



Kuraysia, Lestari, Nabihah & Parinduri

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Statistics Anxiety and Contextual Learning Needs in Statistics Education: Evidence from Community Education Students in Higher Education

Fera Kuraysia*, Retno Dwi Lestari, Asma Syifa Nabihah & Fitri Khoiriyah Parinduri

Community Education, Faculty of Education, Jakarta State University, Indonesia

*Corresponding Author: ferakuraysia@unj.ac.id

ABSTRACT

Statistics education plays a critical role in developing students' data literacy, particularly in non-mathematics disciplines such as community education. However, many students experience challenges in learning statistics, including statistics anxiety and conceptual difficulties. This study aimed to examine community education students' experiences in learning statistics, with a focus on statistics anxiety and contextual learning needs. This study employed a descriptive qualitative design involving 105 students from the Community Education Study Program at Universitas Negeri Jakarta who had completed a Statistics course. Data were collected using open-ended questionnaires and analysed using thematic analysis. To strengthen the analysis, quantified thematic analysis was conducted to identify the frequency of themes across participants. The findings revealed five major themes: contextual learning needs (87.6%), statistics anxiety (64.8%), conceptual difficulties (56.2%), instructional support needs (50.5%), and perceptions of overly theoretical instruction (38.1%). These findings indicate that students' learning experiences were influenced by affective, cognitive, and instructional factors. The results also showed that students strongly preferred contextual and applied learning approaches, including real-world examples and practical activities, which helped them better understand statistical concepts and reduce anxiety. This study contributes to statistics education research by providing empirical evidence from community education students, a population that has received limited attention in previous research. The findings highlight the importance of contextualized and supportive instructional approaches in improving students' understanding and reducing statistics anxiety. These results have important implications for the design of statistics instruction in higher education, particularly in non-mathematics disciplines.

Keywords: statistics anxiety; statistics education; contextual learning; higher education; community education; data literacy



INTRODUCTION

The development of modern data-driven societies requires university students to possess the ability to understand, analyze, and use data critically in various academic and professional contexts. Data literacy has been recognized as an essential competency in higher education, as it enables students to interpret data-based information, evaluate research findings, and make evidence-based decisions (Bauder, 2025; Mosia, 2025). In this context, statistics education plays a crucial role as a foundational component in the development of students' data literacy.

Statistics is an essential course in various academic programs, including community education, as students are expected to use data-driven approaches to understand social phenomena, conduct program evaluations, and perform community-based research. However, previous studies have shown that statistics is often perceived as a difficult and challenging subject, particularly among students from non-mathematics backgrounds (Dodeen, 2025; Habibie et al., 2025). These challenges are not only related to cognitive factors but also affective factors, such as statistics anxiety, which may influence students' learning experiences and outcomes (March et al., 2025; Levpušček, 2022).

Statistics anxiety is a widely documented phenomenon in higher education and has been identified as one of the major barriers in statistics learning. Students who experience statistics anxiety tend to have lower levels of confidence, experience difficulties in understanding statistical concepts, and develop negative attitudes toward statistics learning (Toscano, 2025). This condition becomes more complex among students from non-mathematics programs, who typically have more limited exposure to mathematical and statistical concepts prior to entering higher education (Habibie et al., 2025).

In addition to affective factors, pedagogical approaches used in statistics education also play an important role in shaping students' learning experiences. Previous research has shown that overly theoretical and non-contextual instructional approaches may hinder students' understanding of statistical concepts, particularly among social science students (Bach et al., 2023). In contrast,



instructional approaches that integrate real-world examples, hands-on practice, and the use of statistical software can help improve conceptual understanding and reduce statistics anxiety (Savonen et al., 2023; Judijanto, 2024).

Although numerous studies have examined statistics anxiety and statistics education, most of these studies have focused on general student populations or students in STEM fields. Research specifically examining the experiences of community education students remains limited. Community education students represent a unique population, as they are expected to use data in social and community contexts, yet many of them come from non-mathematics backgrounds. Therefore, it is important to understand community education students' experiences in learning statistics, particularly in relation to statistics anxiety and their learning needs.

This study aims to examine the experiences of community education students in learning statistics, with a focus on statistics anxiety and contextual learning needs. Specifically, this study explores the major themes emerging from students' experiences after completing the Statistics course and identifies learning needs that can support the development of students' data literacy. This study was conducted among students in the Community Education Study Program at Universitas Negeri Jakarta who had completed the Statistics course in 2025.

The findings of this study are expected to contribute to the development of more effective and contextualized statistics education, particularly in the context of community education, and to provide pedagogical implications for instructors in designing statistics instruction that is more responsive to students' learning needs.

RESEARCH METHODS

Research Design

This study employed a descriptive qualitative research design to examine students' experiences in learning statistics, particularly in relation to statistics anxiety and contextual learning needs. A qualitative approach was chosen because it allows for an in-depth understanding of students'



subjective experiences and enables the identification of patterns and themes emerging from their responses. The descriptive design was used to provide a systematic account of students' learning experiences without manipulating any variables.

In addition, this study incorporated quantified thematic analysis by calculating the frequency of themes identified from qualitative responses. This approach enabled the integration of qualitative interpretation with descriptive quantitative representation, providing a more comprehensive understanding of students' experiences in statistics education.

Participants

The participants in this study were 105 students from the Community Education Study Program at Universitas Negeri Jakarta. These students were enrolled in semesters 3, 5, and 7 and had previously completed the Statistics course in semester 2. Participants were selected based on the criterion that they had direct experience in learning statistics, enabling them to reflect meaningfully on their learning experiences.

Based on demographic data, the majority of participants came from non-mathematics educational backgrounds, including social sciences and vocational education, while a smaller proportion came from mathematics and science backgrounds. In addition, most participants were female, reflecting the general demographic characteristics of students in the Community Education Study Program.

Data Collection

Data were collected using an open-ended questionnaire designed to explore students' experiences in learning statistics. The questionnaire included questions related to students' learning experiences, perceived difficulties, emotional responses, and learning needs. The use of open-ended questions allowed participants to express their perspectives freely and provided rich qualitative data for analysis.

Data collection was conducted in 2025 after students had completed the Statistics course. Participation in this study was voluntary, and responses were collected anonymously to ensure confidentiality and encourage honest responses.



Data Analysis

Data were analyzed using thematic analysis following the framework proposed by Braun and Clarke. The analysis involved several stages, including data familiarization, initial coding, categorization, and theme development. First, all student responses were carefully read multiple times to gain a comprehensive understanding of the data. Next, meaningful segments of the data were coded and grouped into categories based on similarities in meaning.

These categories were then further developed into major themes representing students' experiences in learning statistics. To strengthen the analysis, quantified thematic analysis was conducted by calculating the frequency of each theme based on the number of participants whose responses reflected each theme. This process resulted in a thematic coding matrix that allowed for systematic analysis of both qualitative patterns and their prevalence across participants.

This combined qualitative and quantitative thematic approach enabled a more robust interpretation of students' experiences and provided empirical evidence regarding the major challenges and learning needs in statistics education among community education students.

RESULTS AND DISCUSSION

Results

Participant Characteristics

This study involved 105 students from the Community Education Study Program at Universitas Negeri Jakarta who had completed the Statistics course. An analysis of participants' demographic characteristics was conducted to provide contextual understanding of their educational backgrounds and learning experiences.

Based on gender distribution, the majority of participants were female (89.5%), while male students accounted for 10.5%. This distribution reflects the general demographic composition of students in community education programs, which are typically dominated by female students.



In terms of educational background, most participants came from non-mathematics backgrounds. Specifically, 45.7% of students had a social sciences background, 20.0% came from vocational education, and 3.8% had a language background. In contrast, only 27.6% of students came from mathematics and science backgrounds. This finding indicates that the majority of participants had limited prior exposure to mathematics and statistics before entering higher education.

Regarding academic level, participants were distributed across semesters 3, 5, and 7, indicating that all participants had completed the Statistics course and had sufficient academic experience to reflect on their learning experiences.

Table 1. Demographic Characteristics of Participants

Variable	Category	Frequency	Percentage (%)
Gender	Female	94	89.5
	Male	11	10.5
Educational Background	Social Sciences	48	45.7
	Mathematics and Science	29	27.6
	Vocational Education	21	20.0
	Language	4	3.8
	Others	3	2.9
Semester	Semester 3	43	41.0
	Semester 5	38	36.2
	Semester 7	24	22.9
Total		105	100

Thematic Findings

The thematic analysis identified five major themes reflecting students' experiences in learning statistics: contextual learning needs, statistics anxiety, conceptual difficulties,



instructional support needs, and perceptions of overly theoretical instruction. To strengthen the analysis, quantified thematic analysis was conducted by calculating the frequency of each theme.

The most dominant theme was contextual learning needs, reported by 92 students (87.6%). Students emphasized that statistics was easier to understand when instruction included real-world examples, practical exercises, and hands-on learning activities.

The second most frequent theme was statistics anxiety, reported by 68 students (64.8%). Students described feelings of fear, lack of confidence, and anxiety when learning statistics.

Conceptual difficulties were reported by 59 students (56.2%), indicating that many students struggled to understand statistical concepts, terminology, and interpretation of results.

Instructional support needs were reported by 53 students (50.5%), highlighting the importance of clear explanations, guidance, and supportive instruction.

Finally, 40 students (38.1%) perceived statistics instruction as overly theoretical, suggesting that abstract teaching approaches without practical application made learning more difficult.

Table 2. Major Themes and Frequencies

Theme	Frequency	Percentage (%)
Contextual learning needs	92	87.6
Statistics anxiety	68	64.8
Conceptual difficulties	59	56.2
Instructional support needs	53	50.5
Overly theoretical instruction	40	38.1
Total participants	105	100

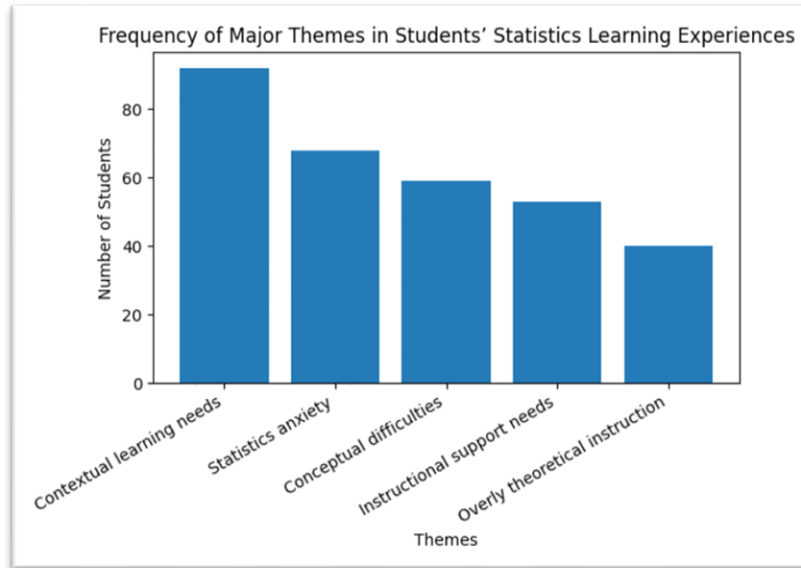


Figure 1. Frequency of Major Themes in Students' Statistics Learning Experiences

Figure 1 provides a visual representation of the frequency of each theme identified in this study. As shown in the figure, contextual learning needs emerged as the most dominant theme, followed by statistics anxiety and conceptual difficulties. Instructional support needs and perceptions of overly theoretical instruction were also reported by a substantial proportion of students.

The graphical representation reinforces the quantitative thematic findings and highlights the importance of contextual and applied instructional approaches in statistics education.

Summary of Results

Overall, the findings indicate that students' experiences in learning statistics were influenced by affective, cognitive, and instructional factors. Statistics anxiety and conceptual difficulties represent major learning barriers, while contextual learning and instructional support play a critical role in enhancing students' understanding.

These findings provide empirical evidence that contextual and student-centered instructional approaches are essential in improving statistics education, particularly among students from non-mathematics backgrounds.



Discussion

The findings of this study provide important insights into community education students' experiences in learning statistics, particularly in relation to statistics anxiety and contextual learning needs. The results indicate that students' learning experiences were influenced by a combination of affective, cognitive, and instructional factors. These findings contribute to the growing body of research on statistics education, especially among students from non-mathematics backgrounds.

One of the most significant findings of this study is the high prevalence of statistics anxiety, reported by 64.8% of participants. Students described feelings of fear, lack of confidence, and concern about making mistakes when learning statistics. This finding is consistent with previous studies that have identified statistics anxiety as a major barrier to effective learning in higher education (March et al., 2025; Toscano, 2025). Statistics anxiety can negatively affect students' confidence, motivation, and engagement, which in turn may hinder their ability to develop statistical understanding and data literacy skills.

The high level of statistics anxiety observed in this study may be explained, in part, by students' educational backgrounds. The demographic data showed that the majority of participants came from non-mathematics backgrounds, including social sciences and vocational education. Previous research has shown that students from non-mathematics backgrounds often experience greater difficulty and anxiety when learning statistics due to limited prior exposure to mathematical and statistical concepts (Habibie et al., 2025). This suggests that students' prior academic preparation plays an important role in shaping their learning experiences in statistics education.

In addition to affective challenges, conceptual difficulties were also commonly reported, with 56.2% of students indicating that they struggled to understand statistical concepts and



terminology. This finding highlights the cognitive challenges associated with learning statistics, particularly for students who may not have strong mathematical foundations. Similar findings have been reported in previous research, which has shown that students often experience difficulties in understanding abstract statistical concepts, especially when instruction focuses primarily on theoretical explanations without sufficient practical application (Bach et al., 2023).

The most dominant finding of this study was the strong need for contextual learning, reported by 87.6% of participants. Students emphasized that statistics was easier to understand when instruction included real-world examples, practical exercises, and hands-on learning experiences. This finding supports previous research demonstrating that contextual and applied instructional approaches can improve students' conceptual understanding and reduce statistics anxiety (Savonen et al., 2023; Judijanto, 2024). Contextual learning helps students understand the relevance of statistics in real-world situations, making abstract concepts more meaningful and easier to comprehend.

In addition, more than half of the participants (50.5%) reported the need for greater instructional support from instructors. Students emphasized the importance of clear explanations, guidance, and supportive learning environments. This finding highlights the critical role of instructors in facilitating effective learning experiences. Supportive instructional practices can help reduce students' anxiety and improve their confidence in learning statistics.

These findings have important pedagogical implications for statistics education, particularly in community education programs. Given that many students come from non-mathematics backgrounds, instructional approaches should be designed to be more contextual, supportive, and student-centered. Integrating real-world applications, practical exercises, and interactive learning strategies may help improve students' conceptual understanding and reduce statistics anxiety.



Furthermore, this study contributes to statistics education research by providing empirical evidence from community education students, a population that has received limited attention in previous research. Most previous studies have focused on general student populations or students in STEM disciplines, whereas this study highlights the unique challenges and learning needs of students in community education programs.

Overall, the findings suggest that improving statistics education requires not only addressing cognitive challenges but also considering affective and instructional factors. Contextualized and supportive instructional approaches may play a key role in enhancing students' learning experiences and promoting the development of statistical literacy in higher education.

CONCLUSION

This study examined community education students' experiences in learning statistics, with a particular focus on statistics anxiety and contextual learning needs. The findings revealed that a substantial proportion of students experienced statistics anxiety, conceptual difficulties, and challenges related to overly theoretical instructional approaches. These findings indicate that learning statistics involves not only cognitive challenges but also affective and instructional dimensions that significantly influence students' learning experiences.

One of the most important findings of this study was the strong need for contextual learning, as the majority of students reported that practical examples, real-world applications, and hands-on learning experiences helped them better understand statistical concepts. This suggests that contextualized instructional approaches can play a critical role in improving students' conceptual understanding and reducing statistics anxiety.

In addition, the findings highlight the importance of instructional support in facilitating effective statistics learning. Clear explanations, supportive teaching practices, and student-centered instructional approaches may help students overcome learning difficulties and develop greater confidence in learning statistics.



This study contributes to statistics education research by providing empirical evidence from community education students, a population that has received limited attention in previous research. The findings underscore the importance of designing statistics instruction that is responsive to students' educational backgrounds and learning needs.

From a pedagogical perspective, integrating contextual learning strategies, real-world applications, and supportive instructional practices may enhance students' engagement, understanding, and confidence in learning statistics. Such approaches may also contribute to the development of statistical literacy, which is essential for students in data-driven academic and professional environments.

Future research may further examine the effectiveness of contextual instructional approaches in improving students' learning outcomes and explore additional factors that influence students' experiences in statistics education.

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