**Original Research Article**

**THE UTILIZATION OF STATISTICAL TOOLS ON THE ATTITUDE TOWARDS STATISTICS AMONG KCAST STUDENTS: A MIXED METHOD STUDY**

**ABSTRACT**

This study examined the relationship between the utilization of statistical tools and students' attitudes toward statistics at Kapalong College of Agriculture, Sciences, and Technology (KCAST). The purpose of this study was to determine how the use of statistical tools influences students’ confidence, engagement, and perception of statistics. Using a convergent parallel mixed-methods design, the research combined quantitative surveys from 142 students and qualitative insights from 14 participants through in-depth interviews and focus group discussions. The findings revealed that while statistical tools helped simplify computations and improve data analysis, students faced challenges in selecting appropriate tools and interpreting results. Despite these difficulties, those who effectively utilized statistical tools reported increased motivation and appreciation for the subject. The results from both quantitative and qualitative phases aligned, suggesting that integrating technology in statistics education enhances learning experiences. The study highlights the need for structured lessons on statistical tool selection, hands-on practice, and continuous instructional support to help students develop confidence and proficiency in statistical analysis.

**Keywords:** *Statistical tools, attitude toward statistics, mixed methods, quantitative analysis, qualitative insights, statistics education*

**INTRODUCTION**

Many students today struggle with attitudes toward statistics, which significantly affect their ability to learn and perform in the subject. These attitudes, often shaped by previous experiences, anxiety, or a lack of confidence, can become barriers to engagement and academic success. Attitudes are learned predispositions that influence how individuals respond to particular situations, and they play an important role in shaping how students approach their educational journey. In the context of statistics, a subject often viewed as challenging and abstract, these attitudes can lead to reduced motivation, limited participation, and poor academic outcomes. Furthermore, the diversity in students' backgrounds and learning experiences contributes to the development of varied perceptions toward the subject. Therefore, how the teacher makes students feel about what they are learning can either positively or negatively influence their engagement and success (Rusticus et al., 2022).

Attitudes toward statistics remain a major challenge in students’ academic experiences. These attitudes can hinder students’ willingness to engage with the subject, reduce their confidence in learning statistical concepts, and ultimately affect their performance. A recent study in Australia involving 171 undergraduate psychology students revealed that students with unfavorable attitudes toward statistics performed significantly lower in their coursework. The findings emphasize the urgent need to recognize and address students’ perceptions, as these alone can be a strong predictor of academic difficulties in statistics (Lethbridge & Allen, 2024).

In the Philippine context, attitudes toward statistics continue to be a significant challenge among senior high school students. A study by Repedro and Diego (2021) found that 35% of students exhibited attitudes in areas such as affect, cognitive competence, and perceived difficulty, which suggests that a notable portion of students experiences anxiety and frustration when learning statistics. These attitudes are concerning, as they hinder students' engagement and overall academic performance in the subject. Additionally, 42% of students demonstrated low levels of statistical literacy, highlighting the disconnect between students' perceptions of statistics and their ability to perform well in the subject. Addressing these attitudes is crucial for improving students' academic outcomes and fostering a more positive and productive learning environment for statistics education.

This study is of social importance because it highlights the imperative to enhance students' attitudes toward statistics in the educational environment. In today's more data-driven world, statistical literacy is required for success in academics and preparation for the workplace across fields. However, numerous students persist in experiencing negative attitudes toward statistics, which hamper their participation and achievement. By analyzing the impact of statistical tool use on students' attitudes, this study provides meaningful insights that can guide inclusive and effective pedagogy to better equip students for the challenges of the contemporary workforce.

Some earlier studies have investigated students' attitudes toward statistics. For example, Griffith et al. (2020) used a mixed-methods approach with 684 students from different disciplines and concluded that roughly 63% had positive attitudes toward statistics. Still, the research was based on self-reported information with some limitations to generalizability. Likewise, Ayebo et al. (2020) investigated the factor structure of the Survey of Attitudes Toward Statistics (SATS-28) in health science students, obtaining mostly positive findings but cautioning about psychometric validity and narrow sample scope. Although these studies confirm the role of attitude in statistics learning, they also point out shortfalls in terms of sample diversity and instrument constraints. This present research fills these gaps by investigating how the application of statistical methods can influence attitudes towards a deeper and more practical understanding of student engagement.

A strategic plan for dissemination was considered to ensure that findings are available to the target populations. Findings will be disseminated to primary stakeholders at Kapalong College of Agriculture, Sciences, and Technology (KCAST) using official reports and presentations. They will also be forwarded to peer-reviewed open-access journals for scholarly dissemination and presented at local and international conferences to elicit scholarly discussion. Additionally, workshops and simplified presentations will be done for students and teachers for ease of access and practical use. Lastly, findings will be disseminated through digital platforms, including educational websites and social media, to expand reach and impact beyond scholarly communities.

**Research Questions**

1.What is the status of the utilization of statistical tools and attitude towards statistics among students at KCAST?

2.Is there a correlation between the utilization of statistical tools and attitude towards statistics?

3.What are the lived experiences and coping mechanism of students with regards to the utilization of statistical tools and attitude towards statistics?

4.What insights can be drawn from the relationship between the utilization of statistical tools and attitude towards statistics among college students?

5.To what extent do the quantitative data corroborate with the qualitative data?

**METHODOLOGY**

**Research Design**

Through the collection, analysis, and integration of both quantitative and qualitative data in a single study or series of studies, mixed methods research enables researchers to explore complex phenomena by analyzing data in different forms, offering a more nuanced view than using either method alone. Creswell (2014) states that mixed methods approaches were valuable in providing a comprehensive understanding of research problems by combining the strengths of both quantitative and qualitative data.

For the purposes of this study, a mixed-method approach is especially appropriate for investigating the connection between utilization of statistical tools and attitude towards statistics among students at KCAST. Through the use of both qualitative (such as focus groups or interviews) and quantitative (such as survey findings) data, the study sought to investigate not only quantifiable attitudes but also the more profound, individual experiences that influence them. A thorough grasp of the relationship between students' attitudes toward learning statistics and utilization of statistical tools was made possible by this method.

For the research, a convergent parallel design was used, under which quantitative and qualitative data were gathered separately but concurrently and then combined at the interpretation stage. Specifically, questionnaires were administered to assess the use of statistical tools and attitude toward statistics, simultaneously with interviews and focus group discussions intended to explore into students' personal experiences and perceptions. In this design, both forms of data carry the same weight and are employed to cross-validate and enrich each other. The quantitative aspect enabled the researchers to recognize patterns, trends, and correlations, while the qualitative aspect offered rich, contextual information about the students' lived experiences. This approach allowed for a holistic view of how the use of statistical tools influenced attitude toward statistics, presenting a richer and more dynamic scholarly discourse on the matter.

Descriptive-correlation is a type of research method that aims to describe the relationship between two or more variables without manipulating them. It helps researchers understand how variables are related and can identify patterns or trends. For example, a study might find that higher levels of physical activity are associated with better mental health outcomes (Creswell, 2014).

In the context of this study, descriptive-correlation is important because it allows researchers to explore the relationship between students' study habits and their academic performance. By examining these variables, the study can provide insights into how different study techniques may influence grades, helping educators develop better strategies to support student learning.

Additionally, Phenomenology is a qualitative research method that aims to comprehend how people actually perceive a given occurrence. Creswell (2013) claims that phenomenology enables researchers to understand the core of participants' experiences and to delve into their individual viewpoints. When examining subjective subjects like attitudes and dispositions, phenomenology can be a useful tool in educational research since it allows researchers to examine how students view and experience particular learning environments.

In this study, a phenomenological method was used in the qualitative section to investigate the individual experiences of education major students in relation to their understanding of statistics. The study's goal was to reveal how these students view statistics, the obstacles they encounter, and how the utilization of statistical tools impacts their attitudes toward the subject through detailed interviews. This in-depth investigation offers a more personal insight into the attitudes uncovered in the numerical data.

**Research Respondents**

In the quantitative phase, 223 students who were enrolled in Statistics related courses in the first semester of academic year 2024-2025 from Kapalong College of Agriculture, Sciences, and Technology, and a total of 142 student samples were selected as the key respondents of the study. This includes 97 BSBA Marketing Management students and 45 BSED Mathematics students. These students were chosen using proportional random sampling, following the method described by Milroy and Gordon (2008). For the qualitative phase, participants were chosen using a purposive sampling method. This non-probability technique was used to select individuals who could provide the most valuable insights related to the research questions (Kuper et al., 2008).

The participants for this study on the utilization of statistical tools and attitude towards statistics at Kapalong College of Agriculture, Sciences, and Technology were chosen based on the following inclusion criteria: (a) must be actively enrolled in the Statistics related courses for the first semester of the 2024-2025 academic year; and (b) must have the willingness to participate in the study.

Additionally, participants who take part in the interviews for the qualitative analysis cannot also take part in the quantitative analysis survey. A total of 14 students were selected: 7 participated in in-depth interviews, and the remaining seven joined focus group discussions, with all participants studying at KCAST. Further, students not enrolled in the mathematics education program were excluded from this study.

**Research Instrument**

The study employed a modified survey instrument to measure two core constructs: Utilization of Statistical Tools (UST) and Attitude Toward Statistics (ATS). The UST scale, adapted from Alharbi and Drew (2014), comprised three subscales grounded in the Technology Acceptance Model (TAM): Perceived Usefulness (PU), Perceived Ease of Use (PEU), and Attitude Toward Statistical Tools (ATST). The ATS scale, based on Vanhoof et al. (2011), included four domains: Interest, Competence, Value, and Effort. Both instruments used a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

For the qualitative component, a semi-structured Focus Group Discussion (FGD) and interview guide was developed to explore students’ lived experiences and coping mechanisms related to their use of statistical tools and attitudes toward statistics. The guide consisted of open-ended questions and was validated by a panel of experts to ensure clarity, relevance, and alignment with the research objectives. Revisions were made based on expert feedback to enhance the instrument’s ability to elicit rich, in-depth responses.

**Data Analysis**

Descriptive statistics, like the mean, were utilized in quantitative data analysis to assess participants' average responses. Standard deviation was also used to measure the variability of responses on survey questionnaires related to the utilization of statistical tools and attitudes towards statistics.

This study uses Pearson correlation coefficient parametric test because the data set was tested using Shapiro-Wilk Test and it was found to be normally distributed (not significant). This statistical tool was employed to determine the strength and direction of the relationship between teaching style and student satisfaction among teacher education students. It assesses whether there was a significant correlation between these two variables and the magnitude of that correlation.

Thematic Analysis was applied to the qualitative data gathered from participants' answers and were coded and condensed, then transcribed, arranged, and distilled into themes. Tables, graphics, or a narrative were used to display the data. Using techniques like coding and classifying to arrange the data, we as researchers immerse ourselves completely in the rich descriptive data. Creating themes that explain the experiences from the viewpoint of those who were experiencing them in this case, the instructors at the Kapalong College of Agriculture, Sciences, and Technology were their aim. Qualitative analysis was therefore an iterative process, whereby the developed themes were refined through multiple readings of the data to arrive at a final analysis.

**RESULTS AND DISCUSSION**

**Table 1. Status of Students’ Attitudes Towards Statistics**

|  |  |  |
| --- | --- | --- |
| Variables and Indicators | Mean | Description |
| 1. *Interest*
 |  |  |
| 1. Enabling myself to learn statistics.
 | 4.27 | Very High |
| 1. Being interested in learning statistics.
 | 4.21 | High |
| 1. Being interested in understanding statistical information.
 | 4.25 | High |
| 1. Enjoying taking statistics courses.
 | 4.05 | High |
| 1. Being interested in using statistics.
 | 4.15 | High |
| **Category Mean** | **4.18** | **High** |
| 1. *Competence*
 |  |  |
| 1. Not feeling insecure when I have to do statistics problems.
 | 3.60 | High |
| 1. Not having trouble understanding statistics because of how I think.
 | 3.52 | High |
| 1. Not stressing out during statistics class.
 | 3.49 | High |
| 1. Not making a lot of math errors in statistics.
 | 3.52 | High |
| 1. Not being scared by statistics.
 | 3.62 | High |
| **Category Mean** | **3.55** | **High** |
| 1. *Value*
 |  |  |
| 1. Seeing statistics as relevant in my life.
 | 4.23 | High |
| 1. Having application of statistics in my profession.
 | 4.15 | High |
| 1. Seeing statistics is useful to the typical professional.
 | 4.23 | High |
| 1. Seeing statistical thinking as applicable in my life outside my job.
 | 4.24 | High |
| 1. Will be using statistics in my everyday life.
 | 4.01 | High |
| **Category Mean** | **4.17** | **High** |
| 1. *Effort*
 |  |  |
| 1. Planning to complete all of my statistics assignments.
 | 4.22 | High |
| 1. Working hard in my statistics course.
 | 4.32 | Very High |
| 1. Studying hard for every statistics test.
 | 4.30 | Very High |
| 1. Attending every statistics class lesson.
 | 4.52 | Very High |
| 1. Participating in group discussions and study sessions for my statistics course.
 | 4.32 | Very High |
| **Category Mean** | **4.34** | **Very High** |
| **Overall Mean** | **4.06** | **High** |

**Level of Attitude Toward Statistics**

Table 1 presents the response of KCAST students’ who have statistics related subjects. It highlights the items with the highest and lowest mean ratings for each indicator, categorizing them from very high to low. The table also includes an interpretation of how KCAST students with statistics related courses exhibited their attitude towards statistics. The study obtained an overall mean score of 4.06 with a description of High. This means that the KCAST students agreed to have positive attitude towards statistics. To facilitate better understanding, the study provided a comprehensive illustration based on a detailed analysis of the data collected from the participants.

Similarly, a study by Lethbridge et al. (2024) emphasized that a negative attitude toward statistics correlates with increased anxiety, procrastination, and poor performance. Their study found that students with higher anxiety levels demonstrated low engagement with statistical concepts and generally weaker academic outcomes. In contrast, students who reported a positive attitude toward statistics exhibited high levels of engagement and confidence in performing statistical tasks.

The first indicator under this variable was interest, which obtained a high level. Many students expressed that the accessibility of statistical software and its ability to simplify computations contribute to their sustained enthusiasm for learning statistics. This suggests that the use of statistical tools fosters an interactive and engaging learning environment that motivates students to explore statistical concepts further. By incorporating statistical tools in instruction, educators can enhance students' curiosity and willingness to apply statistical methods effectively.

A recent study by Al-Haddad et al. (2024) emphasized the importance of student interest in statistics, noting that students who found the subject engaging tend to retain information better and apply statistical knowledge more effectively. Their findings align with the current study, demonstrating that integrating statistical tools into instruction enhances students' motivation and curiosity toward statistical analysis. When students perceive statistics as relevant and applicable, their engagement in learning increases, leading to better comprehension and practical application of statistical methods.

The second indicator under this variable was competence, which also obtained a

high level. The results show that students perceive themselves as competent in utilizing statistical tools, with many expressing confidences in their ability to navigate statistical software and apply various analytical techniques. However, some students also reported challenges in selecting the appropriate statistical method for specific problems, indicating the need for further instructional support in this area. Developing statistical competence requires continuous practice, exposure to real-world applications, and structured guidance from educators to help students refine their analytical skills.

This finding was consistent with the study of Milic et al. (2019), which demonstrated a positive correlation between students' academic achievement and their statistical competency. Their research found that students who developed confidence in statistical tools performed better in statistical analyses, reinforcing the importance of hands-on training and continuous practice in fostering statistical competence. As students gain proficiency in statistical tools, they become more efficient in problem-solving and data interpretation, strengthening their overall mathematical reasoning skills.

The third indicator under this variable was value, which obtained a high level. The findings suggest that students recognize the value of statistical tools in enhancing their data analysis skills and improving their decision-making abilities. Many students acknowledged that statistical tools provide practical applications that extend beyond the classroom, reinforcing the importance of statistical literacy in real-world contexts. When students understand the significance of statistical tools in various industries, they become more motivated to develop proficiency in statistical analysis and research.

This was supported by Smith and Dai (2023), who found that students who perceive statistical tools as valuable are more likely to engage with the subject actively and achieve higher academic performance. Their study highlighted that emphasizing the real-world applications of statistical tools helps students appreciate their significance, thereby increasing their motivation to develop proficiency in statistics. By connecting statistical education with real-world problem-solving, students can better understand how data analysis impacts decision-making in different sectors.

The fourth indicator under this variable was effort, which obtained a very high level. The results indicate that students exert considerable effort in learning and applying statistical tools, with many expressing a strong commitment to developing proficiency in statistical analysis. Despite initial challenges, students demonstrated persistence in navigating statistical software and applying analytical techniques to their coursework. This suggests that fostering a growth mindset and encouraging perseverance in statistical learning can help students overcome difficulties and enhance their analytical abilities.

This aligns with the study of Hofverberg et al. (2022), which emphasized that student effort plays a crucial role in achieving statistical literacy and competence. Their research found that students who actively engaged with statistical tools and dedicated time to practice were more likely to perform well in statistics courses, reinforcing the significance of sustained effort in mastering statistical analysis. Regular engagement with statistical tools helps students build confidence in applying statistical techniques accurately and efficiently.

**Table 2. Status of Students’ Utilization of Statistical Tools**

|  |  |  |
| --- | --- | --- |
| Variables and Indicators  | Mean  | Description |
| 1. *Perceived Usefulness*
 |  |  |
| 1. Having perception that statistical tools are beneficial to my homework and research.
 | 4.41 | Very High |
| 1. Finding statistical tools useful in my statistics course.
 | 4.47 | Very High |
| 1. Having perception that using statistical tools in learning Statistics would enable me to accomplish tasks more quickly.
 | 4.35 | Very High |
| 1. Having perception that using statistical tools would improve my class performance.
 | 4.34 | Very High |
| 1. Having perception that using statistical tools would increase my productivity.
 | 4.32 | Very High |
| **Category Mean** | **4.38** | **Very High** |
| 1. *Perceived Ease of Use*
 |  |  |
| 1. Feeling that it would be easy to become skillful at using Statistical tools.
 | 4.24 | High |
| 1. Learning to operate statistical tools with ease.
 | 4.14 | High |
| 1. Finding statistical tools to be flexible to interact with.
 | 4.16 | High |
| 1. Doing what I want to do in statistical course is easy with statistical tools.
 | 4.19 | High |
| 1. Feeling that I have an ability to determine statistical tools.
 | 4.10 | High |
| **Category Mean** | **4.17** | **High** |
| 1. *Attitude Towards Statistical Tools*
 |  |  |
| 1. Learning statistics using Statistical tools because it makes things easier.
 | 4.39 | Very High |
| 1. Wanting to learning better in using statistical tools to help with learning statistics.
 | 4.34 | Very High |
| 1. Liking the idea of exploring through statistical tools.
 | 4.31 | Very High |
| 1. Thinking that using statistical tools is worthwhile for learning.
 | 4.27 | Very High |
| 1. Thinking that statistical tools does not take too much time in learning my statistics course.
 | 4.18 | High |
| **Category Mean** | **4.30** | **Very High** |
| **Overall Mean** | **4.28** | **Very High** |

**Level of Utilization of Statistical**

Table 2 presents the response of KCAST students’ who have statistics related subjects. It highlights the items with the highest and lowest mean ratings for each indicator, categorizing them from very high to low. The table also includes an interpretation of how KCAST students with statistics related courses exhibited their utilization of statistical tools. The study obtained an overall mean score of 4.28 with a description of very high. This means that the KCAST students agreed to have utilization of statistical tools. To facilitate better understanding, the study provided a comprehensive illustration based on a detailed analysis of the data collected from the participants.

Moreover, the findings support those of Kumar et al. (2023), who examined 300 original research articles from five major biomedical publishing groups to assess the application and reporting of statistical tools. Their study revealed that collaboration with statistical experts led to more accurate data interpretations, and that articles reporting consultation with statisticians exhibited a very high level of methodological rigor. This aligns with the present study’s result, where students demonstrated a high level of statistical tool utilization, suggesting they are likely developing a stronger foundation for precise and meaningful statistical analysis. These parallels highlight how adequate training and support in statistical methods enhance students’ readiness for data-driven academic tasks and professional decision-making.

The first indicator under this variable was perceived usefulness, which obtained a very high level The findings indicated that students who viewed statistical software as beneficial were more likely to engage actively in statistical tasks. Many students appreciated how these tools streamlined calculations and minimized errors, making statistical analysis more manageable. However, students who struggled with technical aspects of statistical tools expressed frustration, which hindered their overall experience. This highlights the need for targeted instruction to maximize the perceived benefits of these tools.

Felix et al. (2024) found that while statistical tools are essential for quantitative research, they do not always enhance qualitative findings. Their study highlighted that qualitative research relies on complex contextual narratives, which statistical methods may overlook. Researchers who rely solely on statistical tools might miss critical interpretative elements necessary for understanding social phenomena. This underscores the need for integrating qualitative and quantitative methods for a more holistic analysis. These findings emphasize the importance of methodological balance in statistical education are crucial for quantitative analysis, they do not always enhance qualitative research. In the context of this research, this serves as a reminder that while perceived usefulness of statistical tools in quantitative tasks is high, educators should still foster awareness of the limitations of such tools in broader research contexts.

Similarly, the study of William (2024) found that the use of statistical tools in educational research significantly enhances the reliability and validity of findings. Their study showed that researchers who utilized statistical methods were able to analyze large datasets effectively, highlighting the necessity of equipping educators with statistical software skills to enhance their teaching methodologies. These findings reinforce the importance of statistical tools in data-driven education significantly improve the reliability and validity of findings. This aligns with the current study’s implication that when students perceive statistical tools as useful, they not only perform better but also develop deeper analytical thinking essential for academic and professional contexts.

The second indicator under this variable was perceived ease of use, which also obtained a high level. The findings revealed that students who found statistical tools intuitive and user-friendly demonstrated higher engagement in statistical tasks. Many students reported that clear instructions and guided practice helped them develop proficiency, reducing their anxiety toward statistical software. However, technical difficulties, unfamiliar interfaces, and lack of training contributed to frustration among some students. This suggests that structured learning approaches can improve students' ease of use and overall experience with statistical tools.

Congruent to the study of Thompson (2021), the study revealed that the negative effects of excessive reliance on statistical tools in social science research. The study revealed that overemphasizing statistical significance can lead to the misinterpretation of data, often at the expense of contextual insights. Researchers who prioritize statistical results over qualitative findings may draw conclusions that lack real-world applicability. The study suggests that a balanced approach integrating both statistical and qualitative methods ensures more meaningful analysis. This ensures accurate and meaningful interpretation of research findings.

The third indicator under this variable was attitude towards using statistical tools, which obtained a very high level. The findings indicated that students with positive attitudes were more likely to explore statistical software independently and apply their skills in research. Many students appreciated the efficiency and accuracy provided by statistical tools, which contributed to their motivation in learning statistics. However, some students expressed hesitation due to perceived complexity and lack of confidence in their ability to use these tools effectively. Encouraging positive attitudes through interactive learning strategies can improve students' adaptability to statistical tools.

In agreement with the study of Bowman and Muir (2021), the study revealed that students who received proper training in statistical tools demonstrated greater confidence and competence in applying them to research. Their study emphasized that integrating hands-on software activities not only enhanced motivation but also strengthened problem-solving skills. Early exposure to statistical tools significantly improved students' adaptability and proficiency, enabling them to navigate complex data analysis with ease. Moreover, the study underscored the importance of continuous support in fostering positive attitudes toward statistical learning. Implementing interactive and technology-driven learning strategies cultivates a more engaging and productive environment, ultimately boosting students' willingness to explore statistical software and improving their overall academic performance.

*Table 3.*

*Significant Relationship Between Attitude Towards Statistics and Utilization of Statistical Tools*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | **Mean** | **R-Value** | **P-Value** | **Decision**$α$**=0.05** |
| Attitudes Towards Statistics | 4.06 | .440 | <.001 | Ho Rejected |
| Utilization of Statistical Tools | 4.28 |

**Significance of the Relationship between Teacher’s Instructional Competence and Language Learning among English Major Students**

Table 3 displays the correlation analysis findings between attitudes towards statistics and students' use of statistical software. The correlation coefficient, r (142) = .440, lies within the moderate range (0.40–0.60) defined by Cohen and Holliday (1983), showing that although not very strong, there is a definite tendency for one variable to rise while the other rises. Since the p-value (< .001) is less than the significance level (α = 0.05), the null hypothesis was rejected and there existed a positive and significant linear relationship among students' use of statistical software and their attitudes towards statistics.This finding implies that students who are more positive in their attitude towards statistics will be more likely to use statistical tools efficiently. It underlines the significance of fostering a learning environment that facilitates not only statistical knowledge but also a positive disposition to the subject.

Evidence from earlier studies substantiates this conclusion. For instance, a study indicated that student influence heavily impacts college students' attitude because statistically supported structured exposure under directed instruction enhanced motivation, lowered anxiety, and enhanced statistical thinking. This supports the Technology Acceptance Model (TAM), which argues that perceived usefulness and ease of use are central to technology adoption. Those students who viewed statistical tools as useful and within reach were more likely to approach statistical learning in a positive way.

Additional research also confirms that students with more hands-on experience with statistical software have better self-efficacy and statistical performance. Smith and Dai (2023) write that direct exposure to statistical tools increases confidence, prompts greater participation, and promotes greater statistical proficiency. Their study further reveals how familiarity and accessibility are key factors for students to be comfortable using statistical tools for problem-solving. Once students become comfortable using statistical software, they are encouraged to engage in research-related activities and use their skills for real data analysis, hence strengthening their knowledge of statistical concepts. A technological approach to statistical education finally boosts both confidence and competence, leading to better learning outcomes.

**Table 4. Lived Experiences and Coping Mechanisms of Students in Maintaining or Regaining a Positive Attitude Towards Statistics.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ISSUES PROBED** | **CORE IDEAS** | **CODE/ CATEGORIES** | **ESSENTIAL THEMES** | **THEORETICAL SUPPORT** |
| Challenges in Understanding Statistics | * having misconceptions about the simplicity of statistics.
* having difficulties in transitioning to advanced concepts, and struggle with abstract ideas.
* having insufficient amount of practice to master statistical problem solving.
 | Having Misconceptions in Learning Statistics | Having Misconceptions and Learning Gaps in Statistics | Constructivist Learning Theory of Piaget (1976) |
| * having limited foundational knowledge due to lack of prior exposure of the concepts.
* having difficulty with formula with heavy topics like central tendency and probability.
* Having learning gaps due to prior missed instruction.
 | Having Insufficient Knowledge with Statistics |
| Motivational Factors in Learning Statistics | * building encouragement from instructors.
* having career prospects in statistics.
* having real-world applications to increase engagement.
* developing a sense of personal relevance and value in statistics
 | Learning Statistics from Teachers and Practical Applications | Mastering Statistics through Teaching and Practical Application | Self-Determination Theory of Deci and Ryan (1985) |
| * attaining personal satisfaction after mastering difficult concepts.
* shifting mindset towards seeing statistics as useful.
* having perseverance despite learning challenges.
 | Fostering Perseverance and Mastery in Statistics |
| Coping Strategies for Learning Difficulties | * developing structured study habits.
* having preference for specific study time.
* using self-affirmations to motivate oneself to study.
 | Building Self-Directed Study Habits | Developing Self-Directed Learning through Collaboration  | Self-Regulated Learning Theory of Zimmerman (1989) |
| * utilizing multimedia resources such as video tutorials.
* participating in peer study groups for collaborative learning.
* seeking explanations from classmates when formal instruction feels insufficient
 | Using Online Resources and Collaborative Learning |
| Stress and Frustration Management | * taking breaks to refresh mental focus.
* setting academic goals for learning motivation.
* balancing academic responsibilities with personal time.
 | Enhancing Learning Through Balance and Focus | Fostering Balanced Learning and Growth Mindset | Coping Theory of Lazarus and Folkman (1984) |
| * adopting a growth mindset to embrace challenges.
* using relaxation techniques such as listening to music to reduce anxiety.
* normalizing struggle and framing mistakes as learning opportunities.
 | Cultivating Growth Mindset and Reducing Anxiety |
| Role of Statistical Tools in Enhancing Learning | * using of statistical tools to simplify data analysis.
* assisting in bridging manual computation with digital methods.
* improving conceptual understanding in Statistics.
 | Integrating Technological Tools for Statistical Understanding | Enhancing Statistical Learning through Technology Integration | Technology Acceptance Model of Devis (1989) |
| * initial difficulties in learning statistical software.
* recognizing statistical importance in research and data-driven decision-making.
* learning through trial and error due to insufficient software guidance.
 | Overcoming Challenges in Statistical Software Learning |

**The Lived Experiences and Coping Mechanisms of Students with Regards to their Attitude Towards Statistics**

There are five key themes that came out of the in-depth interviews and focus group discussions carried out to address the first research question. Prior to the presentation of these themes, Table 4 provides the profile of the purposively selected participants fulfilling the inclusion criteria: they should be KCAST students undertaking a statistics-related subject. This ensures that the qualitative data gathered is immediately applicable to the context of statistical learning.

Statistical misconceptions are commonly problematic for students, and these have a negative impact on their performance, indicates Hofverberg et al. (2022). The authors' research indicates that presenting instructional guidance in steps and contextualized illustrations can improve the conceptual understanding of complicated statistical ideas among students significantly. Interventions of this sort ameliorate conceptual clarity and fill gaps in knowledge.

Similarly, Reyes et al. (2023) highlighted that students with poor foundations in statistics often misinterpret data, leading to analytical errors. Their observations highlight the significance of incorporating statistical literacy programs and enhancing prerequisite mathematical skills to enable proper data interpretation and application.

In sum, these studies highlight the necessity of both conceptual knowledge and practical assistance in teaching students about statistics. The findings from the literature serve to inform interpretation of the qualitative themes presented below, which represent students' lived experiences of working with statistical software and coursework.

**Table 5. Insights of Students Regarding the Use of Statistical Tools on Their Attitude Toward Statistics.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ISSUES PROBED** | **CORE IDEAS** | **CODE/ CATEGORIES** | **ESSENTIAL THEMES** | **THEORETICAL SUPPORT** |
| Enhanced Understanding Through Statistical Tools | * having statistical tools to help organize and structure analysis.
* making statistical knowledge more meaningful by statistical analysis.
* using statistical tools to increase confidence in data accuracy and reliability.
 | Utilizing Statistical Tools for Meaningful Analysis | Enhancing Statistical Analysis and Data Interpretation | Cognitive Load Theory of Sweller (1988) |
| * enhancing the interpretation of data rather than just recognizing numbers.
* understanding the relevance of statistics in research and real-world decision-making.
* using graphical representations to identify patterns and correlations in datasets.
 | Developing Data Interpretation Skills in Statistics |
| Impact on Motivation and Engagement in Learning Statistics | * enhancing interest through interactive and technology-driven learning experiences.
* having persistence in learning software functions to improve statistical proficiency.
* experiencing satisfaction from the ease and accuracy provided by statistical tools.
 | Enhancing Statistical Proficiency through Technology Integration | Strengthening Statistical Skills through Technology Integration | Flow Theory of Csikszentmihalyi (1990) |
| * developing confidence when successfully applying tools.
* facing setbacks when struggling with software navigation.
* feeling more motivated when statistical tools simplify complex calculations.
 | Building Confidence in Statistical Tool Application |
| Challenges in Using Statistical Tools | * struggling to select the most suitable statistical method for specific analyses.
* facing confusion in determining which statistical test or approach to use.
* experiencing difficulties with software commands, interface, and data input.
 | Having Challenges in Statistical Method Selection | Emerging Challenges in Statistical Learning and Application | Zone of Proximal Development of Vygotsky (1978) |
| * having limited exposure to statistical software leading to an extreme learning curve.
* struggling to independently implement learned statistical methods in real scenarios.
* being technologically inexperienced, hinders software mastery.
 | Having Learning Gaps in Statistical Software Proficiency |
| Influence of Learning Environment | * benefiting from well-structured and thorough explanations by instructors.
* having increased student interest due to the teacher’s proficiency in explaining statistical concepts.
* strengthening comprehension through interactive and practice-based learning approaches.
 | Teachers’ Proficiency for Effective Statistical Learning | Enhancing Statistical Learning through Proficient Teaching | Social Learning Theory of Bandura (1977) |
| * shaping students’ perceptions of statistics through engaging and supportive teaching methods.
* learning statistical software through knowledge-sharing and peer assistance.
* benefiting from collaborative environments where peers clarify concepts.
 | Transforming Statistics Learning through Collaboration |
| Recommendations for Effective Statistical Education | * incorporating hands-on exercises and real-world applications to improve understanding.
* promoting perseverance by fostering a supportive and motivating learning environment.
* using technology and software tools consistently across instruction to build confidence.
 | Augmenting Statistical Learning through Application and Support | Enhancing Statistical Education through Application and Quality Instruction | Constructivist Learning Theory of Piaget (1976) |
| * strengthening instructors’ ability to teach statistics effectively through continuous training.
* assessing instructional strategies to improve student comprehension and engagement.
* providing opportunities for students to practice with statistical software in a guided manner.
 | Advancing Statistical Education through Effective Instruction |

**Insights of Students Regarding the Use of Statistical Tools on Their Attitude Toward Statistics**

Table 5 shows the answers of the participants as they shared their observations about how the use of statistical software impacts the attitudes of students toward statistics. Five critical themes were obtained from the in-depth interviews and focus group discussions as a response to the second research question. These themes were created through coding by recurring issues and are explained in the table.

As argued by Rahman et al. (2024), the application of statistical software using creative teaching methods immensely improves the confidence, motivation, and comprehension of students. In their research, it was established that students who participated in hands-on practice with statistical software performed not only better but also performed more efficiently in interpreting statistical information. Through integrating theory with practice, teachers can develop more interactive and efficient learning environments.

Likewise, Martinez and Valdez (2022) found that students who were formally taught statistical tools gained higher confidence and better attitudes towards learning statistics. Their study indicated the effectiveness of personalized learning approaches, including guided tutorials and practical case studies, in lowering students' anxiety and improving their skill in data analysis.

In summary, these studies highlight the importance of formal and applied exposure to statistical software in influencing students' attitudes and confidence towards statistics. The observations obtained from the participants of this study are consistent with these patterns, highlighting the importance of mixing instruction with practical applications to facilitate meaningful interaction with statistical learning.

**CONCLUSION**

The findings indicate that the utilization of statistical tools significantly influences students' attitudes toward statistics, as supported by quantitative data using Mean, R-Value, and P-Value. The results showed that students rated themselves very high in terms of perceived usefulness and attitude, and high in terms of perceived ease of use of statistical tools. Likewise, their attitudes toward statistics were also rated high in terms of interest, competence, and value, and very high in effort. These ratings suggest that students consistently engage with and benefit from statistical tools, reinforcing their positive outlook and confidence in dealing with statistical concepts.

Further insights were drawn from the qualitative phase of the study, which involved in-depth interviews (IDI) and focus group discussions (FGD). The analysis revealed key themes such as: Having Misconceptions and Learning Gaps in Statistics, Mastering Statistics through Teaching and Practical Application, Developing Self-Directed Learning through Collaboration, Fostering Balanced Learning and Growth Mindset, and Enhancing Statistical Learning through Technology Integration. Additional themes highlighted students’ perspectives on the impact of statistical tools, including Enhancing Statistical Analysis and Data Interpretation, Strengthening Skills through Technology, Emerging Challenges in Statistical Learning, and the Role of Quality Teaching in Enhancing Statistical Understanding.

Lastly, the integration of both quantitative and qualitative findings confirmed a significant relationship between the use of statistical tools and students' attitudes towards statistics. The convergence of both data sets validated that the effective utilization of statistical tools enhances students’ capacity to understand statistical concepts, solve problems, and apply these tools in real-world situations. This highlights the multifaceted impact of statistical tool usage—not only improving technical skills but also fostering more resilient, confident, and motivated learners in the field of statistics.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, manuscript.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.ChatGPT v4.0 is used to provide interpretation of the raw data results in qualitative and quantitative and qualitative discussion to ensure consistency

2.

3.

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