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Mathematics Learners' Performance and Academic Achievement at a Public High School Institution in Leyte, Philippines

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Abstract

This study examined the correlation between mathematics performance and academic achievement of junior high school learners in a government-run laboratory high school institution in Leyte and compared the mathematics performance and academic achievement of male and female learners. The study employed the quantitative method using correlational and comparative research designs to analyze the secondary data. It encompassed the records of 1,500 learners obtained through the convenience sampling technique. Pearson's correlation coefficient and the T-test for two independent samples were utilized in analyzing the gathered data. Findings revealed a positive and highly significant correlation between the learners' mathematics performance and academic achievement, indicating that high school learners who are adept in mathematics tend to succeed and perform better in their academic courses. Whereas low performance in mathematics correspondingly connotes low achievement in overall intellectual abilities. No significant difference was found between male and female learners, suggesting that both genders of learners can succeed academically. The study concludes that mathematics performance and academic achievement go hand in hand, while gender does not affect the learners' ability to excel in mathematics. Effectively, secondary learning institutions must provide mathematics learners with learning opportunities during Mathematics classes and classroom activities regardless of gender. Teachers must help learners understand how to solve problems and think critically, expose them to real-world applications, and build their confidence and motivation to excel academically.

Keywords: Academic Achievement, Comparative, Correlational, Junior High School Learners, Mathematics Performance

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INTRODUCTION

Academic achievement is widely regarded as a pivotal factor in learners' subsequent career success. It is one of the facets used to evaluate the learners' cognitive skills (Fandos-Herrera et al., 2023; Semeraro et al., 2020) and efficiency (Trazo & Abocejo, 2019) needed to produce competent and productive human capital in the workplace. On the other hand, mathematical knowledge can be a tool to develop learners' capacity for problem-solving and correct judgment acquired through mathematical skills (Marquez, 2023; Baki & Kilicoglu, 2023), so a learner's success in mathematics alone may reveal their potential in this area of mental ability (Szabo et al., 2020; Mutawah et al., 2019). Further, several countries emphasize learners' mathematical competence since it is critical to their country's development and growth (Simamora & Saragih, 2019). However, a captivating question explored within this study is whether mathematical performance plays a determining role in the overall academic achievement of learners in a government-run laboratory high school context.

Over the years, it has been suggested that one should give more emphasis on developing numeracy and literacy skills (Joo et al., 2020; Lechner et al., 2021; Alkema, 2019; Sellings et al., 2018) for these are competencies that learner needs to cultivate in becoming a valuable human resource in the future. Nevertheless, this conviction does not disclose that these skills directly measure learners' academic achievement. The successful completion of course assignments by learners improves learners' academic achievement (Merugu et al., 2022; Kahu & Nelson, 2018). Krammer et al. (2021) further specified that the learner's overall grade point average (GPA) or an individual course grade typically serves as the most common measure of academic achievement.

In addition, Guhn et al. (2020) reported that high schoolers who spend much time in music courses excel and even score significantly higher on exams in certain major subjects like Mathematics, Science, and English. Their population-level analysis in British Columbia, Canada, found that higher levels of musical engagement were linked to better exam results across course areas, indicating that learners tend to be more academically successful when they engage in music courses. Whereas, in Thailand, Rudd and Honkiss (2019) pointed out that higher learners' English performance could lead to higher academic achievement among Thai learners. It is crucial to explain how high school learners thrive academically and determine whether having a good grasp of mathematics is a reliable indicator of their academic achievement.

The proficiency of learners in mathematics exhibits a strong correlation with their aptitude demonstrated in the fields of Science and Reading Comprehension (Cabarse et al., 2018; Saraspe & Abocejo, 2020). Simultaneously, Mingoa and Abocejo (2021) noted that the learners' scholastic aptitude is essentially linked to their performance in Science. In the same vein, studies (Delosa & Ong, 2021; Swanson et al., 2022b; Li et al., 2022) disclosed that mastery of the English language serves as a predictive factor for success in mathematics, suggesting that learners who are adept in English also tend to succeed in mathematics and the ones who are proficient in mathematics are more likely to succeed in English. In Leyte's secondary schools, there is also a presumption that learners who are good at English possess remarkable intellectual prowess.

Moreover, within a standard class of over forty learners, it is typical to observe individuals who exhibit aptitude or proficiency in mathematics but grapple with challenges in other educational domains (Lynch-Arroyo et al., 2023; de Vera et al., 2022). Conversely, there are learners who not only excel in mathematics but also shine in various other academic disciplines (Abu Khurma et al., 2023; González-Martín et al., 2021; Cuñado & Abocejo, 2018). While it is also apparent that some learners perform exceptionally well across most subjects, their performance in mathematics does not mirror this outstanding achievement. Javed (2018) unveiled that some factors like "learners' potential, previous knowledge, parents' profession, and financial status" affect the learners' choice of courses at the secondary level. The study habits and attitudes of learners are considered crucial attributes that influence mathematics performance (Hashim et al., 2021; Sakirudeen & Sanni, 2017; Etcuban et al., 2019), but the attitudes adversely change as the learners enter secondary schools (Mazana et al., 2019; Jolejole-Caube et al., 2019).

In the previous discussion, the authors noted that a course's performance might be related to other course areas. However, the body of knowledge is still unable to determine whether mathematical performance is related to high school learners' overall academic achievement. Hence, a crucial need to investigate the relation between mathematics performance and academic achievement and to explore more on the gender difference in the mathematics performance and academic achievement of high school learners should be impelled. While previous studies (Morán-Soto & González-Peña, 2022; Capuno et al., 2019; Peteros et al., 2019; Rodriguez & Abocejo, 2018) provided valuable insights into

study habits, factors influencing course selection, gender differences, learner course performance in a global context, research is scarce, particularly in secondary laboratory schools in Leyte, Philippines that seek answers to this issue. In view thereof, this present study attempted to fill a gap in the literature and assist secondary school teachers, curriculum designers, and the entire academic community involved in curriculum design and development towards refining educational policies and instructional practices to improve learners' academic abilities. The present study contends that developing mathematics performance among learners could make them more willing to succeed academically.

This study investigated the mathematics learners' performance and academic achievement at a public laboratory high school institution in Leyte, Philippines. Specifically, it examined the: (1) levels of learners' mathematics performance and academic achievement; (2) a significant correlation between mathematics performance and academic achievement; and (3) significant difference in mathematics performance and academic achievement between male and female learners. In addition, this study tested the null hypothesis of no significant correlation between junior high learners' mathematics performance and academic achievement and no significant difference between male and female junior high learners' academic achievement and performance in mathematics.

METHODS

The authors employed the quantitative method using correlational and comparative research designs to investigate the relation between the mathematics performance and academic achievement of Junior High School (JHS) learners while determining whether there exists a significant difference concerning the learners' mathematics performance and academic achievement based on gender. Along this line, the authors employed a data mining technique to accumulate the relevant data desired to address the problem of the study.

The performance in mathematics courses and overall grade point average (GPA) of junior high school learners served as the primary sources of secondary data for the school years 2015 to 2018. These were obtained from their "School Form 9 (Learner's Progress Report Card)" records from the Registrar's Office at the Laboratory High School Department (LSD) of a government university in Tacloban City, Leyte, Philippines. The said laboratory high school is part of the university's College of Education and is under the jurisdiction and supervision of the Department of Education (DepEd) as one of its district learning centers.

Within the dataset encompassing 1,500 learners, drawn from the total pool of 2,154 learners from the academic years 2015 to 2018, a significant majority (57.73 percent) consisted of male learners, while slightly over two-fifths (42.27 percent) were represented by their female counterparts (see Figure 1). The acquisition of these 1,500 learner records was facilitated through the utilization of the convenience sampling technique. Before retrieving the data, the researchers humbly sought permission from the head of the said school to expound on the purpose of the study. Following approval, all necessary data were collected and handled for the research with the utmost confidentiality.

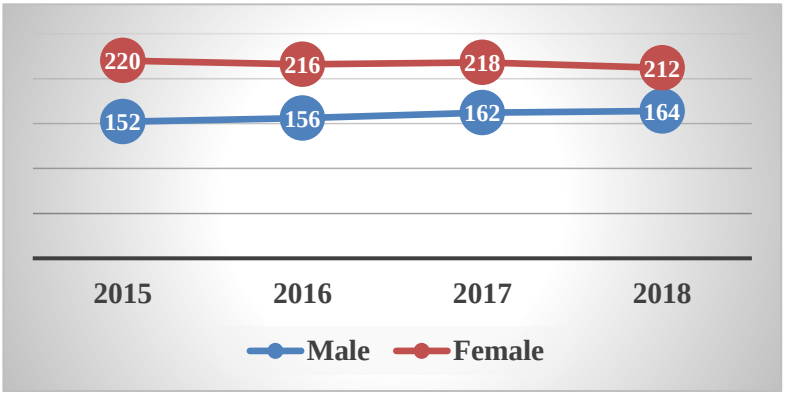

Figure 1. Distribution of Learners Enrollment by Gender, the School Year 2015-2018

The first objective of this study is to determine the levels of mathematics performance and academic achievement of junior high learners. Frequency counts, percentages, and mean scores were derived to generate the needed descriptive statistics to address the first objective. For the second objective, the researchers determined the learners' mathematics performance and grade point average as the basis for investigation and analysis. Finally, Pearson's correlation coefficient or Pearson's r was calculated to reveal the link between mathematics performance and academic achievement.

This present study also examined if there exists a gender difference concerning the mathematics performance and overall academic achievement of junior high learners. The generated data for mathematics performance and academic achievement were grouped by gender to look for statistical differences. Then, the "T-test for two independent samples" was employed in the analysis. In addition, the data acquired were presented in textual and tabular forms and treated using the "Statistical Package for Social Sciences (SPSS)".

RESULTS & DISCUSSION

Levels of Learners' Mathematics Performance and Academic Achievement

Table 1 presents the learners' mathematics performance and academic achievement. As can be gleaned from the table, slightly more than two-fifths (41.47%) of the learners exhibited a very satisfactory level of mathematics performance with only forty- three learners combined (2.86%) manifesting a fairly satisfactory to did not meet expectations levels of mathematics performance. It is also remarkable that about three-fifths of the learners demonstrated either satisfactory (28.20%) or outstanding (27.47%) mathematics performance.

The findings of several studies suggest that factors such as attitude, study habits, and a genuine interest in learning mathematics can potentially serve as predictors of mathematics performance (Huang et al., 2020; Wong & Wong, 2019; Cleary & Kitsantas, 2017; Capuno et al., 2019), particularly among learners who exhibit lower levels of mathematical knowledge. Cresswell and Speelman (2020) further unveiled that as learners' mathematics training increased, there was a corresponding rise in the accuracy of mathematical task completion. In parallel, the findings of this present study align with those of Chand et al. (2021), who asserted that learners displaying proficient

mathematical skills demonstrate enhanced analytical thinking and superior reasoning abilities (Asmarani & Musrikah, 2022). Meanwhile, Tanujaya and Mumu (2022) indicated that a deficiency in mathematical skills among learners can lead to heightened levels of anxiety about the subject. This, in turn, exerts a detrimental influence on their overall performance in mathematics.

Table 1. Distribution of Learners' Mathematics Performance by Level

Score Range	Frequency	Percent	Level
90 – 100	412	27.47	Outstanding
85 – 89	622	41.47	Very Satisfactory
80 – 84	423	28.2	Satisfactory
75 – 79	41	2.73	Fairly Satisfactory
< 75	2	0.13	Did Not Meet Expectations

Number of cases = 1500
Mathematics Performance Weighted Mean Score = 86.94 (Very Satisfactory)

In addition, Table 2 shows that the highest number which is nearly one-half (45.47%) of the total number of learners' records showcased a notably commendable level of academic achievement. This underscores the learners' successful performance in their academic pursuits. Moreover, slightly more than one-third (35.40%) showed an outstanding level of academic achievement with only twelve (0.80%) exhibiting a satisfactory level and none of the learners obtained a score range of below 75.

As further indicated by mean scores, the learners demonstrated very satisfactory levels of mathematics performance (mean score = 86.94) and academic achievement (mean score = 88.43), respectively. The derived findings vary from that of Jolejole-Caube et al. (2019), which indicated poor mathematics performance of the learners. The result of this present study is consistent with the finding of Sadiku and Sylaj (2019) showing high performance of the learners in their academics. The "very satisfactory" achievement of learners may likewise be attributed to the learners' high regard for learning, background, and the strong partnership and collaboration by both parents and teachers. Sekiwu et al. (2020) also asserted that school attendance has a minimal influence on academic achievement.

Table 2. Distribution of Learners' Academic Achievement by Level

Score Range	Frequency	Percent	Level
90 – 100	531	35.40	Outstanding
85 – 89	682	45.47	Very Satisfactory
80 – 84	275	18.33	Satisfactory
75 – 79	12	0.80	Fairly Satisfactory
< 75	-	-	Did Not Meet Expectations

No. of cases = 1500; Academic Achievement Mean Score = 88.43 (Very Satisfactory)

Correlation Between the Learners' Mathematics Performance and Academic Achievement

As reflected in Table 3, correlation analysis revealed that the learners' mathematics performance and academic achievement exhibited statistical significance ($\alpha < 0.05$); the correlation is equal to 0.750, and the p-value is 0.00 indicating a positive and highly significant correlation between the identified variables. The derived finding may suggest that enhancing mathematics performance will more likely aid the learners to succeed academically, making them more motivated to study and learn to improve their academic abilities in school. It further implies that high school learners who are proficient in mathematics tend to succeed and perform better in their academic courses. Meanwhile, low performance in mathematics can be a detrimental influence on overall academic achievement.

Table 3. Correlation Between the Learners' Mathematics Performance and Academic Achievement

Variable	Mean	SD	r-value	Strength of Correlation	p-value
Mathematics Performance	86.94	4.44	0.750**	Strong	0.000
Academic Achievement	88.43	3.7			

***Highly significant at $\alpha < 0.01$ (two-tailed)*

Additionally, many high school learners need a lot of time and effort to comprehensively grasp the underlying ideas that underpin mathematical techniques and procedures. Nonetheless, successful understanding and solving mathematical problems bring delight, excitement, and fulfillment to learners (Cabuquin, 2022b). The finding of Cabarse et al. (2018) indicates that a learner who performs well in mathematics and science is likely to exhibit better reading comprehension. This is a clear manifestation of the finding in the present study. Moreover, other studies (Abdullah et al., 2022; Hofkens et al., 2022; Swanson et al., 2022a) asserted that the learners' competence in mathematics is significantly related to their achievement in English, and vice versa. On the contrary, the finding of the present study differs from that of Guhn et al. (2020), which revealed high school learners who are into music courses achieved better in academic courses like English, Mathematics, and Science.

This study also supports Rudd and Honkiss' (2019) conclusion that better English performance would translate into higher GPA accomplishments. The null hypothesis of no significant correlation between mathematics performance and academic achievement of high school learners is not accepted. The results, showing a positive and highly significant correlation between the study variables, cannot be generalized because there may be some influencing factors, such as intelligence, the effectiveness of the teacher's instruction, the course chosen by the learners, and socioeconomic status, which affected the outcome.

The authors presume that the junior high school learners' prior academic backgrounds before admission to the targeted school may have influenced the result, needing more research to corroborate the finding. In addition, examining the levels of academic achievement of junior high learners cannot be used to generalize the learners' mathematics performance alone without considering the many factors surrounding the learners' academic achievement such as other subjects from Mathematics, their socioeconomic status, and other factors that the authors readily acknowledged from the

results of previous studies. Likewise, the present study was conducted only in one government-run secondary laboratory high school institution, and the result may not apply to all secondary schools in the country.

Gender Difference in the Mathematics Performance and Academic Achievement of Learners

Table 4 reveals the difference between mathematics performance and academic achievement of male and female learners. As shown in the table, there is no difference between males' and females' mathematics performance and no difference between males' and females' academic achievement. The findings indicate that both male and female learners can succeed academically without bias and that gender has no significant impact on the learners' ability to learn mathematics. The hypothesis of no significant gender difference among learners in mathematics performance and academic achievement has not been rejected.

Table 4. The Difference in Learners' Mathematics Performance and Academic Achievement by Gender

Variable	Gender	n	Mean	SD	t-value	p-value
Mathematics Performance	Male	634	87.05	4.79	0.780**	0.435
	Female	866	86.86	4.16		
Academic achievement	Male	634	88.29	3.94	-1.240**	0.216
	Female	866	88.53	4.52		

***Not Significant at < 0.05 (two-tailed)*

The study's finding on the difference between gender and academic achievement is congruent with the findings of Cheng and Chen (2022) and Fjelkner-Pihl (2022) reaffirming no variance between gender and learners' academic achievement. It also supports the result that male and female learners in mathematics do not differ significantly in terms of achievement and retention scores (Baliram & Ellis, 2019; Cabuquin, 2022a; Younes et al., 2020). Similarly, it is clear from the findings that male and female learners are on the same level, and gender as a predictor of learners has no bearing on academic achievement and mathematical learning ability. This deviates from West et al. (2020) and Jameson (2020), who found that male learners scored lower in mathematics than female learners at the junior level but higher than female learners at the senior level. Astalini et al. (2021) also specified the differing mathematical perceptions between male and female learners.

Furthermore, recent studies (Polat et al., 2021; Epifanio et al., 2021; Turhan, 2020; Alcantara & Bacsa, 2017; Pagiling et al., 2022) showed conflicting views about learners' mathematical competency and other academic subject performances based on gender. Whereas other studies displayed a trend of females outperforming males in terms of their academic performances at elementary and junior levels (Chow et al., 2023; Cabuquin, 2023), some studies found males to perform better than their counterparts, especially in mathematics at the postsecondary level (Zhao & Perez-Felkner, 2022; Pollanen et al., 2018; Mozahem et al., 2021). On the contrary, both male and female learners can achieve equality in academics without prejudice, and gender has no substantial influence on their mathematics performance (Jacobson et al., 2022; Zajda, 2022; Sarouphim & Chartouny, 2016).

CONCLUSION

Indeed, learning mathematics is not easy to come by for most high school learners. Improving their mathematics performance requires support and proactive involvement from teachers, parents, and the learners themselves. This dedication towards learning ensures a holistic approach to stimulate learners' drive and willingness toward academic success. The authors, therefore, conclude that mathematics performance has a "direct bearing" on the academic achievement of high school learners. High school learners who are proficient in mathematics tend to succeed and perform better in their academic courses while low mathematics performer learners tend to experience difficulties in their overall academic achievement. On the other hand, gender does not influence the mathematics performance and academic achievement of junior high school learners. Learners of both genders can succeed (or otherwise) academically and have the same ability to learn mathematics. Grounded on the study findings and conclusion, the authors recommend that teachers enrich learners' problem-solving and critical thinking skills by exposing them to substantive mathematics lessons that involve real-life applications. This is to help learners become more confident and perform well in other courses. High school learners in mathematics, science, and other academic courses must be exposed to the same learning inputs and opportunities. On the other hand, teachers must develop and enhance their teaching abilities through active involvement in the Continuing Professional Development (CPD) program of the government, especially in mathematics teaching. Related studies may be further conducted to explore the consistency of the results taking into consideration other attributes such as learners' satisfaction, attainment of learning outcomes, persistence, acquisition of skills, and competence. The investigation can also include other variables such as variance in age and grade levels, intelligence, teacher's teaching quality, subject choice, and socio-economic status.

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DECLARATIONS

Author Contribution	:	Author 1: Conceptualization and Visualization, Writing the Original Draft, Outlining Methodology; Gathering, Secondary Data, Discussing Draft Analysis, Interpretation, and Implications, Framing Initial Conclusion Author 2: Writing and Updating the Review of Literature, Editing the Draft Manuscript, Formal Analysis, Editing and Formatting APA References Style, Validation, and Supervision
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