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Bridging the gap: Examining HUMSS students' perceptions of sampling in statistics

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Abstract

This study examines the challenges faced by Grade 11 HUMSS students at Tayabas Western Academy in comprehending sampling and sampling distribution within statistics and probability. Employing a quantitative approach with all Grade 11 HUMSS students as respondents, the research reveals that, despite a notable interest in the subject, there exists an inconsistent understanding of these topics, indicating a suboptimal grasp of fundamental concepts. Contrary to students' positive perception and interest in statistics, their performance in the assessment ranged from 11% to 54%, revealing a substantial gap between perception and actual performance. Intraclass Correlation Coefficient (ICC) analysis involving four raters established a substantial agreement of 0.75 for the proposed instructional materials, emphasizing their reliability. The identified gaps necessitate for tailored learning materials essential to equip students with the knowledge and skills crucial for proficient data analysis. The proposed resource aims to bridge existing gaps, enhancing the learning experience in statistics and probability for HUMSS students. This study not only highlights current challenges but also lays the foundation for future research and intervention strategies to address the disparities between students' perceptions and their actual performance in basic statistics which is also prerequisite to understand future subjects.

Keywords: *sampling, statistics, HUMSS, mathematics, learning guide*

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Introduction

In the wake of the global pandemic, education has undergone a profound transformation, with students encountering learning gaps (Bailey et al., 2021; Symaco & Bustos, 2022). Among the subjects grappling with the repercussions of this upheaval is Statistics, a discipline that demands meticulous understanding and application (Fabby, 2021). The learning gap precipitated by the pandemic has cast a shadow over the comprehension of statistical concepts, making this already subject even more formidable for students.

Statistics, in its basic introduction, which inherently relies on a solid foundation of mathematical understanding and reasoning, has become a daunting frontier for learners navigating the disruptions caused by remote and hybrid learning models (Garin & Campit, 2023; Yohannes et al., 2021). In addition, statistics and probability pose persistent challenges for students in mathematics classrooms, with factors such as probabilistic reasoning and combinatorial thinking contributing to difficulties in understanding these concepts (Fitzmaurice et al., 2014). Probabilistic reasoning, an integral component of statistical reasoning, involves grappling with notions of likelihood and uncertainties, compounding the struggles students face in statistics and probability (Kula & Koçer, 2020). Combinatorial thinking, as the logical connection of formulas and counting procedures, further complicates comprehension (Coolidge, 2020).

In the Philippines, the high school statistics curriculum, aligned with the K-12 framework, covers a comprehensive range of topics to introduce students to the fundamental principles of statistical analysis. The curriculum begins with an introduction to statistics, where students delve into basic concepts and definitions, as well as the application of descriptive statistics in understanding measures of central tendency and dispersion. The subsequent section on sampling techniques equips students with essential skills in various sampling methods such as simple random sampling, stratified random sampling, systematic sampling, and cluster sampling (Reston et al., 2014).

Moving forward, the curriculum for probability distributions, covering both discrete and continuous probability distributions, with a specific focus on the binomial and normal distributions. Exposure to different sampling methods not only teaches students the technical aspects of selection but also hones their critical thinking skills in choosing the most

appropriate method for a given scenario. Moreover, understanding sampling is integral for students entering fields such as market research, public health, or social sciences, where the ability to make accurate predictions and draw valid conclusions from a limited dataset is indispensable (Kranzler & Anthony, 2022). In essence, a solid grasp of sampling empowers students to conduct research that is not only statistically sound but also practical and applicable in real-world contexts.

Of note, the broader context of mathematics education, statistics and probability emerge as perennial stumbling blocks for students, including those in Grade 11 HUMSS (Humanities and Social Sciences) programs (Santiago, 2022). While mathematics is often perceived as challenging, studies reveal that a "can do" attitude is crucial for success (Abarca et al., 2023; Refugio et al., 2020; Syapal et al., 2022). Nevertheless, a significant portion of students continues to grapple with mathematical concepts, leading to a pressing need for targeted interventions. Nabayra (2022) and Puspitasari et al. (2019) highlighted the historical development of probability and statistics, emphasizing their relevance in analyzing numerical data, yet the persisting struggles of students in these subjects highlight a gap in effective pedagogy. This study aimed to determine the difficulties encountered in sampling and sampling distribution in statistics and probability. Specifically, the study sought answers to the following questions:

1. What are the perceived difficulties of the respondents in terms of students' interest, study habits, teacher's personality traits, teacher's teaching skills and teacher's instructional materials?
2. What is the performance of the Grade 11 HUMSS students in the sampling and sampling distribution?
3. Based on the results, what learning material can the researchers suggest regarding the difficulty of the respondents?
4. What is measure of reliability or agreement among raters to the learning material?

Methodology

In conducting this study, the quantitative research design was selected in accordance Creswell and Creswell (2018), since the choice of a quantitative approach was informed by the need to systematically enumerate the perceived difficulties encountered by Grade 11

HUMSS students in Sampling and Sampling Distribution in Statistics, aligning with the structured and organized principles emphasized in Creswell's comprehensive resource. Moreover, to assess the perceived difficulties encountered by Grade 11 HUMSS students at Tayabas Western Academy in Sampling and Sampling Distribution in Statistics all one hundred twenty (120) Grade 11 HUMSS students were chosen as respondents. Survey questionnaires were pilot tested and measured the internal consistency before dispensing, after getting an acceptable Cronbach's alpha remarks of 0.833, the instruments were distributed to gather data on the difficulties faced by students in the mentioned topics. The researchers collaborated with the teacher in charge to distribute and collect the surveys, allowing respondents 15-20 minutes for completion.

To triangulate the perception of the students a post-test was also administered to measure the students' learning outcomes in the topics. Statistical treatments included calculating the weighted arithmetic mean to determine difficulties encountered, using a Likert scale for interpretation, and employing the standard deviation formula for data dispersion analysis. Mastery of learning competencies was interpreted based on a scale adapted from DepEd Memorandum No. 160 s. 2012. Furthermore, to measure the index level of agreement for the learning guide, the Intraclass Correlation Coefficient (ICC) was employed. The ICC is a measure of reliability or agreement, and its interpretation is as follows:

ICC = 0: No reliability or agreement among raters.
0 < ICC < 0.20: Slight agreement.
0.21 < ICC < 0.40: Fair agreement.
0.41 < ICC < 0.60: Moderate agreement.
0.61 < ICC < 0.80: Substantial agreement.
0.81 < ICC < 1.00: Almost perfect agreement.

Ethical considerations in this study were observed, starting with obtaining informed consent from both students and their guardians before their participation. Clear and transparent communication was maintained throughout the process, ensuring that students understood the purpose of the study, their voluntary involvement, and the confidentiality of their responses. Additionally, measures were implemented to safeguard the emotional well-

being of the students, providing adequate support and debriefing opportunities to address any potential concerns or discomfort arising from the survey and assessments.

Findings

The mean levels of perceived difficulties among Grade 11 HUMSS students in various aspects—interest, study habits, teacher personality traits, and instructional materials—converge within the spectrum of "somehow difficult," with means ranging from 3.05 to 3.09. Notably, the variable "teaching skills" stands out with a mean of 3.30, signifying a level of ease or "very good teaching." Students express a moderate level of interest in statistics, practice their study habits somewhat, find the teacher's personality traits somewhat acceptable, and perceive the teaching skills positively. Additionally, the conventional instructional materials are considered somehow effective.

In terms of performance, Grade 11 HUMSS students exhibit varying levels, with correct answers ranging from 11% to 54% per question and an overall mean assessment score of 12.8. Recognizing the challenges highlighted by the perceived difficulties and performance gaps, it is recommended that teachers develop comprehensive learning modules tailored specifically for HUMSS students. Recognizing this gap, the proposed creation of a modular guide tailored for Grade 11 HUMSS students emerges as a valuable initiative. Intraclass Correlation Coefficient (ICC) analysis involving four raters demonstrated a substantial agreement of .75, affirming the reliability and consensus among evaluators for the proposed learning guide. These learning guides extensively cover topics related HUMSS jargons while incorporating sampling and sampling methods as instructions, aiming to address the identified difficulties and enhance the overall learning experience for the students.

Conclusion

The importance of statistics for students extends far beyond the confines of a single course—it is a gateway to success in academia. Through exposure to various sampling techniques such as simple random sampling, stratified random sampling, and cluster sampling, students not only learn how to select unbiased samples but also gain insights into minimizing errors and addressing biases. In essence, proficiency in sampling provide

students to navigate the complexities of statistical analysis and make informed decisions based on robust and representative data sets. As students embark on their educational journey, an adept understanding of statistics becomes not just an asset but a prerequisite for further learning such as quantitative research. The resource made in this study is anticipated to guide students and teachers with the requisite knowledge and skills, fostering proficiency in understanding basic concepts in statistics.

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