

Determinants of the Performance in Statistics and Probability of Grade Eleven Senior High School Students in the Division of Pasig City

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ABSTRACT

This study examined the factors influencing Senior High School students' performance in Statistics and Probability in public secondary schools in the Division of Pasig City. Grounded in the premise that learning outcomes in mathematics are shaped by both internal and external variables, the study sought to identify correlates that may serve as a basis for designing enrichment activities to improve students' achievement in the subject. Specifically, it explored the effects of study habits, attitude toward the subject, fear and anxiety, and parental involvement on academic performance. The perceived effectiveness of teachers in teaching Statistics and Probability—measured through classroom management, teaching strategies, mastery of content, motivation, teacher–student relationship, and medium of instruction—was also examined.

Using a descriptive research design, data were collected from 362 Senior High School students selected through a probability sampling technique. The results revealed that students' overall performance in Statistics and Probability was at a satisfactory level. Correlation analyses indicated that attitude toward the subject, fear or anxiety levels, parental involvement, and the medium of instruction significantly influenced students' performance. These findings underscore the need for targeted instructional interventions that foster positive attitudes, reduce anxiety, and encourage parental engagement to enhance students' understanding of Statistics and Probability.

This study contributes to the growing body of literature on mathematics education by emphasizing the multifaceted nature of academic performance and the importance of psychosocial and pedagogical factors in shaping learning outcomes.

Keywords: Statistics and Probability, academic performance, attitude toward mathematics, anxiety, parental involvement, teacher effectiveness, medium of instruction

INTRODUCTION

Education is universally recognized as the cornerstone of human development and social progress. It equips individuals with the knowledge, skills, and values needed to live productively and contribute meaningfully to society. This vision is echoed in the United Nations Sustainable Development Goal (SDG) 4 – Quality Education, which calls for inclusive and equitable quality education and the promotion of lifelong learning opportunities for all (United Nations, 2015). As emphasized by UNESCO (2021), achieving SDG 4 entails not only access to education but also the assurance that learning is effective, relevant, and transformative. Schools therefore bear the responsibility of developing learners who are not only academically competent but also capable of applying knowledge to real-world contexts, fostering lifelong learning and sustainable development.

Among the academic disciplines that directly contribute to the attainment of SDG 4 is Mathematics, a field that cultivates reasoning, problem-solving, and analytical thinking—skills vital in a rapidly evolving, data-

driven world (DepEd, 2016; Nardo, 2017). Mathematics serves as a foundation for scientific inquiry and technological innovation, aligning with SDG 4's emphasis on equipping learners with skills relevant to employability and sustainable livelihoods. However, despite its central role in education, many students struggle to appreciate and master mathematical concepts. Negative attitudes, anxiety, and low motivation toward mathematics have long been recognized as key barriers to learning (Zakaria & Nordin, 2008; Mahanta & Islam, 2012; Asante, 2012). Such affective and behavioral challenges impede students' ability to develop numeracy and quantitative reasoning—competencies essential for achieving quality education outcomes (UNESCO, 2021).

Within the Philippine context, Statistics and Probability is a fundamental component of the Senior High School Mathematics curriculum under the K to 12 Program (DepEd, 2016). It enables students to interpret data critically, make informed decisions, and engage in evidence-based reasoning, which are indispensable in research and in everyday problem-solving. Furthermore, it serves as a preparatory course for higher-level research subjects such as Practical Research 2 and Inquiries, Investigations, and Immersion (Laguador, 2019). These subjects embody the competencies envisioned in SDG 4.7, which aims to ensure that learners acquire the knowledge and skills necessary to promote sustainable development, including critical thinking and scientific literacy (UNESCO, 2021).

Despite the curriculum's emphasis on competency-based learning, several studies and official assessments have revealed persistent challenges in mathematics achievement. According to the Department of Education–Bureau of Education Assessment (BEA, 2019), Senior High School students in the Division of Pasig City obtained a Mean Percentage Score (MPS) of 27.47% in Mathematics during the National Achievement Test (NAT)—a rating categorized as Low Proficient and significantly below the 75% national target. Although the division ranked 7th among the 16 divisions in the National Capital Region, the results still highlight the urgent need to improve mathematics instruction and learning outcomes. This concern is consistent with findings from previous studies, which indicate that mathematics achievement is influenced by a combination of cognitive, emotional, and environmental factors such as study habits, self-concept, parental support, and teacher effectiveness (Tosto et al., 2016; Mutodi & Ngirande, 2014).

The Division of Pasig City, guided by its vision “PASIG – Performing High in Academics, Service at Its Best, and Inspiring Governance,” strives to uphold academic excellence. However, classroom observations and Learning Action Cell (LAC) discussions among mathematics teachers have revealed that many students demonstrate low engagement and limited enthusiasm toward Statistics and Probability. Teachers employ various instructional innovations, including the integration of information and communication technologies, yet student performance on quizzes and examinations often remains below the satisfactory level. Similarly, student-led research at San Lorenzo Ruiz Senior High School reported that learners frequently perceive Statistics and Probability as one of the most difficult subjects in the Senior High School curriculum, resulting in low academic performance (Nardo, 2017; Laguador, 2019).

These realities emphasize the importance of understanding the underlying factors that influence students' achievement in Statistics and Probability. This study, therefore, aims to determine the determinants of academic performance among Grade 11 students in public Senior High Schools in the Division of Pasig City. Specifically, it explores how study habits, attitude toward the subject, fear and anxiety, and parental involvement affect students' performance, alongside perceptions of teacher effectiveness in terms of classroom management, teaching strategies, mastery of subject matter, motivation, teacher–student relationships, and the medium of instruction. The findings of this study will contribute to the design of enrichment programs and pedagogical interventions that promote equitable, high-quality learning experiences, thus supporting the broader pursuit of SDG 4 – Quality Education by fostering inclusivity, engagement, and excellence in mathematics education.

METHODOLOGY

This study utilized a descriptive–correlational research design to examine the factors influencing Senior High School students' academic performance in Statistics and Probability within the Division of Pasig City. The

descriptive–correlational approach was deemed appropriate because it allowed the researcher to identify patterns, describe prevailing conditions, and determine the extent of relationships among variables in their natural context (Calderon & Gonzales, 2008; Creswell & Creswell, 2018). Specifically, the study aimed to describe the students' demographic profiles and determine how study habits, attitudes toward the subject, fear or anxiety levels, parental involvement, and teachers' effectiveness were associated with their performance in Statistics and Probability. As defined by Santrock, as cited in Javier (2013), correlational research enables the examination of the strength and direction of relationships between two or more variables, which supports the intent of this investigation.

The participants of the study were 362 Grade 11 students enrolled in Statistics and Probability during the first semester of School Year 2019–2020. They were drawn from a total population of 5,994 Senior High School students in the Division of Pasig City using a multistage stratified random sampling technique. The sample size was computed through Cochran's (1977) formula, which ensures statistical representativeness with a 95% confidence level and a 5% margin of error, adjusted for a finite population. This sampling procedure allowed proportional representation across schools, strands, and gender distribution to ensure the validity of results.

Data were gathered using a structured and validated questionnaire composed of four parts. The first part covered the respondents' demographic information, including the parents' educational attainment and monthly family income. The second part assessed the extent to which study habits, attitudes toward Statistics and Probability, fear or anxiety levels, and parental involvement affected student performance. These sections were adapted from the study of Flores and Enriquez (2017). The third part, patterned after the instrument developed by Sunga (2017), evaluated the perceived effectiveness of teachers in Statistics and Probability across six domains: classroom management, teaching strategies, mastery of subject matter, motivation, teacher–student relationship, and medium of instruction. Each part utilized a four-point Likert scale with descriptors ranging from “strongly agree” to “strongly disagree” or their appropriate equivalents to reflect the degree of influence or effectiveness. The fourth part gathered the students' actual first-semester grades in Statistics and Probability, which served as the measure of academic performance.

The research instrument underwent expert validation by the Division Mathematics Supervisor, subject heads, and Senior High School focal persons to ensure content validity. Reliability was determined using Cronbach's alpha, which yielded coefficients ranging from 0.707 to 0.916 across subscales, signifying acceptable to excellent internal consistency (Biddix, 2017). These results indicate that the questionnaire was both valid and reliable for measuring the constructs investigated in the study.

Before data collection, ethical clearance was obtained from the Schools Division Superintendent and participating school heads. Permission letters were issued to conduct the survey and access students' grades in Statistics and Probability. The researcher personally administered the questionnaires to ensure accurate understanding of the items and to minimize response bias. The participants were informed of the study's purpose, their right to withdraw at any time without penalty, and the confidentiality of their responses. No personally identifiable information was disclosed, and all data were handled following ethical standards for educational research (Creswell & Creswell, 2018).

Descriptive statistics, including frequency, percentage, and mean, were employed to summarize the respondents' profiles and perceptions. Inferential analysis through multiple regression was conducted to identify which independent variables—study habits, attitudes, fear or anxiety, parental involvement, and teachers' effectiveness—significantly predicted the students' performance in Statistics and Probability. The use of both descriptive and inferential statistics allowed for a comprehensive interpretation of the data and alignment of findings with the study's objectives.

RESULTS AND DISCUSSION

The findings revealed that the overall performance of senior high school students in Statistics and Probability was at a satisfactory level, indicating moderate mastery of the subject. This aligns with the report of the Department of Education's Bureau of Education Assessment (BEA, 2023), which observed that Filipino

learners continue to exhibit challenges in mathematics-related competencies. Among the examined correlates, students' attitudes toward the subject, their levels of fear and anxiety, parental involvement, and the medium of instruction emerged as significant determinants of academic performance.

Students who exhibited positive attitudes toward Statistics and Probability achieved higher grades, consistent with Aiken (2002) and Hannula (2019), who emphasized that affective factors play a critical role in mathematics learning. Conversely, elevated levels of fear and anxiety were associated with lower performance, supporting previous studies that mathematical anxiety can hinder concentration, reduce motivation, and impair problem-solving ability (Ashcraft & Krause, 2007; Ramirez et al., 2018). These results suggest that emotional readiness and confidence substantially influence students' engagement and achievement in mathematical learning contexts.

Parental involvement was another crucial factor, as students who reported active parental support performed better than those with minimal involvement. This finding corroborates the assertion of Hill and Tyson (2009) that parental engagement fosters stronger learning motivation and higher academic outcomes. Similarly, the medium of instruction, particularly the use of English, was found to affect comprehension and communication in mathematics, resonating with Bernardo (2004), who noted that language proficiency mediates the understanding of abstract mathematical concepts.

The study's results underscore the multifaceted nature of mathematical learning, where cognitive, affective, and contextual factors intersect. In line with the Sustainable Development Goal 4 (United Nations, 2015), which calls for inclusive and equitable quality education, these findings emphasize the importance of creating supportive learning environments that nurture both competence and confidence in learners. Strengthening teacher strategies, reducing classroom anxiety, and enhancing parental collaboration can collectively improve mathematics achievement and contribute to the broader goal of quality education for all.

CONCLUSION AND RECOMMENDATIONS

The study revealed that students' performance in Statistics and Probability is shaped by both affective and contextual factors, particularly attitude toward the subject, levels of fear and anxiety, parental involvement, and the medium of instruction. Although students generally performed at a satisfactory level, their achievement remains below the desired national proficiency standard. These findings affirm that academic success in mathematics is not merely a function of cognitive ability but also of emotional resilience, home support, and language accessibility.

Aligned with Sustainable Development Goal 4 (United Nations, 2015), which underscores equitable and quality education for all learners, this study highlights the need for educational stakeholders to cultivate supportive and inclusive learning environments. Teachers should adopt pedagogical strategies that reduce anxiety, foster confidence, and strengthen positive attitudes toward Statistics and Probability. Incorporating contextualized examples, collaborative learning, and formative assessments can help students meaningfully engage with mathematical concepts.

School administrators are encouraged to implement enrichment programs that integrate parental engagement and communication strategies to support student learning beyond the classroom. Continuous professional development should also be provided to mathematics teachers to enhance instructional effectiveness and content mastery. Furthermore, policymakers may consider language-sensitive instruction in mathematics to ensure that linguistic barriers do not hinder comprehension and participation.

Future research may explore longitudinal or experimental designs to establish causal relationships between affective variables and mathematics achievement. Expanding the study to different contexts or regions could also enhance the generalizability of findings. Overall, strengthening affective, instructional, and environmental supports can help advance student proficiency in Statistics and Probability, thereby contributing to the broader pursuit of inclusive and quality education envisioned under SDG 4.

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