

Analysis of Statistical Literacy Level among PGSD UNIMED Students: A Survey in the Educational Statistics Course

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Abstract. This study aims to analyze the level of statistical literacy among students of the Elementary School Teacher Education program (PGSD) at Medan State University (UNIMED) in the context of the learning the Educational Statistics course. Statistical literacy is a crucial skill for future educators, enabling them to understand, interpret, and apply data accurately and critically. This research employed a quantitative approach using a survey method. The sample consisted of 119 students randomly selected from several classes that had completed the Educational Statistics course. The instrument used was a validated statistical literacy questionnaire covering aspects such as conceptual understanding, data interpretation, and the application of statistics. The findings revealed that most students demonstrated a moderate level of statistical literacy, with notable weaknesses in interpreting data and applying statistics in real-world educational scenarios. These results highlight the need for more contextual and application-oriented teaching strategies to enhance students' statistical literacy.

Keywords: Statistical Literacy, PGSD Students, Survey, Educational Statistics.

1 Introduction

Statistical literacy is one of the essential competencies that prospective teachers must possess, particularly students in the Elementary School Teacher Education (PGSD) program. According to Gal (2002) and Garfield & Ben-Zvi (2008), in the era of big data and increasingly complex information, teachers are required to understand, interpret, and use data critically as a basis for decision-making in both teaching and educational research [1], [2]. Watson (2006) explains that statistical literacy does not merely involve computational ability, but also critical thinking skills in reading, interpreting, and communicating data-based information [3]. Unfortunately, several studies have shown that the statistical literacy level of pre-service teachers is still categorized as low to moderate. For example, Budiman (2019)

found that most elementary education students experienced difficulties in interpreting graphs and the results of simple statistical analyses [4]. Similarly, Yuliati (2021) pointed out that the main weakness of students lies in their ability to apply statistical concepts in real-life situations [5]. Prihastari et al. conducted an analysis of statistical literacy among PGSD students in the Statistics Education course. The results revealed that students' abilities in statistical interpretation and representation were relatively low [6]. This condition may have an impact on the low quality of data-driven learning in elementary schools.

Statistical literacy refers to an individual's ability to understand, interpret, and use statistical information in everyday life. Several key indicators can be used to measure statistical literacy, including:

1.1 Understanding of Basic Statistical Concepts

The ability to comprehend terms, formulas, and fundamental statistical concepts commonly applied in education. The indicators include: 1) Identifying types of data (nominal, ordinal, interval, ratio); 2) Explaining the difference between population and sample; 3) Understanding measures of central tendency (mean, median, mode); 4) Understanding measures of dispersion (range, standard deviation, variance); 5) Explaining the concept of basic probability and frequency distribution. [2], [1].

1.2 Interpretation and Data Analysis

The ability to read, interpret, and draw conclusions from various forms of data presentation. The indicators include: 1) 1) Reading graphs, tables, or diagrams and explaining their meaning; 2) Interpreting measures of central tendency and dispersion within a given context; 3) Identifying patterns or trends in data; 4) Drawing appropriate conclusions based on statistical calculations; 5) Assessing the accuracy and reliability of data [7], [8].

1.3 Application of Statistics in Educational Contexts

The ability to use statistics to solve real problems in the field of education. The indicators include: 1) Applying statistical formulas to analyze educational research data; 2) Selecting appropriate analytical methods for different types of learning data; 3) Interpreting statistical results in the context of educational evaluation (e.g., exam scores, attitude assessments); 4) Using statistical findings to support decision-making in educational practice; 5) Utilizing technology (e.g., Excel/SPSS) to process educational data [9], [10].

Based on this background, the present study aims to analyze the statistical literacy level of PGSD students at Universitas Negeri Medan in the Statistics Education course, focusing on three main aspects: conceptual understanding, data interpretation, and application in real contexts.

2 Method

This study employed a quantitative approach with a survey method. The population consisted of all PGSD students at Universitas Negeri Medan who had completed the Statistics Education course. A total of 119 students were selected as the sample using simple random sampling across several classes. The research instrument was a statistical literacy questionnaire

validated by experts, covering three main aspects: (1) understanding of basic statistical concepts, (2) data interpretation (tables, graphs, statistical results), and (3) application of statistics in real educational contexts. The instrument comprised 21 items. Data were analyzed using descriptive statistics by calculating frequency distributions, percentages, and categorizing students' statistical literacy levels. The categories were determined based on mean scores, namely low, moderate, and high.

3 Result and Discussion

The results of the study indicate that, in general, students' statistical literacy falls into the moderate category. A more detailed description of the findings is presented as follows:

- 1) **Conceptual Understanding Aspect:** The majority of students were able to understand basic concepts (mean, median, mode), although some errors remained in inferential concepts. Out of the seven items assessed, the lowest responses were found in students' understanding of how to calculate and explain standard deviation and variance, interpret the meaning of frequency distributions in data, and apply descriptive and inferential statistics. Overall, these results are presented in Fig.1, with a scale where 1 indicates *strongly disagree* and 4 indicates *strongly agree*.

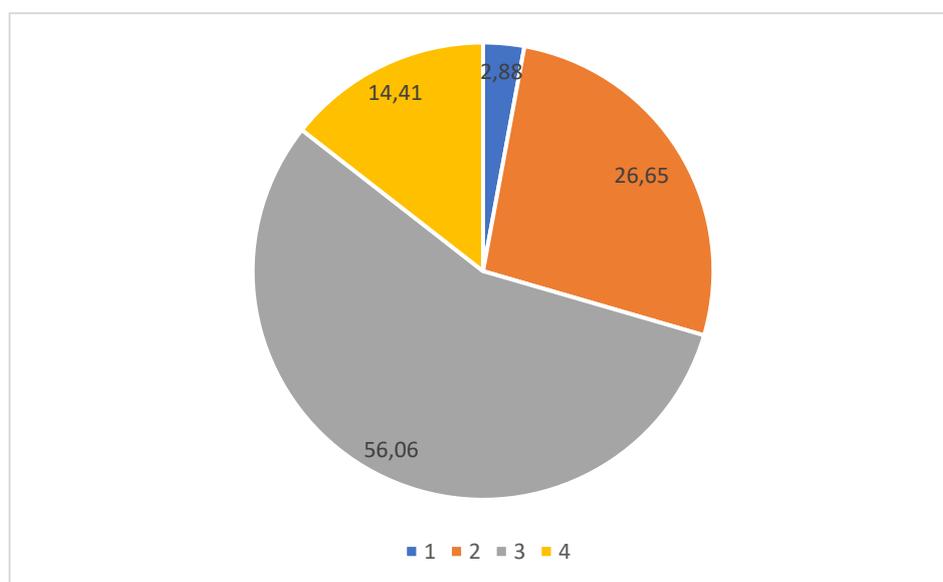


Fig. 1. Distribution of students' responses on the aspect of understanding basic statistical concepts

- 2) **Data Interpretation Aspect:** Most students experienced difficulties in reading graphs, tables, and connecting the results of statistical analyses with real-world phenomena. Out of the seven items assessed, low responses were found in students' understanding of

interpreting measures of central tendency, identifying patterns or trends in statistical data, evaluating the accuracy and reliability of data, explaining the meaning of statistical calculations such as standard deviation, and recognizing common errors in data interpretation. Overall, these results are presented in Fig. 2, with a scale where 1 indicates *strongly disagree* and 4 indicates *strongly agree*.

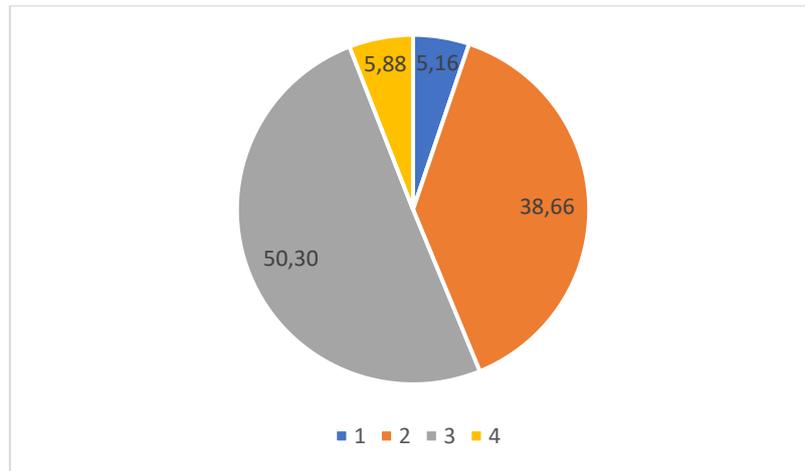


Fig. 2. Distribution of students' responses on the aspect of data interpretation and analysis

- Aspect of Statistical Application:** Students tend to experience difficulties in linking statistical theory with real educational problems in elementary schools. Based on the seven statements assessed, it was found that the indicators related to selecting appropriate statistical methods according to data types, interpreting statistical results in learning evaluation, using software (Excel/SPSS) to process statistical data, applying statistics in completing coursework, as well as designing and analyzing student learning outcomes statistically still showed relatively low responses. Overall, the distribution of responses is presented in Fig. 3, with a scale where 1 indicates *strongly disagree* and 4 indicates *strongly agree*.

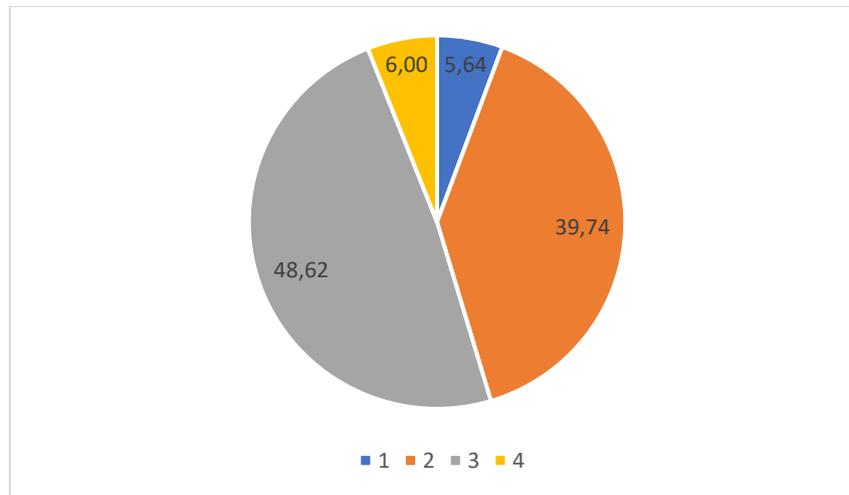


Fig. 3. Distribution of students' responses on the aspect of statistical application

These findings indicate that the main weaknesses of prospective teacher students lie in the aspects of data interpretation and real-world application. This is most likely due to learning methods that emphasize procedural and mathematical calculations rather than context-based problem solving. Therefore, it is necessary to develop more applicable and contextual approaches in teaching statistics, such as problem-solving, project-based learning, and the integration of authentic data from educational settings. Such efforts are expected to improve students' statistical literacy, enabling them to become data-literate teachers who can teach statistical concepts more effectively in elementary schools.

4 Conclusion

This study concludes that the level of statistical literacy among PGSD UNIMED students falls within the moderate category. The main weaknesses are found in their ability to interpret data and apply statistical concepts in real-world educational contexts. Therefore, lecturers need to develop more applicable, context-based, and relevant approaches to the teaching of statistics that are aligned with real problems in the field of education. In this way, students as prospective teachers can acquire stronger statistical literacy to support their professional roles in the future.

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