagnostic assessments in identifying arithmetic deficiencies. Curriculum-based diagnostic tools, structured interviews, and error analyses were found to provide deeper insights into students' misconceptions compared to traditional summative tests (Clarke & Shinn, 2025; Domingo & Alcantara, 2022; Delos Reyes & Zulueta, 2020). Diagnostic-based interventions and differentiated instruction also improved arithmetic fluency and learner confidence when aligned with learners' cognitive and contextual needs (Nava & Salinas, 2023; Fuchs et al., 2020; Dowker, 2023). The literature further demonstrates that demographic and contextual factors influence mathematics proficiency. Socioeconomic status affects access to educational resources and learning opportunities (Reyes & Tagalog, 2020; Jordan & Hansen, 2020). Attendance, class sectioning, parental involvement, and self-perceived math ability also significantly influence arithmetic learning and mathematics performance (Capuno et al., 2019; Garcia & Villanueva, 2022; Pizon & Ytoc, 2021). Studies additionally show that learner perceptions, math anxiety, and teacher expectations affect engagement, persistence, and achievement in mathematics (Wu et al., 2022; Godoy Jr., 2021; Chinn, 2023).

1.3 Local, National, and Global Context of Foundational Numeracy and Mathematics Achievement

Globally, mathematics proficiency remains a major educational concern, particularly regarding foundational arithmetic competencies. International studies continue to report strong links between early arithmetic deficits and later mathematics underachievement (Jordan & Hansen, 2020; Dowker, 2023). Nationally, the Philippines continues to experience low mathematics performance in international assessments such as TIMSS and PISA (OECD, 2023). Local studies likewise report persistent numeracy gaps among Filipino learners, especially in rural and economically disadvantaged communities (Reyes & Tagalog, 2020; Delos Reyes & Zulueta, 2020). Pandemic-related disruptions further intensified inequalities in mathematics learning and widened foundational learning deficits (De Guzman et al., 2022; Luna & Ocampo, 2023). Within Eastern Samar and Taft National High School, arithmetic deficiencies remain evident through low mathematics achievement, poor attendance patterns, limited instructional resources, and reduced parental support. These contextual challenges reinforce the need for localized research examining how foundational arithmetic deficiencies influence mathematics performance among Grade 10 learners.

1.4 Theoretical and Conceptual Foundations of Arithmetic Proficiency and Mathematics Learning

This study is anchored on several educational and cognitive theories explaining the relationship between arithmetic proficiency and mathematics performance. Cognitive Load Theory (Sweller et al., 2019) explains that learners with weak arithmetic fluency experience cognitive overload when solving advanced mathematical problems because working memory resources are consumed by basic computations. Constructivist Learning Theory (Lourenço, 2020; Daniels, 2021) posits that learners build new mathematical knowledge from prior foundational concepts. Weak arithmetic schemas therefore hinder the acquisition of advanced mathematical understanding. Gagné's Hierarchical Learning Theory and Siegler's Model of Mathematical Development (Siegler & Lortie-Forgues, 2019) emphasize that mastery of prerequisite arithmetic skills is necessary for progression to higher-level mathematical competencies. Information Processing Theory (Cowan, 2020) highlights the importance of automaticity in arithmetic operations to reduce cognitive strain and support complex reasoning. Social Cognitive Theory (Schunk & DiBenedetto, 2020) explains how self-efficacy and self-perceived math ability influence persistence, motivation, and mathematics achievement. Ecological Systems Theory (Rosa & Tudge, 2019) further explains how environmental and contextual factors such as socioeconomic status, attendance, family support, and school structures shape learners' arithmetic development and mathematics outcomes.

1.5 Research Gaps on Foundational Arithmetic Deficiencies and Grade 10 Mathematics Performance

Despite extensive literature on mathematics achievement, several gaps remain evident. Most studies on arithmetic deficiencies focus on elementary or early middle school learners, with limited research examining Grade 10 students in rural Philippine contexts. Existing studies also rarely investigate how learner variables such as sex, economic status, attendance, class sectioning, parental involvement, and self-perceived math ability interact with arithmetic proficiency and mathematics performance. Furthermore, while intervention programs such as ARAL and the National Learning Camp exist, empirical evaluations of their effectiveness in addressing arithmetic deficiencies remain limited. Diagnostic tools are also inconsistently integrated into instructional planning and remediation practices. In addition, learner and teacher perceptions regarding arithmetic difficulties are often examined separately from quantitative performance data. This study addresses these gaps by investigating the relationship between foundational arithmetic proficiency and mathematics performance among Grade 10 learners at Taft National High School while incorporating demographic, contextual, and perceptual variables through a mixed-methods approach.

1.6 Alignment of the Study with Relevant Sustainable Development Goals (SDGs)

This study aligns primarily with SDG 4 – Quality Education by addressing foundational numeracy gaps and promoting equitable access to quality mathematics learning. The investigation of arithmetic deficiencies supports efforts to improve learning outcomes, strengthen foundational competencies, and reduce educational inequalities among secondary learners. The study also aligns with SDG 8 – Decent Work and Economic Growth because mathematics proficiency contributes to employability, workforce readiness, and long-term economic participation. Strengthening arithmetic and mathematical skills helps prepare learners for higher education, technical training, and future employment opportunities. Additionally, the study relates to SDG 10 – Reduced Inequalities by examining how socioeconomic status, attendance, parental involvement, and class sectioning influence mathematics achievement. Understanding these disparities may support the development of inclusive and context-sensitive educational interventions.

1.7 Importance of the Study to Educational, Socio-Economic, and Community Sustainability

This study contributes to educational sustainability by supporting evidence-based interventions that strengthen foundational numeracy and improve mathematics learning outcomes. The findings may assist teachers, school administrators, and policymakers in developing diagnostic-based remediation programs and differentiated instructional strategies. The study also contributes to socio-economic sustainability by addressing learning inequalities associated with poverty, limited educational resources, and attendance issues. Improved mathematics proficiency may enhance learners' academic success, future employability, and participation in economic development. In terms of community and institutional sustainability, the research supports the improvement of school-based intervention programs and instructional practices within rural and semi-urban educational settings. By examining learner and teacher perceptions alongside performance data, the study also contributes to psychological and social sustainability through the promotion of learner confidence, academic resilience, and inclusive educational practices.

2. Material and methods

2.1 Research Design

This study employed a mixed-methods approach using a convergent parallel mixed-methods design as described by Creswell and Plano Clark (2018). Quantitative and qualitative data were collected simultaneously, analyzed independently, and integrated during interpretation to provide a comprehensive understanding of the relationship between foundational arithmetic proficiency and mathematics performance. The quantitative component examined the level of arithmetic proficiency and its relationship with students' mathematics grades through measurable statistical data. The qualitative component explored the perceptions and experiences of students and teachers regarding arithmetic deficiencies and their

effects on mathematics learning. The integration of both approaches strengthened the validity and depth of the findings through methodological triangulation.

2.2 Locale of the Study

The study was conducted at Taft National High School in Taft, Eastern Samar, Philippines. The school serves learners from both urban and rural barangays and represents diverse socio-economic and cultural backgrounds. During School Year 2025–2026, the school had approximately 950 students, including around 271 Grade 10 learners. The school was selected because of consistently low mathematics achievement and recurring arithmetic deficiencies observed through classroom assessments, school records, and teacher observations. Common difficulties involved operations on fractions, decimals, and integers, which affected students' understanding of advanced mathematical concepts. The socio-economic and cultural conditions of the learners were also considered. Many students came from low-income households, with some parents engaged in overseas or informal employment, limiting academic support at home. Variations in access to learning resources, internet connectivity, tutorials, and study environments were also expected to influence arithmetic proficiency and mathematics performance. Although the findings primarily apply to schools with similar contexts, the study provides relevant insights for other schools in Eastern Samar and comparable Philippine settings.

2.3 Respondents of the Study

The respondents included all Grade 10 learners enrolled at Taft National High School during School Year 2025–2026. Based on enrollment records, the population consisted of 271 students, including 131 males and 140 females from various class sections grouped according to academic performance. Grade 10 learners were selected because this level serves as a critical stage before senior high school where mastery of foundational arithmetic is necessary for higher-level mathematics learning. For the qualitative component, ten students representing low, average, and high arithmetic proficiency levels and five mathematics teachers were purposively selected to provide diverse perspectives regarding arithmetic learning and mathematics performance.

2.4 Sample and Sampling Procedure

The study used total population sampling through a census approach involving all 271 Grade 10 students who met the inclusion criteria. This approach allowed a comprehensive analysis of the relationship between foundational arithmetic proficiency and mathematics performance while minimizing sampling bias and improving the reliability of the findings. Participants included officially enrolled Grade 10 students aged 14 to 17 years who voluntarily agreed to participate and provided informed consent through themselves or their legal guardians. Students with incomplete academic records, excessive absences exceeding 20% of class days based on DepEd Order No. 8, s. 2015, or those who declined participation were excluded from the study. For the qualitative component, purposive sampling was used to select students and teachers capable of providing varied experiences and insights regarding arithmetic learning challenges and instructional practices.

2.5 Research Instrument

The primary instrument was an adapted questionnaire composed of three parts. The first part gathered demographic information, including sex, economic status, section, attendance, parental involvement, and self-perceived mathematics ability. The second part was a 20-item Arithmetic Proficiency Test adapted from the DepEd Mathematics Diagnostic Test (2018) and aligned with the Most Essential Learning Competencies (MELCs) for Grades 4–6. The test covered operations involving whole numbers, fractions, decimals, and integers. The third part measured mathematics proficiency using students' first-quarter mathematics grades obtained from school records. A structured interview guide was also utilized to collect qualitative data from selected students and mathematics teachers. Student interviews focused on experiences in arithmetic learning, emotional responses to mathematics, problem-solving strategies, teacher support, parental involvement, and suggestions for improvement. Teacher interviews explored observed arithmetic deficiencies, instructional strategies, intervention practices, and factors affecting mathematics learning. To encourage openness and comfort, interviews were conducted in quiet and familiar settings while maintaining confidentiality and anonymity. Participants were informed of their right to skip uncomfortable questions, and conversational questioning techniques were used to promote honest responses. The arithmetic test underwent expert validation by specialists in Mathematics Education and educational assessment. The Item Content Validity Index (I-CVI) and Scale Content Validity Index (S-CVI) followed the acceptable values recommended by Polit and Beck (2006). Pilot testing involving 30 Grade 10 students from a nearby school was conducted, and item analysis procedures followed Ebel and Frisbie (1991). Reliability measures included Cronbach's Alpha, Split-Half Reliability, Test–Retest Reliability, and Inter-Rater Reliability using Cohen's Kappa. The instrument was theoretically grounded on Thorndike's Law of Exercise and Readiness (1932) and Skemp's (1976) Relational Understanding Theory, with supporting evidence from Geary (2011) and Jordan et al. (2010) emphasizing the importance of arithmetic fluency in mathematics achievement.

2.6 Data Gathering Procedure

Permission to conduct the study was secured from the school principal and the Division Office. Ethics clearance was subsequently obtained from the university's research review board to ensure compliance with ethical standards. Consent

forms were distributed to participating students and their parents or guardians prior to data collection. After obtaining consent, the arithmetic proficiency test and questionnaires were administered during scheduled class hours with the assistance of subject teachers. Students' first-quarter mathematics grades were retrieved from official school records with proper authorization from the class adviser and school registrar. Interviews with selected students and teachers were then conducted to gather qualitative insights regarding arithmetic deficiencies and mathematics learning experiences.

2.7 Data Analysis Techniques

The study employed both quantitative and qualitative data analysis procedures consistent with mixed-methods research principles advocated by Creswell (2014). Quantitative data were analyzed using descriptive statistics, including frequency distributions, means, and standard deviations, to summarize demographic variables and arithmetic proficiency levels. Pearson's Product-Moment Correlation Coefficient (r) was used to determine the strength and direction of the relationship between foundational arithmetic proficiency and mathematics performance. Inferential statistics such as independent samples t-tests and one-way ANOVA were used to determine significant differences in mathematics performance when grouped according to moderating variables including sex, economic status, attendance, section, parental involvement, and self-perceived math ability. All computations were conducted using SPSS version 27 with a significance level set at $\alpha = 0.05$. Effect sizes, including Cohen's d and η^2, were also reported in accordance with American Psychological Association (2020) standards. Qualitative data from interviews were analyzed using Braun and Clarke's (2006) six-phase thematic analysis framework. Interview recordings were transcribed verbatim, coded inductively, and organized into emerging themes related to arithmetic learning, mathematics anxiety, instructional practices, and learner perceptions. Themes were reviewed, refined, and interpreted alongside the quantitative findings to identify convergences and divergences between statistical trends and participant experiences. Trustworthiness was strengthened through triangulation, member checking, and peer debriefing (Nowell, Norris, White, & Moules, 2017; Castillo & Lising, 2021).

2.8 Ethical Considerations

The study complied with ethical guidelines established by the academic institution and the Department of Education. Participants and their guardians were fully informed about the purpose, procedures, and nature of the research before participation. Written informed consent was secured, and confidentiality was maintained through participant coding and secure data storage. Participation was voluntary, and respondents were informed of their right to withdraw at any stage without consequences. The research also underwent formal ethics review and received approval from the university's Institutional Ethics Review Committee.

3. Results and Discussion

3.1 Foundational Arithmetic Proficiency and Mathematics Performance of Grade 10 Learners

3.1.1 Demographic Profile of Grade 10 Learners

The respondents were relatively balanced in terms of sex, with slightly more female students than males. Most learners belonged to the average economic category, although a considerable number came from low-income households. The majority had regular attendance, while a smaller proportion demonstrated poor attendance patterns. Most students reported moderate parental involvement and moderate self-perceived math ability. Only a few students rated themselves with very high mathematical confidence. These findings suggest that demographic, socio-economic, and psychological factors may influence students' mathematics performance. The substantial proportion of learners from low-income households may limit access to educational support and learning resources, supporting the observations of the World Bank (2022). Attendance patterns likewise reinforce Gottfried's (2019) findings that absenteeism negatively affects mathematics achievement. Moderate parental involvement aligns with Fan and Williams' (2018) assertion that parental engagement supports academic performance, while the prevalence of moderate self-perceived math ability supports Pajares and Graham's (2021) claim that self-efficacy influences mathematics achievement.

3.1.2 Level of Foundational Arithmetic Proficiency

Most Grade 10 learners demonstrated moderate foundational arithmetic proficiency, while a substantial proportion fell within the low proficiency category. Only a small percentage achieved high arithmetic proficiency. The overall mean score indicated that many students continued to experience difficulties in operations involving whole numbers, fractions, decimals, and integers. The findings indicate persistent arithmetic deficiencies among learners, which may hinder mastery of higher-order mathematical concepts. This supports Geary (2011) and Jordan et al. (2010), who emphasized that arithmetic fluency is a strong predictor of mathematics competence. The results also confirm that unresolved foundational gaps can negatively affect students' ability to engage with advanced mathematical tasks such as algebra, geometry, and problem-solving.

3.1.3 Relationship Between Arithmetic Proficiency and Mathematics Performance

The analysis revealed a strong and statistically significant positive relationship between foundational arithmetic proficiency and mathematics grades. Students with higher arithmetic proficiency scores also tended to obtain higher mathematics

grades. The computed correlation coefficient showed a strong positive association, leading to the rejection of the null hypothesis stating that no significant relationship exists between arithmetic proficiency and mathematics performance. This finding confirms that foundational arithmetic skills are essential for higher mathematics achievement. The result supports Skemp's (1976) theory of relational understanding, which explains that mastery of basic arithmetic concepts supports learning in advanced mathematics. It also aligns with Henkel et al. (2024), who found that interventions targeting arithmetic skills significantly improve mathematics achievement. Similarly, Mullis et al. (2020) emphasized that weaknesses in basic arithmetic negatively affect performance in algebra, geometry, and other higher-order mathematical domains.

3.2 Differences in Mathematics Performance Across Learner Variables

3.2.1 Mathematics Performance by Sex

Female learners obtained slightly higher mathematics grades than male learners; however, the difference was not statistically significant. The effect size was also small, indicating minimal practical difference between male and female students in terms of mathematics performance. The findings indicate that sex was not a significant factor influencing mathematics achievement among the respondents. This result supports Ganley and Lubienski (2016), who observed that although female students may report higher levels of math anxiety, this does not necessarily translate into lower mathematics performance. The result suggests that both male and female learners were similarly affected by arithmetic proficiency levels and other contextual variables.

3.2.2 Mathematics Performance by Economic Status

Learners from high-income households achieved the highest mathematics grades, followed by students from average-income households, while learners from low-income households obtained the lowest grades. Statistical analysis confirmed significant differences in mathematics performance across economic status categories. The findings suggest that economic status significantly affects mathematics achievement. Students from economically advantaged households may have greater access to learning materials, tutoring, technology, and supportive study environments. Conversely, learners from low-income households may experience barriers that negatively influence arithmetic proficiency and mathematics learning. These results align with OECD (2021), UNESCO (2021), Sirin (2005), and World Bank (2022), all of which emphasize the influence of socio-economic resources on educational achievement.

3.2.3 Mathematics Performance by Section

Differences in mathematics grades were observed across class sections, with Section 10–Earth obtaining the highest mean grade, while Sections 10–Jupiter and 10–Saturn achieved the lowest. Statistical analysis revealed significant differences in mathematics performance among the sections. The findings indicate that classroom grouping and learning environments influence mathematics achievement. Higher-performing sections may benefit from stronger peer influence, more collaborative learning opportunities, and effective instructional practices. In contrast, lower-performing sections may experience weaker peer motivation and less favorable classroom dynamics. These findings support DepEd (2023), which explains that classroom environments and sectioning practices can significantly shape academic outcomes and learner performance.

3.2.4 Mathematics Performance by Attendance

Students with regular attendance achieved the highest mathematics grades, while learners with poor attendance obtained the lowest. Statistical analysis confirmed a significant difference in mathematics performance across attendance categories. The results demonstrate that attendance is an important factor affecting mathematics achievement. Consistent attendance ensures continuous exposure to arithmetic instruction and reinforcement of mathematical concepts, while absenteeism disrupts sequential learning and skill development. This finding supports Gottfried's (2019) assertion that absenteeism negatively affects academic performance by limiting instructional continuity and opportunities for practice and feedback.

3.2.5 Mathematics Performance by Parental Involvement

Learners whose parents were frequently involved in their education obtained higher mathematics grades compared to students whose parents were rarely involved. Statistical analysis revealed significant differences in mathematics achievement based on levels of parental involvement. These findings suggest that parental involvement positively contributes to students' mathematics performance. Active parental engagement may provide academic guidance, encouragement, and emotional support that strengthen learners' confidence and arithmetic proficiency. This result aligns with Fan and Williams (2018), who emphasized that parental involvement enhances academic motivation, achievement, and mathematical confidence.

3.2.6 Mathematics Performance by Self-Perceived Math Ability

Students with high or very high self-perceived math ability achieved the highest mathematics grades, while learners with low self-perceived ability obtained the lowest grades. Statistical analysis showed a significant effect of self-perceived math ability on mathematics performance, with a relatively large effect size. The findings indicate that self-efficacy strongly influences mathematics achievement. Learners who believe in their mathematical abilities are more likely to engage in

problem-solving, persist during difficult tasks, and maintain positive attitudes toward mathematics. Conversely, low self-confidence may lead to anxiety, avoidance behaviors, and reduced engagement. These results support Pajares and Graham (2021), who identified self-efficacy as a major predictor of mathematics performance and academic persistence.

3.3 Perceptions of Students and Teachers on Arithmetic Deficiencies and Mathematics Learning

3.3.1 Early Arithmetic Gaps and Learning Difficulties

Students and teachers consistently reported persistent misunderstandings involving fractions, decimals, and integer operations. Learners described confusion when solving advanced mathematical problems because of unresolved arithmetic gaps, while teachers observed recurring computational errors despite repeated instruction. These findings confirm that foundational arithmetic deficiencies continue to affect higher-order mathematics learning. The results support Skemp's (1976) theory of relational understanding, which explains that weak conceptual foundations hinder the acquisition of abstract mathematical concepts. The qualitative findings also reinforce the quantitative results showing that many students demonstrated only low to moderate arithmetic proficiency.

3.3.2 Math Anxiety and Avoidance Behaviors

Many students expressed fear, anxiety, and avoidance when engaging with arithmetic tasks, especially those involving fractions and non-whole number operations. Teachers also observed that some learners froze or disengaged during mathematics activities requiring arithmetic reasoning. The findings demonstrate that arithmetic deficiencies are not only cognitive but also emotional in nature. Persistent struggles with basic operations may increase frustration and reduce students' willingness to participate in mathematics learning. This supports Geary's (2011) argument that fluency deficits contribute to emotional barriers such as anxiety, which further impede mathematical learning and performance.

3.3.3 Teacher Instructional Responses and Interventions

Teachers reported implementing remedial worksheets, peer tutoring, differentiated review sessions, and reteaching strategies to address arithmetic deficiencies. Despite these efforts, some students continued to experience difficulties with foundational operations and higher-level mathematical concepts. The findings suggest that while remedial interventions are beneficial, they may be insufficient if they do not directly target conceptual arithmetic gaps. This result aligns with Henkel et al. (2024), who emphasized that effective remediation must focus specifically on foundational arithmetic competencies to produce meaningful improvement in mathematics achievement.

3.3.4 Self-Efficacy Beliefs and Mathematics Engagement

Students with low confidence in mathematics often avoided difficult tasks and doubted their abilities even when they understood certain procedures. Teachers similarly observed that negative self-perceptions reduced students' willingness to participate and persist in mathematics activities. The findings indicate that self-efficacy significantly influences learner motivation, participation, and persistence in mathematics learning. Negative self-beliefs may reinforce arithmetic difficulties and contribute to continued underachievement. This supports Pajares and Graham (2021), who emphasized that self-efficacy is a critical mediator of academic achievement and motivation in mathematics education. Together, the qualitative themes of early arithmetic gaps, math anxiety, instructional responses, and self-efficacy beliefs reinforce the quantitative findings of the study. The results demonstrate that foundational arithmetic deficiencies interact with emotional, motivational, instructional, and socio-economic factors, shaping the mathematics performance of Grade 10 learners in a multidimensional manner.

4. Conclusion & Recommendations

The study concluded that foundational arithmetic proficiency is a significant determinant of mathematics performance among Grade 10 learners at Taft National High School. Learners with stronger arithmetic skills consistently achieved higher mathematics grades, confirming the importance of mastery in basic operations for higher-order mathematical learning. The findings further revealed that economic status, classroom environment, attendance, parental involvement, and self-perceived math ability significantly influenced mathematics achievement, while sex did not significantly affect performance. Qualitative findings also showed that arithmetic deficiencies were closely linked with math anxiety, low confidence, avoidance behaviors, and instructional challenges, indicating that mathematics achievement is shaped by interconnected cognitive, emotional, motivational, and contextual factors. Self-efficacy emerged as a critical influence on learner engagement, persistence, and overall mathematics success.

The study recommends the implementation of targeted remediation programs focusing on foundational arithmetic operations such as fractions, decimals, and integers to strengthen learners' mathematical competence. Schools should provide additional academic support for economically disadvantaged learners through tutoring, learning materials, and equitable intervention programs. Classroom environments and sectioning practices should also be reviewed to improve peer support, differentiated instruction, and learner engagement. Schools and teachers are encouraged to strengthen attendance monitoring systems and foster stronger school–parent partnerships to support consistent learning and academic

motivation. Furthermore, instructional strategies should promote learners' self-efficacy, reduce math anxiety, and encourage persistence through supportive and collaborative learning experiences. Teachers should also integrate motivational and emotional considerations into instructional planning to address both the cognitive and affective dimensions of mathematics learning.

The study was limited to Grade 10 learners of Taft National High School during School Year 2025–2026 and focused specifically on foundational arithmetic proficiency and mathematics performance within this context. The findings were based on quantitative data from diagnostic tests and mathematics grades, as well as qualitative insights from selected students and teachers, which may limit broader generalization to other schools or regions with different socio-economic and educational conditions. Additionally, the study concentrated on selected learner variables such as sex, economic status, attendance, parental involvement, and self-perceived math ability, without examining other possible influences on mathematics achievement.

Compliance with ethical standards

This study complied with the ethical guidelines established by the academic institution and the Department of Education. Permission to conduct the study was secured from the school principal and the Division Office, and ethics clearance was obtained from the university's research review board. Confidentiality and anonymity were maintained through participant coding and secure data storage. Participation was voluntary, and respondents were informed of their right to withdraw from the study at any stage without consequences.

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