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Crafting a Responsive Teaching Framework for Data Analysis: A Phenomenological Study on Students' Experiences in Learning Descriptive and Inferential Statistics

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ABSTRACT

This present study employed the qualitative phenomenological approach in acquiring data regarding the lived experiences of 26 third-year BEED students at a local community college in the Philippines in learning descriptive and inferential statistics within the research coursework context. The thematic findings revealed that students find their experiences in learning statistics very much characterized by anxiety and confusion, followed by slowly developing self-confidence in understanding complicated concepts, formulas, and the usage of statistical software. Some of the common challenges faced included choosing an appropriate statistical test, interpreting the results, and applying their knowledge of statistics to real-world research issues. However, they cited several strategies used in instruction that helped them to understand most of these aspects, such as step-by-step and structured explanations, use of practical and real-life data, hands-on activities, support and patience by the instructor, visual aids, and collaborative group work. This study is grounded in Ausubel's theory of meaningful learning, thereby stressing the connection of new knowledge to the pre-existing cognitive structures of the learner. Following from these insights, the study proceeds to propose the Scaffolded Teaching Approach to Transform Statistics Learning (S.T.A.T.S. Framework)—an innovative student-centered framework that seeks to bring in diagnostic assessment, thematic instruction, active engagement, technology-enhanced learning, and regular reflective feedback. The S.T.A.T.S. Framework is aimed at addressing the barriers to statistics education by reducing anxiety, enhancing accessibility in statistical learning, and promoting both statistical literacy and self-efficacy. The study holds implications for educators interested in molding higher education data analysis instruction into being effective, responsive, and inclusive.

INTRODUCTION

Teaching and learning statistics, particularly descriptive and inferential data analysis, remains a formidable challenge in higher education, especially in local community colleges where students are expected to produce full-blown research outputs within a single semester. For many learners, statistics elicit feelings of anxiety, confusion, and low confidence, often stemming from complex mathematical language, abstract thinking requirements, and limited time to master technical skills. In the Philippine context, these challenges are amplified by insufficient teacher training, limited resources, and large class sizes, creating a significant gap between students' learning needs and the instructional strategies applied. Addressing this pedagogical dilemma is critical, as statistical literacy is now a fundamental skill in a data-driven world where education, policy, and research rely on sound quantitative reasoning (Gabio & Cajandig, 2025; Repedro & Diego, 2021). Thus, crafting a responsive teaching framework rooted in students' lived experiences can bridge this disconnect and enhance learning outcomes in data analysis courses.

The need for effective statistics education is reinforced by national and global educational priorities. The Commission on Higher Education (CHED) in the Philippines mandates research output as a core component of tertiary education, requiring statistical competence

as part of curricular outcomes. Meanwhile, education frameworks aligned with the 21st-century competencies and UNESCO's Sustainable Development Goals stress data literacy and evidence-based thinking as vital in fostering global citizenship. The theoretical lens of David Ausubel's (1963) Meaningful Learning Theory as cited in Adolfo and Villarin (2023) emphasizes the significance of connecting new knowledge to learners' prior experiences. This principle resonates with phenomenology's focus on subjective lived experiences, suggesting that instructional design in statistics should be anchored on learners' cognitive and emotional engagement with data.

Recent studies reflect ongoing difficulties students face in mastering statistical concepts. Gabio and Cajandig (2025) found that cognitive and affective factors such as prior knowledge, anxiety, and instructional clarity directly influence statistical mastery. Naval *et al.* (2022) observed persistent gaps in students' understanding of concepts like standard deviation and hypothesis testing in modular distance learning. Dumale and Gurat (2023) identified pedagogical approaches like direct instruction and technology-aided materials as commonly used, though their effectiveness remained inconclusive. Internationally, Hunt *et al.* (2023) and Barcelona *et al.* (2023) also highlighted statistical anxiety's detrimental effects, with the latter noting how teacher presence can mitigate this anxiety. These studies establish a foundational

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understanding of barriers to statistics learning while offering varied pedagogical interventions.

Despite these efforts, there remains a substantial research gap in understanding how students themselves make sense of their struggles, strategies, and needs while learning statistics—especially through a phenomenological lens. Most existing studies emphasize quantitative performance metrics and interventions, yet few explore the nuances of learners’ internal narratives, coping strategies, or their perceptions of effective teaching. Moreover, while some propose enhancement programs (Gabio & Cajandig, 2025), there is insufficient exploration of frameworks grounded directly in students’ authentic learning experiences. A qualitative, phenomenological approach offers the opportunity to construct such a framework by capturing the voices of students who have navigated the complexities of statistical learning in under-resourced educational settings.

This study explored the experiences and challenges encountered by college students in learning data analysis and aims to gather insights that can inform a teaching framework that responds to their needs. Specifically, it aimed to answer the following research questions:

1. How do college students describe their experiences and challenges in learning descriptive and inferential statistics in their research subject?
2. What strategies or learning practices do students find helpful in making sense of data analysis?
3. What insights and recommendations can be drawn from students to guide the development of an innovative and responsive teaching framework for data analysis?
4. What innovative teaching framework can be developed based on the findings?

The primary purpose of this phenomenological research is to explore college students’ lived experiences in learning data analysis, specifically descriptive and inferential statistics, within the context of research coursework. It aims to document their struggles, coping mechanisms, and pedagogical preferences to inform the creation of a responsive teaching framework. By examining these narratives, the study aspires to address the instructional gaps that persist in many local colleges. Ultimately, the research contributes to the development of pedagogical practices that are attuned to the realities of Filipino students—those that not only teach statistics, but also cultivate confidence, competence, and critical thinking.

This study is anchored on David Ausubel’s (1963) Meaningful Learning Theory, which posits that meaningful learning occurs when new information is connected with relevant concepts already present in the learner’s cognitive structure. In the context of statistics education, students are more likely to understand and retain statistical concepts when instruction builds upon their prior knowledge and personal experiences. As cited by Adolfo and Villarin (2023), this theory emphasizes relevance, structure, and clarity in teaching—qualities that are essential for overcoming the complexity of data analysis. The phenomenological approach of this study

aligns with Ausubel’s framework, as it seeks to identify how learners perceive and internalize statistical knowledge in relation to their existing cognitive and emotional schema. Informed by this theoretical grounding, the study seeks to build a responsive framework that facilitates meaningful learning of descriptive and inferential statistics through pedagogical strategies that resonate with students’ lived realities.

LITERATURE REVIEW

Statistical Anxiety and Student Attitudes Toward Statistics
Statistical anxiety continues to be a pervasive issue among learners. In the Philippines, Repedro and Diego (2021) found that while students appreciated the value and usefulness of statistics, many reported negative emotions and difficulty in understanding concepts. Similarly, Aquino and Samuel (2022) revealed that stress, perfectionism, and academic procrastination significantly contributed to statistical anxiety, which in turn negatively affected performance. Internationally, Hunt *et al.* (2023) and March *et al.* (2025) demonstrated how anxiety could either hinder or, at optimal levels, enhance performance depending on its intensity and management. These findings underscore the emotional dimensions of statistics education, suggesting a need for pedagogical strategies that actively reduce anxiety.

Pedagogical Practices and Teaching Strategies

Effective instruction is a cornerstone of statistical understanding. Dumale and Gurat (2023) identified technology-aided instruction, problem-based learning, and multiple representations as frequently employed strategies in modular settings, albeit with mixed success due to the limitations of distance learning. Naval *et al.* (2022) emphasized the critical role of teachers in clarifying complex ideas and recommended enhancements to modular learning through blended approaches. Meanwhile, Wahba *et al.* (2024) found that integrating AI tools like ChatGPT into instruction significantly improved statistical reasoning and attitudes. Douglas (2024) and Yang (2017) both highlighted the benefits of active learning and well-structured online courses, respectively, in promoting better engagement and comprehension in statistics.

Instructional Gaps and Contextual Challenges

Despite various interventions, gaps in instructional effectiveness persist. Gabio and Cajandig (2025) identified multiple factors affecting students’ statistical mastery, including unclear instruction, limited resources, and cognitive overload. Casinillo (2022) found that even when students showed resilience, learning conditions such as poor internet access, cramped study environments, and lack of teacher interaction hampered learning. Moreover, Levpušček Puklek and Čukon (2022) emphasized the need to address students’ attitudes and beliefs, especially among those with weak mathematical foundations. These insights highlight the limitations of one-size-fits-all

pedagogies and the importance of tailoring instruction to learners' contexts and needs.

The Role of Teacher Presence and Supportive Learning Environments

Teacher presence plays a critical role in managing students' emotions and fostering learning. Barcelona *et al.* (2023) noted that teacher presence moderates the effects of statistical anxiety, with visibility and guidance making learners feel more secure and confident. Similarly, Schreiter *et al.* (2024) in their review of STEM teacher education emphasized that equipping teachers with data and statistical literacy, as well as affective teaching skills, is vital in cultivating effective classroom practices. These studies point to the centrality of teacher-student interaction in the teaching of statistics.

Gaps in the Literature and the Need for a Student-Informed Framework

Although existing research provides valuable insights into statistical anxiety, instructional methods, and performance, there is limited investigation into how students themselves perceive and interpret their learning journeys. Most studies adopt quantitative approaches that miss the depth and nuance of students' voices. Furthermore, little has been done to consolidate these insights into a holistic teaching framework grounded in local educational contexts, particularly in resource-limited public colleges in the Philippines. This study addresses this gap by using a phenomenological approach to capture students' subjective experiences, offering a basis for constructing a responsive framework rooted in empathy, clarity, and relevance.

MATERIALS AND METHODS

Research Design

This study employed a qualitative research design using thematic analysis within the framework of transcendental phenomenology (Moustakas, 1994; Creswell, 2013). The design was chosen to explore in depth the lived experiences of students in learning descriptive and inferential statistics. Through open-ended, narrative-based responses, the study aimed to uncover recurring themes and meaningful insights that could inform the development of a responsive teaching framework for data analysis.

Research Locale

The study was conducted at Initao College, a local community college in Misamis Oriental, Philippines. The setting was chosen due to its relevance to the study—where research course in Teacher Education Program is taught within a limited semester, and contextual teaching challenges in statistical subjects are prevalent. The locale provided access to students with recent and first-hand experiences in navigating statistical concepts in their research courses.

Research Participants

The participants were twenty-six (26) third-year students enrolled in the Bachelor of Elementary Education (BEED) program at Initao College who had already completed their Research subject and participated in a college-organized statistics seminar. Purposeful sampling was employed to select participants based on their direct engagement (Creswell & Plano Clark, 2011) with statistical analysis in academic research. The inclusion criteria ensured that the participants had sufficient exposure to both instruction and application of descriptive and inferential statistics, making them suitable sources of insight for the study's objectives.

Research Instrument

The study utilized a semi-structured, open-ended questionnaire distributed via Google Forms. This instrument was designed to capture reflective and detailed responses related to the participants' experiences with statistical learning. Questions were crafted in alignment with the study's three specific objectives and followed a phenomenological structure, encouraging participants to reconstruct their learning journeys in their own words. Students were allowed to respond in Cebuano, Filipino, or English, depending on their language preference, to promote inclusivity and authentic self-expression. The open-ended questions were organized according to the study's specific objectives:

RQ1. How do college students describe their experiences and challenges in learning descriptive and inferential statistics in their research subject?

- Can you describe your overall experience learning data analysis in your research subject?
- What difficulties did you encounter when learning either descriptive or inferential statistics?
- What part of the research process involving statistics was most confusing or frustrating for you?

RQ2. What strategies or learning practices do students find helpful in making sense of data analysis?

- How would you describe your teacher's method of teaching statistics in your research subject?
- What helped you the most in understanding statistical concepts—lectures, handouts, group work, etc.?
- Did your teacher use any activity or approach that really helped you grasp the lesson better? What parts of their teaching were effective or helpful?

RQ3. What insights and recommendations can be drawn from students to guide the development of an innovative and responsive teaching framework for data analysis?

- Based on your experience, what suggestions would you give to improve the teaching of statistics in research courses?
- If you were to design a lesson on data analysis, what methods or tools would you use to make it more understandable?

Data Analysis

Thematic analysis of the responses was done using Creswell’s (2007) simplified version of Moustakas’s (1994) Stevick-Colaizzi-Keen process which involves: description of experiences with the phenomenon, bracketing, listing of significant statements, coding and clustering of significant statements to form themes, producing textual descriptions of experience, building of structural descriptions, and combining description of essences. Each research question has corresponding open-ended guide questions or probing questions. The themes were coming from each probing question based on the responses of the participants.

the study, their rights as participants, and assurances of confidentiality. Participation was voluntary, and students could withdraw at any time without consequences. They were informed that their responses would be used solely for academic purposes and that all identifying information would remain confidential.

Participants were given ample time to complete the form to allow for reflection and detailed responses. After data collection, all electronic files were stored securely and deleted following the completion of the analysis to maintain data privacy. Pseudonyms were assigned to participants’ responses to ensure anonymity in the reporting of findings.

Data Gathering Procedure and Ethical Considerations

The data were collected asynchronously through a Google Form containing the open-ended questionnaire. Prior to accessing the form, participants were presented with an informed consent statement, explaining the purpose of

RESULTS AND DISCUSSION

How do college students describe their experiences and challenges in learning descriptive and inferential statistics in their research subject?

Table 1: Thematic Analysis of Students’ Experiences and Challenges in Learning Descriptive and Inferential Statistics

Main Themes	Sub-themes	Significant Statements	General Description of the Theme
Theme 1: Students’ Overall Experience in Learning Data Analysis	Mixed Emotional Journey	P1: ‘a rollercoaster ride of emotions... ultimately rewarding’; P5: ‘challenging and rewarding... fulfilling to see how the data revealed insights’; P20: ‘challenging... overwhelming... gave me a deeper understanding and appreciation’; P26: ‘kapoy pero laban gyapon’	Students describe their experiences as a blend of frustration and fulfillment, often starting with confusion and ending in appreciation of data analysis as a powerful research tool.
	Value of Instructional Support	P2: ‘with the help of our instructor... dako kaayo og tabang’; P4: ‘naka sabot nako sukad nag seminar na si sir...’; P22: ‘helpful kaayo jud ang ppt. and discussion nimo sir’; P24: ‘help of our research adviser... gained a clearer understanding’	Students highlighted the crucial role of teacher support, seminars, and instructional materials in clarifying difficult concepts and enhancing their understanding.
	Growth in Confidence and Skills	P3: ‘deeply understand... appropriate formula’; P10: ‘boosted my confidence in handling data’; P11: ‘valuable and rewarding... strengthened my critical thinking’; P16: ‘challenging but rewarding... medyo confident nko gamay’	Despite initial struggles, students expressed growth in analytical thinking, self-confidence, and statistical skills through practice and application.
Theme 2: Challenges in Understanding Descriptive and Inferential Statistics	Difficulties with Statistical Concepts	P1: ‘trouble with hypothesis testing and interpreting p-values’; P5: ‘confusing... probability and significance levels’; P12: ‘hard time understanding formulas... mean, median, p-values’; P24: ‘lisod... understanding ANOVA, Kruskal-Wallis... p-values’	Many students reported difficulty grasping core statistical concepts such as hypothesis testing, statistical significance, and proper test usage.

	Confusion in Software Use and Calculations	P3: 'step by step process... recheck 2 times'; P6: 'didn't get to properly use Jamovi'; P11: 'normality check and homogeneity test... confusing at first'; P25: 'confusing because it has many tables to make'	Students found statistical software, calculations, and tool selection overwhelming and error-prone without sufficient guidance or prior experience.
	Struggle in Interpretation and Application	P10: 'confused about when to use the right method'; P14: 'confusing to interpret results'; P18: 'overwhelming to connect abstract concepts to real-world contexts'; P22: 'struggled to understand what results meant... lisud mangitag supporting studies'	Students struggled not just with calculations but also with how to interpret and apply results meaningfully in their research.
Theme 3: Confusing or Frustrating Parts of the Statistical Process	Difficulty Choosing Appropriate Tests	P1: 'choosing the right statistical model... daunting'; P13: 'choosing the right statistical test... confusing'; P22: 'knowing which test to use... overwhelming'; P24: 'lisod kaayo i-determine kung unsa nga test gamiton'	A common challenge was selecting the correct statistical test or model, which many students found difficult and intimidating.
	Challenges in Interpreting Results	P5: 'understanding what the p-values and correlation coefficients meant'; P11: 'interpreting p-values... frustrating at first'; P16: 'interpreting output sa Excel... lisod pud e understand'; P23: 'interpreting results... frustrating'	Interpreting the statistical output, particularly p-values and significance, was reported as a major hurdle across many responses.
	Errors and Uncertainty in Execution	P19: 'confused with the codes... in Excel'; P20: 'normality test or equal variance... difficult'; P12: 'struggled with what results meant for research questions'; P26: 'pagpili kung unsa nga sakto na statistical... confusing and frustrating'	Students expressed concerns about making mistakes in the statistical procedures, revealing a sense of uncertainty and lack of confidence during execution.

Theme 1: Students' Overall Experience in Learning Data Analysis

Mixed Emotional Journey

Students commonly described their journey in learning statistics as emotionally complex, marked by cycles of confusion, frustration, and, ultimately, fulfillment. One participant reflected, "a rollercoaster ride of emotions... ultimately rewarding" (P1), while another added, "challenging and rewarding... fulfilling to see how the data revealed insights" (P5). This duality echoes through statements such as, "challenging... overwhelming... gave me a deeper understanding and appreciation" (P20), and in vernacular, "kapoy pero laban gyapon" [tiring, but still fighting] (P26). These narratives are consistent with the findings of Gabio & Cajandig (2025), who noted that affective factors—such as attitude, anxiety, and self-efficacy—significantly shape students' mastery of statistics. Similarly, Aquino & Samuel (2022) observed that students' emotional responses, including anxiety and stress, can both hinder and motivate performance, suggesting that a certain level of anxiety is natural and,

when managed, may even contribute to perseverance and growth.

Value of Instructional Support

Participants repeatedly highlighted the importance of instructor guidance, seminars, and well-prepared materials in making sense of difficult concepts. For example, P2 noted, "with the help of our instructor... dako kaayo og tabang" [a great help], while P4 observed, "naka sabot nako sukad nag seminar na si sir..." [I understood after Sir's seminar]. P22 emphasized, "helpful kaayo jud ang ppt. and discussion nimo sir" [the PowerPoint and your discussion were very helpful], and P24 credited the "help of our research adviser... gained a clearer understanding." Such testimonials echo findings from Naval *et al.* (2022), who emphasized the "critical role of teachers in the teaching-learning process," particularly in clarifying complex topics. The moderating effect of teacher presence is also supported by Barcelona *et al.* (2023), who found that higher teacher presence was linked with reduced anxiety and improved learning outcomes in statistics.

Growth in Confidence and Skills

Despite early difficulties, many students eventually reported increased confidence and skills, particularly in analytical thinking and the use of statistical tools. P3 shared, “deeply understand... appropriate formula”, while P10 stated, “boosted my confidence in handling data”. P11 elaborated, “valuable and rewarding... strengthened my critical thinking”, and P16 concluded, “challenging but rewarding... medyo confident nko gamay” [I’m a bit more confident now]. These gains align with the conclusions of Hunt *et al.* (2023), who reported that moderate statistics anxiety can drive improved preparation and performance, while repeated practice and exposure, as described by Lim *et al.* (2015), help enhance long-term retention and confidence.

Overall, students’ experiences in learning data analysis were shaped by a blend of emotional highs and lows, dependence on instructional support, and gradual growth in statistical literacy and self-efficacy. This pattern mirrors broader findings in the literature that emotional, instructional, and cognitive factors jointly contribute to students’ trajectories in mastering statistics.

Theme 2: Challenges in Understanding Descriptive and Inferential Statistics

Difficulties with Statistical Concepts

Students candidly shared the obstacles they faced in grasping key statistical ideas. For example, P1 described “trouble with hypothesis testing and interpreting p-values”, P5 admitted “confusing... probability and significance levels”, and P12 noted, “hard time understanding formulas... mean, median, p-values.” The complexity of advanced tests was highlighted by P24: “lisod... understanding ANOVA, Kruskal-Wallis... p-values” [difficult to understand ANOVA, Kruskal-Wallis, and p-values]. Such conceptual struggles are widely documented. Gabio & Cajandig (2025) found that both cognitive and affective factors—such as prior knowledge and anxiety—significantly affect statistical mastery, while Naval *et al.* (2022) and Repedro & Diego (2021) observed persistent difficulties among Filipino students with concepts like hypothesis testing, correlation, and interpretation of statistical significance.

Confusion in Software Use and Calculations

The integration of statistical software posed its own set of challenges. P3 noted the need to “recheck 2 times” to ensure accuracy, while P6 said, “didn’t get to properly use Jamovi.” P11 added, “normality check and homogeneity test... confusing at first”, and P25 described, “confusing because it has many tables to make.” Consistent with these findings, Tucker *et al.* (2022) reported that students often start with negative attitudes toward statistical software, though engagement and practice can improve their perceptions over time. Similarly, Yang (2017) emphasized that software-related confusion is common and underscores the necessity for clear, guided instruction.

Struggle in Interpretation and Application

Even after calculations, making sense of the results proved taxing. P10 stated, “confused about when to use the right method”, P14 described, “confusing to interpret results”, P18 admitted, “overwhelming to connect abstract concepts to real-world contexts”, and P22 shared, “struggled to understand what results meant... lisod mangitag supporting studies” [difficult to find supporting studies]. These challenges reflect the “last-mile problem” noted by Naval *et al.* (2022)—the leap from calculation to interpretation remains a major barrier, particularly in modular and distance learning contexts. As Gabio & Cajandig (2025) noted, students struggle with not only computational mastery but also the real-life application of statistical findings.

Students’ primary challenges centered around complex statistical concepts, unfamiliar software, and interpreting results, echoing the multifaceted barriers—cognitive, technological, and practical—described in the literature.

Theme 3: Confusing or Frustrating Parts of the Statistical Process

Difficulty Choosing Appropriate Tests

A recurring frustration was the selection of correct statistical models or tests. P1 stated, “choosing the right statistical model... daunting”, P13 said, “choosing the right statistical test... confusing”, P22 remarked, “knowing which test to use... overwhelming”, and P24 lamented, “lisod kaayo i-determine kung unsa nga test gamiton” [very difficult to determine which test to use]. This mirrors findings by Dani & Al Quraan (2023), who found that students’ lack of confidence in statistics often leads them to avoid quantitative methods altogether, and by Gabio & Cajandig (2025), who pointed to cognitive overload as a major factor in students’ difficulties.

Challenges in Interpreting Results

Interpreting statistical output, especially p-values and correlation coefficients, was a commonly cited challenge. P5 described, “understanding what the p-values and correlation coefficients meant”, P11 said, “interpreting p-values... frustrating at first”, P16 noted, “interpreting output sa Excel... lisod pud e understand” [hard to understand], and P23 simply summarized, “interpreting results... frustrating.” This difficulty is not unique; March *et al.* (2025) described “interpretation anxiety” as a major node in the network of statistics anxiety, while Naval *et al.* (2022) and Repedro & Diego (2021) found that interpreting data remains a weak point even among advanced students.

Errors and Uncertainty in Execution

The possibility of making errors contributed to ongoing uncertainty and a lack of confidence. P19 said, “confused with the codes... in Excel”, P20 mentioned, “normality test or equal variance... difficult”, P12 described, “struggled with what results meant for research questions”, and P26 admitted, “pagpili kung unsa nga sakto na statistical...

confusing and frustrating” [choosing which statistical tool to use is confusing and frustrating]. According to Casinillo (2022), students’ resilience in learning statistics is tested not just by conceptual hurdles but also by technical execution and the fear of mistakes—especially in remote or self-guided settings.

The most confusing and frustrating elements involved not just the mechanical aspects of statistics, but also the interpretive leap—matching tests to questions, interpreting output, and managing uncertainty and potential errors. These struggles are persistent and well-documented in the literature.

In sum, students’ experiences with descriptive and inferential statistics in research subjects are characterized

by emotional turbulence, significant dependence on instructional support, incremental growth in skills and confidence, and persistent difficulties with both conceptual and practical elements of statistical analysis. These patterns strongly corroborate existing research on statistical learning in the Philippines and internationally, emphasizing the need for responsive instructional frameworks that address not only cognitive and technical barriers but also emotional and affective dimensions of learning statistics.

What strategies or learning practices do students find helpful in making sense of data analysis?

Table 2: Thematic Analysis of Effective Strategies and Instructional Approaches in Learning Statistics

Main Themes	Sub-themes	Significant Statements	General Description of the Theme
Theme 1: Effective Teaching Methods in Statistics	Step-by-step and Structured Explanations	P5: ‘explained concepts step by step and used examples from our research’; P11: ‘breaking down complex topics into manageable steps’; P12: ‘explained the lessons step by step’; P17: ‘step by step ang pag tudlo sa among instructor’	Many students appreciated the clear, organized approach of teachers who presented lessons in a structured, sequential manner. This made it easier for learners to follow complex statistical concepts and build confidence gradually.
	Hands-on and Practical Applications	P1: ‘used hands-on activities to drive home key statistical concepts’; P10: ‘we use real examples, do hands-on activities’; P11: ‘guided us through each statistical test’; P24: ‘let us use our own data for practice’; P26: ‘from basic to complex... with examples’	Teachers who provided hands-on experiences and real-data applications helped students grasp statistics more effectively. Practical engagement made abstract ideas more relatable and meaningful.
	Supportive and Patient Teaching Style	P5: ‘teacher’s patient and approachable style made learning manageable’; P16: ‘guided us even if the topic was fast-paced’; P18: ‘teacher explained things multiple times’; P22: ‘taas pud gyud kaayo syag pasensya sa amoa’	Students valued instructors who showed patience, understanding, and support. Such teaching styles reduced anxiety and increased students’ willingness to engage and ask questions.
Theme 2: Learning Resources and Peer Collaboration	Lectures and Teacher Explanations	P2: ‘lectures... with the help of PPT... made concepts clear’; P10: ‘lectures helped me understand’; P11: ‘lectures and handouts were instrumental’; P22: ‘lectures... helped me learn research concepts for the first time’	Lectures delivered with visual aids and examples were among the most effective resources for foundational understanding, especially for first-time learners of research and statistics.

	Group Work and Peer Support	P1: 'group work and peer discussion cemented understanding'; P14: 'explained things to each other and solved problems'; P18: 'group activities allowed collaborative application'; P23: 'group work allows sharing of different perspectives'	Working in groups provided opportunities for peer learning, clarification of confusing points, and collaborative problem-solving, enhancing students' understanding of complex concepts.
	Visual Aids and Digital Tools	P5: 'visual tools like graphs and charts helped grasp topics'; P20: 'infographics and statistical software like Jamovi helped learning'; P22: 'organized PPTs made topics easier to understand'; P24: 'visual aids and peer collaboration improved comprehension'	Visual presentations, digital tools, and organized materials were cited as essential aids in helping students digest and remember statistical content.
Theme 3: Effective Instructional Activities	Workshops and Simulations	P1: 'workshop where we analyzed sample dataset... very effective'; P11: 'Jamovi simulation helped apply statistical concepts'; P20: 'seminar-workshop... explained and demonstrated with guided practice'	Workshops and guided simulations allowed students to connect theoretical learning with practical skills. These interactive methods supported retention and meaningful understanding.
	Step-by-step Demonstrations	P10: 'step-by-step examples and real-life applications'; P13: 'used real-life scenarios... easier to connect with'; P24: 'step-by-step discussion made learning easier'	Demonstrating the full process of statistical analysis step-by-step using examples helped demystify abstract statistical processes and supported better retention.
	Use of Student Data and Real Contexts	P5: 'used actual data from our research to teach'; P18: 'real-life data analysis tasks and tutorials'; P26: 'used our own data to apply and practice concepts'	Applying statistics using their own research data enabled students to contextualize learning and appreciate its direct relevance to their academic work.

Theme 1: Effective Teaching Methods in Statistics Step-by-step and Structured Explanations

Many students valued teachers who presented lessons in a clear, sequential manner, allowing them to follow complex statistical concepts more easily and build confidence gradually. One participant noted, "explained concepts step by step and used examples from our research" (P5), while another shared, "breaking down complex topics into manageable steps" (P11). P12 reiterated, "explained the lessons step by step," and P17 expressed appreciation for "step by step ang pag tudlo sa among instructor" [the instructor taught us step by step]. This method aligns with Gabio and Cajandig (2025), who found that clarity of instruction and the organization of lessons are vital instructional factors for improving statistical mastery. Similarly, Douglas (2024) highlighted the positive impact of active and structured learning strategies on student outcomes in statistics courses, emphasizing that stepwise instruction builds foundational understanding and reduces cognitive overload.

Hands-on and Practical Applications

Students frequently mentioned that engaging with hands-on activities and real-data applications facilitated deeper understanding. P1 shared, "used hands-on activities to drive home key statistical concepts," while P10 reflected, "we use real examples, do hands-on activities." P11 described, "guided us through each statistical test," and P24 recounted, "let us use our own data for practice." P26 observed, "from basic to complex... with examples." These practical approaches are echoed by Wahba *et al.* (2024), who demonstrated the effectiveness of AI and digital tools in developing students' statistical reasoning through real-world applications. Yang (2017) further supported the importance of case studies and practice-oriented instruction, finding that these methods promote long-term retention and relevance of statistical knowledge.

Supportive and Patient Teaching Style

Many participants appreciated instructors who were

approachable, patient, and supportive. For example, P5 noted the “teacher’s patient and approachable style made learning manageable,” P16 mentioned being “guided... even if the topic was fast-paced,” P18 observed that the “teacher explained things multiple times,” and P22 remarked, “taas pud gyud kaayo syag pasensya sa amoa” [very patient with us]. The importance of supportive teaching is underscored by Barcelona *et al.* (2023), who found that a strong teacher presence reduces statistical anxiety and fosters a positive learning climate, particularly in challenging subjects like statistics. Aquino and Samuel (2022) also noted that a patient, motivating teaching style helps alleviate students’ anxiety and procrastination, promoting engagement and learning.

Structured explanations, practical engagement, and a supportive teaching style were consistently cited as effective instructional methods, helping students master both foundational and advanced statistical concepts. These approaches made learning less intimidating and more accessible, a finding strongly corroborated by both local and international research.

Theme 2: Learning Resources and Peer Collaboration **Lectures and Teacher Explanations**

Lectures—especially when supplemented with visual aids and clear explanations—were identified as crucial resources. P2 explained, “lectures... with the help of PPT... made concepts clear,” and P10 remarked, “lectures helped me understand.” P11 said, “lectures and handouts were instrumental,” and P22 noted, “lectures... helped me learn research concepts for the first time.” Naval *et al.* (2022) affirmed that well-designed modules and lecture materials are essential for foundational learning in statistics, especially for students with limited prior exposure. The use of PowerPoint presentations and handouts was also shown to help in structuring content, aiding memory and comprehension.

Group Work and Peer Support

Collaboration was highlighted as key to understanding challenging topics. P1 reported, “group work and peer discussion cemented understanding,” P14 said, “explained things to each other and solved problems,” P18 pointed out, “group activities allowed collaborative application,” and P23 shared, “group work allows sharing of different perspectives.” Dumale and Gurat (2023) indicated that while collaborative learning was restricted during the pandemic, its importance in normal settings is well-documented. Douglas (2024) also emphasized the role of peer interaction in active learning environments, which not only enhances understanding but builds students’ confidence in discussing and applying statistical concepts.

Visual Aids and Digital Tools

The use of visual resources and technology was repeatedly mentioned as helpful. P5 stated, “visual tools like graphs and charts helped grasp topics,” P20 cited, “infographics and statistical software like Jamovi helped learning,” P22

said, “organized PPTs made topics easier to understand,” and P24 summed up, “visual aids and peer collaboration improved comprehension.” This finding resonates with Tucker *et al.* (2022), who found that visual aids and statistical software reduce students’ apprehension and make abstract ideas concrete. Digital resources, such as tutorials and interactive software, help bridge gaps in conceptual understanding and technical skills.

Lectures, collaborative work, and digital/visual aids are indispensable resources, providing students with diverse means of engaging with statistical content. These resources not only support individual learning but foster an environment conducive to group inquiry and practical application.

Theme 3: Effective Instructional Activities **Workshops and Simulations**

Interactive activities, such as workshops and simulations, were highly regarded by students. P1 reflected, “workshop where we analyzed sample dataset... very effective,” P11 shared, “Jamovi simulation helped apply statistical concepts,” and P20 recalled, “seminar-workshop... explained and demonstrated with guided practice.” Workshops and simulations are strongly endorsed by Yang (2017), who found that experiential learning and guided practice are effective for statistics education—especially in bridging theory and application.

Step-by-Step Demonstrations

Demonstrating procedures and analyses step by step was another valued strategy. P10 stated, “step-by-step examples and real-life applications,” P13 recalled, “used real-life scenarios... easier to connect with,” and P24 confirmed, “step-by-step discussion made learning easier.” Lim *et al.* (2015) found that retrieval-based and stepwise practice, particularly with immediate feedback, helps cement understanding and builds students’ analytical abilities.

Use of Student Data and Real Contexts

Allowing students to apply statistical techniques to their own data was especially impactful. P5 said, “used actual data from our research to teach,” P18 mentioned, “real-life data analysis tasks and tutorials,” and P26 observed, “used our own data to apply and practice concepts.” Wahba *et al.* (2024) found that the use of authentic, student-generated data in teaching statistics leads to more positive attitudes and deeper comprehension, as students see direct relevance to their academic and professional lives.

Interactive activities, demonstrations, and contextualized application of statistics using students’ own data help solidify learning. These methods foster the development of practical skills and promote sustained engagement, as evidenced in both local and global studies.

In summary, students identified a combination of structured instruction, practical engagement, supportive teaching, effective resources, and authentic activities as most effective in learning statistics. These strategies not

only clarify complex concepts but also reduce anxiety, enhance collaboration, and connect classroom learning to real-world applications. Such findings reinforce the need for dynamic, student-centered instructional frameworks, as advocated by recent educational research.

What insights and recommendations can be drawn from students to guide the development of an innovative and responsive teaching framework for data analysis?

Table 3: Thematic Analysis of Student Insights and Recommendations for Framework Development

Main Themes	Sub-themes	Significant Statements	General Description of the Theme
Theme 1: Recommendations for Improving Statistics Instruction	Real-life Examples and Practical Applications	P1: ‘incorporating more practical applications and real-world examples’; P5: ‘use real-world examples or actual student research data’; P14: ‘using more real-life examples to make statistics easier to understand’; P24: ‘use survey data from actual research projects for computing mean, SD, hypothesis testing’	Participants emphasized the importance of using real-life data and contextualized examples to make statistical concepts more relatable and easier to grasp.
	Step-by-Step Explanations and Visual Aids	P5: ‘clear step-by-step instructions’; P12: ‘step-by-step explanations and give handouts they can follow’; P24: ‘breakdown the formulas gradually... use visual tools like Excel or Jamovi’; P10: ‘step-by-step guides and visual aids like pictures and charts’	Students recommended using structured instruction and visual tools to aid comprehension, particularly for complex or abstract topics.
	Supportive Learning Environment	P5: ‘a patient and encouraging teaching style creates a positive learning environment’; P18: ‘fostering a supportive learning environment... greatly enhance understanding’; P24: ‘instructors must be open for questions and approachable’; P16: ‘what if research is spread over more than one semester... so students don’t feel rattled’	Participants expressed that a respectful and responsive teacher presence builds motivation, especially when students are struggling.
Theme 2: Proposed Instructional Methods and Tools	Hands-On and Interactive Learning	P3: ‘simulation during lectures... hands-on’; P10: ‘more hands-on activities using tools like Excel and Jamovi’; P24: ‘give tasks so students can analyze data themselves... interactive class is better’; P26: ‘real-life research data and group activities’	Many participants suggested incorporating more interactive and hands-on activities that give students practical experience in working with data.
	Use of Technology and Statistical Software	P2: ‘tools like Microsoft Excel or Google Sheets’; P18: ‘interactive visualizations and step-by-step guides using Excel’; P20: ‘lecture-based with practical applications... demonstration’; P11: ‘Jamovi or Excel for hands-on practice’	Students highlighted the need to utilize accessible technologies and software for demonstrating and applying statistical procedures effectively.

	Collaborative and Peer Learning Activities	P1: 'group work and discussions to help students learn from one another'; P13: 'add group activities so students can collaborate'; P22: 'games and collaborative activities'; P16: 'hands-on practice and questions... that's when things start to make sense'	Peer collaboration and small group work were seen as essential for mutual support, especially when grasping difficult concepts.
Theme 3: Desired Features of a Teaching Framework	Simplified and Accessible Teaching	P12: 'use simple real-life examples and visuals'; P14: 'step-by-step guides and relatable contexts'; P24: 'use simple language even Bisaya if needed to ensure understanding'; P5: 'simple explanations of key terms and formulas'	A simplified, jargon-free approach was strongly advocated to accommodate diverse learners and improve accessibility of instruction.
	Flexible and Student-Centered Approach	P7: 'it would be nice to have two advisers to support students'; P15: 'every group should have access to a laptop to follow the lessons'; P19: 'each and everyone should learn to interpret the data using Excel'; P6: 'gamified methods for collaboration and engagement'	Students expressed a desire for differentiated instruction, additional support systems, and more equitable access to tools and learning resources.
	Blended Learning and Supplementary Activities	P11: 'provide more workshops for better understanding'; P17: 'always offer supplemental resources... I find it effective'; P25: 'seminar workshop for students... effective for learning'; P20: 'continue the seminar-workshop approach for step-by-step demonstration'	Blended approaches combining lectures, seminars, and hands-on workshops were recommended for holistic and practical engagement.

Theme 1: Recommendations for Improving Statistics Instruction

Real-life Examples and Practical Applications

A central recommendation from students is to anchor instruction in real-world, contextualized examples. As P1 advised, "incorporating more practical applications and real-world examples," and P5 echoed, "use real-world examples or actual student research data." P14 stated, "using more real-life examples to make statistics easier to understand," while P24 suggested, "use survey data from actual research projects for computing mean, SD, hypothesis testing." Such preferences highlight students' desire for authenticity and relevance in instruction, making statistical concepts more tangible and less abstract. This aligns strongly with Gabio & Cajandig (2025) and Wahba *et al.* (2024), both of whom found that the use of authentic data and practical examples enhances statistical literacy and motivation, as students better appreciate the application of statistics in their fields.

Step-by-Step Explanations and Visual Aids

Students emphasized the need for clear, structured instruction. P5 recommended, "clear step-by-step instructions," while P12 urged, "step-by-step explanations and give handouts they can follow." P24 stressed,

"breakdown the formulas gradually... use visual tools like Excel or Jamovi," and P10 requested, "step-by-step guides and visual aids like pictures and charts." Structured guidance, paired with visual resources, helps demystify abstract concepts and supports different learning styles. This mirrors recommendations from Douglas (2024) and Lim *et al.* (2015), who found that scaffolding and visual aids—especially when combined with retrieval-based and stepwise practice—significantly improve students' comprehension and retention.

Supportive Learning Environment

Students consistently expressed the value of a positive and encouraging teacher presence. P5 noted, "a patient and encouraging teaching style creates a positive learning environment," while P18 emphasized, "fostering a supportive learning environment... greatly enhance understanding." P24 shared, "instructors must be open for questions and approachable," and P16 suggested, "what if research is spread over more than one semester... so students don't feel rattled." A respectful and responsive classroom builds confidence and persistence, especially when students encounter difficulties. This finding is strongly reinforced by Barcelona *et al.* (2023), who showed that teacher presence moderates statistical anxiety and

enhances learning outcomes, and by Aquino & Samuel (2022), who noted that supportive environments mitigate anxiety and stress, improving student engagement. Students recommend that instruction should be anchored in real-life data, guided by clear and structured explanations with visual aids, and delivered in a supportive, patient environment. These strategies collectively lower barriers to learning and motivate sustained engagement.

Theme 2: Proposed Instructional Methods and Tools Hands-On and Interactive Learning

A major suggestion is the inclusion of hands-on, participatory activities. P3 proposed, “simulation during lectures... hands-on,” P10 called for “more hands-on activities using tools like Excel and Jamovi,” P24 recommended, “give tasks so students can analyze data themselves... interactive class is better,” and P26 advocated for “real-life research data and group activities.” Active and experiential learning approaches, such as simulations and workshops, foster deeper understanding and application of statistical skills. This echoes the findings of Yang (2017) and Douglas (2024), who demonstrated that interactive and application-based methods support retention and the practical transfer of knowledge.

Use of Technology and Statistical Software

The integration of technology and statistical software was repeatedly highlighted. P2 encouraged the use of “tools like Microsoft Excel or Google Sheets,” P18 suggested, “interactive visualizations and step-by-step guides using Excel,” P20 preferred a “lecture-based with practical applications... demonstration,” and P11 endorsed “Jamovi or Excel for hands-on practice.” Such recommendations align with Tucker *et al.* (2022) and Wahba *et al.* (2024), who found that accessible technology and guided software use reduce cognitive load, lower apprehension, and improve mastery of statistical analysis.

Collaborative and Peer Learning Activities

Students view collaboration as critical. P1 recommended “group work and discussions to help students learn from one another,” P13 wanted to “add group activities so students can collaborate,” P22 promoted “games and collaborative activities,” and P16 noted, “hands-on practice and questions... that’s when things start to make sense.” Peer learning and group tasks facilitate clarification, mutual support, and confidence-building, especially for students hesitant to ask questions in class. Douglas (2024) and Dumale & Gurat (2023) note that collaboration enhances engagement, deepens understanding, and provides practical benefits for diverse learners.

Instructional approaches should integrate interactive, hands-on activities, accessible technology, and collaborative group work, all of which promote meaningful learning, engagement, and skill development.

Theme 3: Desired Features of a Teaching Framework Simplified and Accessible Teaching

Simplicity and accessibility are at the core of students’

recommendations. P12 advised, “use simple real-life examples and visuals,” P14 wanted “step-by-step guides and relatable contexts,” P24 emphasized, “use simple language even Bisaya if needed to ensure understanding,” and P5 requested “simple explanations of key terms and formulas.” A simplified, jargon-free approach makes statistics more inclusive, especially for students with varied backgrounds. Naval *et al.* (2022) found that accessible materials are crucial for supporting first-time or less-confident learners.

Flexible and Student-Centered Approach

Participants advocated for more support systems and equitable access. P7 suggested, “it would be nice to have two advisers to support students,” P15 wished for “every group should have access to a laptop to follow the lessons,” P19 encouraged that “each and everyone should learn to interpret the data using Excel,” and P6 recommended “gamified methods for collaboration and engagement.” Differentiated instruction and expanded resource access accommodate diverse learning needs. Gabio & Cajandig (2025) noted that resource availability and contextual factors influence statistical mastery, while Dani and Al Quraan (2023) argued for flexible curriculum designs to encourage confidence and interest.

Blended Learning and Supplementary Activities

Blended, multimodal approaches were also recommended. P11 suggested, “provide more workshops for better understanding,” P17 emphasized, “always offer supplemental resources... I find it effective,” P25 proposed, “seminar workshop for students... effective for learning,” and P20 recommended to “continue the seminar-workshop approach for step-by-step demonstration.” Combining lectures, seminars, workshops, and online resources ensures both foundational understanding and applied skills, as demonstrated in Yang (2017) and Douglas (2024).

A student-centered framework should be simple, flexible, and inclusive, featuring accessible language, varied support, and a blend of lectures, workshops, and supplementary resources, thus accommodating diverse learners and learning contexts.

In summary, students call for a responsive teaching framework that emphasizes practical application, structured and visual instruction, supportive learning environments, hands-on and technology-enhanced activities, collaboration, and flexibility. Such a framework should use real data, encourage peer and teacher support, simplify complex topics, and provide diverse, blended learning opportunities. These recommendations directly reflect and extend current evidence in statistics education literature, advocating for more equitable, accessible, and effective instruction in data analysis.

What innovative teaching framework can be developed based on the findings?

Based on the study’s findings, an innovative teaching framework for statistics—the Scaffolded Teaching

Table 4: Proposed Teaching Framework: Scaffolded Teaching Approach to Transform Statistics Learning (S.T.A.T.S. Learning Framework)

Week	Component / Focus	Topics / Activities	Expected Output
Week 1	<p>S – Scaffolded Learning (Diagnosis: Survey/diagnose students’ prior knowledge, attitudes, and software familiarity; use quick pre-tests or interviews to identify anxiety points.)</p> <p>T – Thematic Instruction (Concept Introduction: Use analogies, real-world examples, and scaffolded materials; introduce vocabulary with plain language and (if needed) local language explanations.)</p>	<ul style="list-style-type: none"> • Diagnosis: Pre-assessment of students’ knowledge and software skills • Introduction to Content Validity Index (CVI) and Reliability Testing (Cronbach’s Alpha) • Practical workshop: Evaluating survey/questionnaire items for validity and reliability 	<ul style="list-style-type: none"> • Validated instrument (with CVI) • Reliability analysis output • Reflection on assessment process
Week 2	<p>A – Active Engagement (Application: Engage with authentic datasets (ideally student-generated); embed statistics into the actual research workflow.)</p> <p>T – Technology Integration (Guided Practice: Conduct step-by-step, hands-on sessions with statistical software and group analysis; rotate roles for peer teaching.)</p>	<ul style="list-style-type: none"> • Concept refresher: Descriptive statistics overview • Hands-on data analysis: Frequency, Percentage, Mean, Median, SD using Excel/Jamovi • Introduction to Correlational Analysis: Pearson r, Spearman ρ, Chi-Square, Regression Analysis • Guided computation and interpretation using student-generated data • Collaborative presentation of descriptive and correlation results 	<ul style="list-style-type: none"> • Descriptive stats tables & graphs • Correlation analysis results • Group presentations
Week 3	<p>T – Technology Integration (cont’d)</p> <p>S – Student and Teacher Reflection (Reflection and Feedback: End each activity program with reflection activities; address challenges and successes; gather formative feedback. Framework Feedback Loop: Revisit framework periodically based on student</p>	<ul style="list-style-type: none"> • Introduction to Hypothesis Testing Concerning Means: Parametric: Independent Samples T-test, One-way ANOVA, Paired Samples T-test; Nonparametric: Mann-Whitney U, Kruskal-Wallis H, Wilcoxon Signed-Rank Test • Step-by-step hands-on sessions on software (Excel/Jamovi/SPSS) • Peer-led data analysis and interpretation workshops • Individual reflection and group feedback on learning progress 	<ul style="list-style-type: none"> • Sample hypothesis tests and interpretations • Peer-led demo outputs • Learning journal and feedback survey

Approach to Transform Statistics Learning (S.T.A.T.S. Learning Framework)—can be developed to directly address students’ experiences, challenges, and recommendations. The framework is grounded in the realities described by students, who consistently reported a mix of anxiety, confusion, and eventual growth in confidence as they learned statistics for research. They highlighted the effectiveness of step-by-step explanations, real-life examples, supportive teacher presence, hands-on activities, technology integration, and peer collaboration. These needs reveal a persistent gap in current instruction, especially in under-resourced contexts, and underscore the importance of a responsive, student-centered approach.

The S.T.A.T.S. Framework responds to these gaps by systematically scaffolding students’ learning journeys. It begins with a diagnostic phase that assesses students’ prior knowledge, attitudes, and anxieties through surveys, pre-tests, or interviews. This enables teachers to identify specific misconceptions or barriers and to tailor subsequent instruction accordingly—a practice strongly aligned with Ausubel’s Meaningful Learning Theory, which emphasizes connecting new concepts to learners’ existing knowledge and experiences. The next phase introduces statistical concepts through thematic instruction, using plain language, analogies, and contextualized examples such as evaluating real research

instruments. This approach directly addresses students' calls for authentic, practical applications that make statistics more relevant and less abstract.

Active engagement is a core component of the framework. Students are encouraged to work with real or student-generated datasets and to participate in the research workflow, promoting authentic application of statistical concepts. Collaborative group work is emphasized, allowing students to support each other and share diverse perspectives—an approach students found particularly helpful in deepening their understanding. Technology integration is systematically embedded, with guided, hands-on sessions using accessible tools like Excel or Jamovi. These sessions are designed to demystify software use and build students' confidence through practice and peer support, addressing the widespread apprehension around statistical technology reported in the study.

A distinctive feature of the S.T.A.T.S. Framework is its emphasis on reflection and feedback. Each module concludes with activities that prompt both students and teachers to reflect on what strategies worked, which areas remain challenging, and how instruction can be improved. This feedback loop ensures the framework remains adaptive and responsive to students' evolving needs, fostering an inclusive environment where learning is continually refined. The combination of cognitive scaffolding, practical engagement, emotional support, and adaptive feedback makes the S.T.A.T.S. Framework both innovative and transformative.

In summary, the S.T.A.T.S. Framework is a direct response to students' lived experiences and the best practices identified in the literature. It makes statistics tangible and relevant through contextualization, enhances mastery through scaffolding and technology integration, and cultivates a supportive, collaborative, and reflective classroom culture. By rooting instruction in both student voice and pedagogical theory, this framework provides a sustainable model for improving statistical literacy and confidence among research students, particularly in resource-limited settings.

CONCLUSIONS

This phenomenological study revealed that college students' experiences in learning descriptive and inferential statistics are marked by a complex interplay of anxiety, confusion, and gradual growth in confidence and competence. The findings highlight that students often encounter significant challenges in mastering statistical concepts, interpreting data, and using statistical software, but these difficulties are mitigated by supportive instructional approaches, step-by-step explanations, practical applications, and collaborative learning environments. The consistent need for relevance, clarity, patience, and contextualized teaching underscores a persistent gap between student learning needs and traditional instructional methods. The development of the S.T.A.T.S. (Scaffolded Teaching Approach to Transform Statistics Learning) Framework—rooted in student voice

and best practices—emerges as a responsive, student-centered solution that integrates diagnostic assessment, thematic instruction, active engagement, technology, and reflective feedback. Ultimately, the study affirms that a framework grounded in students' lived experiences and pedagogical theory can foster not only statistical literacy but also confidence, critical thinking, and motivation in research-based learning.

Based on the findings, it is recommended that educators adopt a scaffolded, student-centered teaching framework such as the S.T.A.T.S. Learning Framework to address the diverse needs of students in learning statistics. Teachers should begin instruction with diagnostic assessments to identify students' prior knowledge and anxieties, then provide clear, step-by-step explanations and real-world examples tailored to learners' contexts. Integrating technology and accessible software through guided, hands-on activities will help demystify statistical tools, while promoting collaborative and peer-led learning will enhance understanding and engagement. Regular reflection and feedback loops should be institutionalized to ensure instruction remains adaptive and inclusive. Schools and educational institutions are also encouraged to support teacher training in contextualized and affective statistics instruction, invest in resources for blended and interactive learning, and promote policies that enable flexibility and equitable access to digital tools. By implementing these recommendations, institutions can bridge gaps in statistical education and cultivate a more empowered, statistically literate generation of learners.

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