# Utilization of statistical software applications and its influence on students' attitude and performance in Statistics

Erwin C. Benedictos
erwin.benedictos@lspu.edu.ph
Laguna State Polytechnic University, Sta. Cruz Campus, Laguna, Philippines, 4009

**Abstract**

The study aimed to determine the effect of utilization of statistical software, and it's influence on students' attitude and performance in statistics. In this study, an experimental methodwas used to investigate the research problem. The participants consisted of 30 selected college students who taking up statistics subject with data analysis. The instruments used in the study wereSATS 36, standardized questionnaire by Candace Schau. Findings revealed that majority of the respondents are female and most of them used mobile phone as gadgets used. The study implies that there is a significant affect in using statistical software application to the attitude of the students towards Statistics, as well as to their performance in statistics. Therefore, it is recommended to learn and use statistical software application to those students taking statistics subject with data analysis that help students to improve their performance in statistics and.to encourage and motivate the learners to have a positive attitude toward statistics.

Keywords: Statistics, software, students, attitude, performance

## 1. Introduction

Today, it is difficult to envision statistics instruction without the aid of technology. In modern statistics classes, computers are either projected onto a screen in the classroom or students work at their own computers in a lab setting. A web-based course featuring filmed lectures, interactive discussions, group projects, and electronic test and evaluation tools is a style of education that is more popular nowadays. The technological revolution has had a significant impact on education, possibly more so than on many other fields.

Technology advancements that make it easier for individuals to learn have necessitated the development of a new method for delivering learning and its materials. Technology is frequently used by students as a learning aid. Accounting information systems frequently make use of accounting technology. Statistics also address the usage of technology in the classroom.

The statistics course reflects the typical exposure to statistical analysis and research methodologies, which many students may find valuable in their future jobs. Software for statistics, including SPSS, EViews, and others, is covered in the statistics course. Because it can enhance their capacity to read, synthesize, interpret, and report on their final project, statistics is a crucial subject for students to master. One of the hardest and most difficult subjects is statistics, which can cause performance delays due to emotional and cognitive reactions. One of the subjects that causes students the most worry is statistics, particularly those who study the social and humanities.

Using SPSS in psychology courses at a Slovenian university was the subject of research by Brezavsscek, Sparl, and Zniddarsic (2017). They found that several attitudes, including self-efficacy, worry about statistics, the importance of SPSS, and perceived usability, predicted students' future plans to use SPSS. Brezavsscek and associates did not look into the relationship between these constructs and students' module success. Rode and Ringel (2019) investigated the differences in students' levels of anxiety when interpreting R or SPSS output in introductory statistics classes.

They found that the initial anxiety produced by R output was higher than that by SPSS output. By the

end of the module, the disparity was gone, showing that students can adapt to R just as effectively as they can to SPSS. It should be noted that neither software program was taught to the students in the Rode and Ringel (2019) study. Research exploring the attitudes and experiences of psychology students with software is therefore scarce. Statistical software can be viewed as a form of facilitator that might lessen the students' resistance to learning statistics in the social sciences.

The role of statistical software support during education is still largely unknown, despite the relatively significant number of social sciences education studies on attitudes toward statistics and statistics phobia. In recent decades, statistical methods have grown in importance in research, industry, and society. They offer useful facts that can only be discovered by studying survey data. Despite these realities, statistics courses are typically not offered at universities. Personal experiences that students have with statistics are frequently a source of fear and unfavorable perceptions. When researching statistics,

Students can better understand the value of statistics courses for their future employment by adopting a favorable attitude toward statistical tools. Therefore, it would be beneficial to pinpoint the key elements that could affect the uptake and ongoing use of statistical software (Brezavek, A., Parl, P., & Nidari, A., 2016).

In fact, an enlarged statistics module at an Indonesian institution, under the Guidelines for Assessment and Instruction in Statistics Education (GAISE; 2016), was the most significant development and suggestion in statistics education over the previous ten years (Jatnica, 2015). Jatnica discovered that although students' marks dropped after using SPSS for the duration of the session, they thought their statistical knowledge and skills had improved. Technology's rapid advancement has significantly altered contemporary society and all facets of daily life, including politics, business and trade, and education. Modern society's growth of civilizations and nations is greatly influenced by technical innovation. Along with them, the development of information and communications technology brought about a significant shift in 21st-century educational practices.

Descriptive and inferential statistics are often introduced in Probability and Statistics. The textbook that is required, lectures, and regular chalk and board drills are all common teaching methods in traditional classroom-based statistics courses. However, recent technological advancements give educators a fresh approach to teaching statistics that is pertinent to and adaptable to the needs of the modern educational environment. Technology is increasingly being used in classrooms, and this has several benefits. The use of technology in the classroom can help students learn more actively, collaborate better, become more independent, and focus on task-based instruction, among other things. Nevertheless, despite these activities and movements, statistics is still still consistently viewed as a subject that is dull, difficult, and frightening. Students often memorize the procedures and formulas needed to perform well on exams. Additionally, memorizing equations without understanding them is low level learning (Mendezabal & Tindowen, 2017).

In today's educational environment, the use of technology as a teaching aid is crucial. Education in mathematics and statistics also reflects this. Even though technology is finally being incorporated into education, it is still difficult to use for both teaching and learning.

The statistics course reflects the standard exposure to research methodology and statistical evaluation, which may be helpful for many students' future employment. Software for statistics, including SPSS, EViews, and others, is available for the statistics course. Statistics is a subject that every student should be proficient in since it can improve their ability to read, summarize, interpret, and report on their final assignment. One of the most difficult and demanding subjects is statistics, which can cause emotional and cognitive reactions that might cause performance to lag.

One of the subjects that causes the most concern is statistics, particularly for students who study social and humanistic disciplines. A student's attitude toward computers might be summed up as what they love or hate about them.

Due to the perception of statistics as a hard science, students believe it to be particularly challenging for them. Many of us who teach statistics must put in a lot of effort to enhance our curriculum. It is necessary to focus some of that work on creating and using effective assessments. The teaching-learning process depends on students' attitudes toward statistics, according to theory, research, and the experiences of both teachers and students of statistics. The impact of using statistical software on students' attitudes and

performance in statistics is discussed in this essay.

1.1. Background of the study

An increasing corpus of studies has shown that students' performance in statistics and research technique courses suffers as a result of statistics fear. The fact that most samples only consist of undergraduate students completing an introductory level statistics curriculum is a significant constraint of the statistics attitude literature. There aren't many studies that look at students who take statistics modules later in their degrees. The study by Walker and Brakke (2017), which contrasted students' attitudes in an introductory and advanced undergraduate curriculum, stands out as an outlier. They found a marginally favourable attitude toward statistics among the women in their sample who attended a historically Black college in the United States. In the advanced class, attitudes were much higher at the start of the semester but not at the end because of disparities between the modules that they discovered. Therefore, both the introductory and advanced classes had generally mixed reviews.

In today's educational environment, the use of technology as a teaching aid is crucial. Education in mathematics and statistics also reflects this. Even though technology is finally being incorporated into education, it is still difficult to use for both teaching and learning. The use of technology in the classroom is still very low, even though many colleges and universities now have access to fast internet connections, professors who are trained to use educational technology, and supportive institutional policies.

Regardless of study level, statistics modules may benefit students more if they assist them in developing a practical ability, like using statistical software (Hernandez 2006). In fact, an enlarged statistics module at an Indonesian institution, under the Guidelines for Assessment and Instruction in Statistics Education (GAISE; 2016), was the most significant development and suggestion in statistics education over the previous ten years (Jatnica, 2015). Jatnica discovered that although students' marks dropped after using SPSS for the duration of the session, they thought their statistical knowledge and skills had improved. Another work is the work of Brezavsscek, Sparl, and Zniddarsic (2017) who examined the used of SPSS in psychology modules at a Slovenian university.

They discovered that several attitudes (such as self-efficacy, worry about statistics, the utility of SPSS, and perceived simplicity of use) influenced students' plans to use SPSS in the future. Brezavsscek and colleagues did not investigate the relationship between these constructs and students' success in the module. In beginning statistics modules, Rode and Ringel (2019) looked at the differences in anxiety around reading R or SPSS results. They discovered that while the result from R initially caused greater anxiety than the output from SPSS, the difference vanished by the conclusion of the program, demonstrating that students can adapt to R just as well as they can to SPSS. Note that neither of the software packages was used to teach the students in the Rode and Ringel (2019) study how to utilize them. As a result, nothing is known about psychology students' attitudes toward and experiences with software.

Software called a statistical package is created specifically to do statistical analysis. Several software programs, including SPSS (http://www.spss.com), S-plus (http://www.insightful.com), R (http://www.r-project.org), SAS (http://www.sas.com), and Minitab (http://www.minitab.com), have been used by statisticians for a long time. Although the industry's needs were the main focus during development, many programs have since changed to become more menu-driven and user-friendly for students. Software that is operated by file menus rather than commands is referred to as menu driven.

To comprehend these attitudes and how they affect teaching and learning, the Survey of Attitudes toward Statistics (SATS) was established. The six components of the SATS are affect (students' feelings about statistics), cognitive competence (students' attitudes about their intellectual knowledge and skill when applying statistics), value (students' attitudes about the usefulness, relevance, and value of statistics in personal and professional life), difficulty (students' attitudes about the difficulty of statistics as a subject), interest (students' level of individual interest in statistics), and effort (amount of work the student expends to learn statistics).

Students who have a favorable attitude about statistical software when learning statistics are more likely to have a positive attitude toward statistics in general and to see the value of taking statistics courses for

their future employment. Therefore, it would be beneficial to pinpoint the key elements that may affect the uptake and ongoing use of statistical software (Brezavek, Parl, & Nidari, 2016).

Therefore, the definition of statistical software self-efficacy (SSSE) is the conviction that one can conduct a statistical analysis utilizing statistical software. People who have lower self-efficacy using statistical software will be more readily irritated by performance barriers and will react by lowering their judgments of their abilities to utilize statistical software. On the other hand, those who have a high level of confidence in their ability to use statistical software are less likely to be discouraged by challenging issues. They are therefore more likely to persevere in their efforts and get through whatever challenges they encounter, which supports their decision to employ statistical software. Additionally, students have a positive attitude toward learning statistics using PSPP software and other forms of technology. This indicates that senior high school students have a good attitude toward using PSPP to learn statistics, which has led to their increased interest in the material and increased participation in class discussions.

The study by Sto,-Tomas, M., Tindowen, D. J, Mendezabal, M. J, Quilang, P. & Agustin, E. T. found that students thought technology made learning statistics entertaining, participatory, and easy to grasp. (2019) examined how Grade 11 Senior High School Students used PSPP software to learn statistics, along with their attitudes and academic achievement regarding Statistics. The findings show that senior high school students have a positive view about statistics and cognitive abilities. This indicates that a moderate attitude toward the topic is present when PSPP is used.

Students nevertheless stated that their competency and grasp of the topic were neither extremely high nor extremely low, despite the use of mathematical software in teaching statistics. This may be attributable to the subject's difficulty and their misconception that it is solely procedural and conceptual in nature, even though rigorous statistical analysis is required. Even though there is technology to help them study the subject, they still struggle. However, the results show that using technology also makes it simple for pupils to learn statistics.

The findings conform to the results of previous studies that students have a negative attitude towards mathematics and statistics if the lessons will be delivered in a traditional way, but there is an increase in the interests of the students and their attitudes are becoming positive if there is an integration of technology in the classroom.

In today's educational environment, the use of technology as a teaching aid is crucial. Education in mathematics and statistics also reflects this. Even though technology is finally being incorporated into education, it is still difficult to use for both teaching and learning. The use of technology in the classroom is still very low, even though many colleges and universities now have access to fast internet connections, professors who are trained to use educational technology, and supportive institutional policies.

1.2. Theoretical Framework

We regularly generate and transport enormous amounts of data in the commercial world nowadays. Having access to so many data give a wealth of options from a commercial perspective, but how can we put the data to use? Utilizing business intelligence is the solution. Business intelligence is the name given to a category of software that gathers and combines data, visualizes information, unearths trends and insights buried within data, and aids users in making data-informed decisions. Statistical software is one of the various types of BI solutions that focus on more specialized requirements. Software for statistical analysis, often known as statistical software, refers to instruments that help with data collecting and analysis based on statistics to reveal patterns and trends. When performing data science, they frequently use statistical analysis approaches and theories like regression analysis and time series analysis. Quantitative data science includes statistical analysis. As the name implies, statistical analysis uses statistics, which is "the science that deals with the collection, classification, analysis and interpretation of numerical facts or data...by use of mathematical theories of probability," according to BI software provider SAS. "Statistical analysis" is defined as "the science of collecting, exploring and presenting large amounts of data to discover underlying patterns and trends." Descriptive statistics and inferential statistics are two crucial statistical techniques used in data analysis. Both approaches are valuable and provide unique insights. When most people hear the word "statistics," they

typically think of descriptive statistics, which is the study of data that aids in the meaningful description or summarization of data. Without drawing any conclusions outside the scope of the research or addressing any assumptions, they simplify vast amounts of data for straightforward interpretation. We can present and comprehend data more readily using descriptive statistics as opposed to processing it in its raw form. In contrast, inferential statistics enables researchers to test a hypothesis using a sample of data and then draw conclusions and generalize about the larger population. Beyond the facts at hand, inferential statistics aims to draw inferences about potential outcomes. For descriptive statistics, we select a group to investigate, measure every subject in that group, and give a precise numerical description of the group. Although descriptive statistics are useful for examining the spread and center of the data, they cannot be utilized to draw more generalizations or conclusions because they are expressed as exact numbers. For inferential statistics, we plan how to obtain a representative sample after first identifying the target population. The results will be expressed in confidence intervals and margins of errors based on the uncertainty of using a sample that cannot accurately reflect the population. This is done after studying the sample and testing hypotheses based on the sample data. Both types of statistics are at the core of the statistical analysis that drives statistical software, which is used in tandem to intelligently address business challenges. Business intelligence can benefit from statistical software in a variety of ways. Statistics may increase the value of the proprietary data that belongs to your company even further since business intelligence is the art of gathering, evaluating, and turning data into insights that can be use. Statistical analysis may help you plan with predictive analytics models based on previous data and provide insight into how efficiently your firm is performing. While performing statistics can be challenging, with the correct BI tools, it can be a breeze. By no means is statistical analysis simple, and most statistical software platforms can be perplexing or outright incomprehensible to the common user. Additionally, certain tools have steeper learning curves than others, which makes them more challenging to master. Find out who will be using the product and how much expertise they have with statistics. An essential phase in the evaluation process is considering the interoperability and integration capabilities of potential statistics software. Pricing for statistical software varies from free for open-source programs like Python and R to thousands of dollars per license for more feature-rich options (Tseng, H., 2021, November 6).

In a computer system, software is a type of program which permits to accomplish some unique activities or control the computer. "The term "software" refers to the set of electronic program instructions or data a computer processor reads to perform a task or operation." Software improves the precision and productivity of the work. It essentially tells the peripheral devices throughout the entire computer system what to do and how to do it. Software for doing complex statistical analysis is known as statistical software. To deliver science-based insights into patterns and trends, they are the tools that help with the organizing, analysis, and presentation of data sets. To perform data sciences, statistical software uses statistical analysis theorems and procedures like regression analysis and time series analysis (Shrestha, R., 2022, February 5).

Although the terms "data" and "statistics" are frequently used interchangeably, there is a significant difference between the two in academic research. Data are discrete items of information that are recorded and used for analysis. The foundation from which statistics are derived is raw data. The outcomes of data analysis, including its interpretation and presentation, are statistics. In other words, a calculation has been performed that offers some insight into the significance of the data. Even though it's not required, statistics are frequently presented as tables, charts, or graphs. In scholarly study, statistics and data are commonly used. Government organizations frequently release data, such as those on unemployment or educational literacy. These statistics are frequently referred to as "statistical data" (Dewitt Wallace Library., 2021, March 9).

People today regularly create and share enormous amounts of data in the corporate sector. Access to so many data offer a wealth of commercial prospects, but how can those potential materialize? With the use of business intelligence, it is simple to gather and combine data, produce data visualizations, find trends and insights buried in data, and assist in making data-informed decision.

Statistical software is one of the many types of tools that cater to more specialized purposes. Tools that help with statistics-based insights into patterns and trends are referred to as statistical software, often known as statistical analysis software. It is used in data science to carry out statistical analysis theorems and procedures,

such as regression analysis and time series analysis.

The top five statistical programs available now, according to selecthub.com, are SPSS Statistics, SAS/STAT, Stata, Minitab, and GraphPad Prism. Finding a product that meets your goals and best supports you in the decision-making process can be challenging because there are so many options available on the market that can perform statistical analysis. Because of this, it is necessary to think about what a statistical analysis is. What advantages are there? What justifies analysis? Which statistics program is the best?

Statistical analysis is a tool that can be used by researchers, data scientists, and analysts to investigate and present the data information that datasets disclose, explore the connections between data points, and discover underlying trends and patterns in data. Additionally, it is utilized to create probability models, validate them, and employ analytical methods to anticipate the future and find useful information.

The fact that most samples solely consisted of undergraduate students completing an introductory level statistics curriculum is a significant limitation of the statistics attitude literature. There aren't many studies that look at students who take statistics modules later in their degrees. The study by Walker and Brakke (2017), which contrasted students' attitudes in an introductory and advanced undergraduate curriculum, stands out as an outlier. They found a marginally favourable attitude toward statistics among the women in their sample who attended a historically Black college in the United States. In the advanced class, attitudes were much higher at the start of the semester but not at the end because of disparities between the modules that they discovered. Therefore, both the introductory and advanced classes had generally mixed reviews.

Students who have a favorable attitude about statistical software when learning statistics are more likely to have a positive attitude toward statistics in general and to see the value of taking statistics courses for their future employment. Therefore, it would be beneficial to pinpoint the key elements that may affect the uptake and ongoing use of statistical software (Brezavek, Parl, & Nidari, 2016).

Most of these elements and how they affect students' performance are backed by a variety of theories, including the achievement goal theory, self-efficacy theory, and self-determination theory. According to the self-efficacy theory, pupils are more likely to do better when they have a favorable opinion of their abilities. The latter is supplemented by the self-determination theory, which contends that students' perceptions of statistics (Affect) have an impact on their ability to learn. Finally, the achievement goal theory emphasizes the importance of value and effort in achieving the goal as the motivations behind behavior in a certain area.

Therefore, the definition of statistical software self-efficacy (SSSE) is the conviction that one can conduct a statistical analysis utilizing statistical software. People who have lower self-efficacy using statistical software will be more readily irritated by performance barriers and will react by lowering their judgments of their abilities to utilize statistical software. On the other hand, those who have a high level of confidence in their ability to use statistical software are less likely to be discouraged by challenging issues.

They are therefore more likely to persevere in their efforts and get through whatever challenges they encounter, which supports their decision to employ statistical software. The concept of statistics learning self-efficacy (SLSE), which is comparable to statistical software self-efficacy, refers to students' confidence in their capacity to succeed in statistics learning activities. According to a study by Sto,-Tomas, M., Tindowen, D. J, Mendezabal, M. J, Quilang, P, and Agustin, E. T., these beliefs might have a beneficial or bad impact on pupils' behavior. As of 2019, attitude refers to a person's way of thinking, acting, and behaving. Students' learning experiences of many kinds have an impact on how they develop their attitudes. Recent developments also reveal that attitude towards learning a specific subject may positively affect students' academic performance, especially if teachers use appropriate intervention and action, including using technology-aided instruction. The attitudes of the students should also be considered as the landscape for teaching statistics shifts from the old way to one supported by technology. The following categories describe the overall attitudes of students regarding learning probability and statistics with PSPP:

a. Statistics Cognitive Competence. This refers to the positive and negative attitudes concerning a student's knowledge and skills as applied to statistics.

b. Technology Cognitive Competence. This refers to the positive and negative attitudes concerning a student's knowledge and skills as applied to technology and computers.

c. Learning Statistics with Technology. This refers to the positive and negative attitudes concerning a student's attitudes to learning statistics with the aid of technology.

d. Value. This refers to the positive and negative attitudes to the worth and usefulness of statistics in students' personal and professional life.

e. Affect. This refers to the positive and negative emotions concerning statistics.

Additionally, students have a positive attitude toward learning statistics using PSPP software and other forms of technology. This indicates that senior high school students have a good attitude toward using PSPP to learn statistics, which has led to their increased interest in the material and increased participation in class discussions. Students in particular thought that technology makes learning statistics enjoyable, participatory, and simple to comprehend. Because students can independently investigate statistical topics and issues thanks to technology like the PSPP, the classroom is becoming more learner centered. Along with value, students' attitudes regarding learning statistics with PSPP are positive. This indicates that pupils internalized the importance of the subject thanks to the use of technology in the classroom, like the PSPP. The study's findings indicate that one benefit of employing technology in statistics instruction is that it improves students' procedural and conceptual skills, but more crucially, it emphasizes the application of such skills in real-world contexts. Students specifically believed that the figures were important and applicable to their daily lives. In practical applications, statistics is widely employed across many industries and disciplines, including the social and natural sciences. To draw reliable conclusions from a body of collected data and in the face of ambiguity, statistical approaches and procedures are also utilized in decision-making processes.

Regarding the students' attitudes toward learning statistics with the help of the PSPP, it can be concluded that senior high school students have a positive and favorable attitude towards the topic when employing technology like the PSPP to do so. They particularly enjoy learning statistics since they are using technology, which is how most kids choose to learn most subjects. Additionally, because to the usage of technology, students increasingly enjoy learning statistics and think the topic is engaging rather than boring.

There have been numerous assessment tools to gauge attitudes toward statistics, beginning with the Roberts and Bilderbac-created Statistics Attitude Survey (SAS). The Attitudes Toward Statistics Scale (ATS) and the Survey of Attitudes Toward Statistics Scale (SATS) are two of the tools that are most frequently used. The ATS gauges how students feel about using statistics in their field of study and about the statistics courses they are taking. SATS uses the Affect scale, the Cognitive Competence scale, the Value scale, and the Difficulty scale to gauge how people feel about statistics. Affect measures how you feel about statistics positively and negatively; Cognitive Competence measures how you feel about your knowledge and abilities when it comes to statistics; Value measures how you feel about how valuable statistics are in your personal and professional life; and Difficulty measures how you feel about how difficult statistics is to study. The cognitive, or relationship with thinking, conceptions, and beliefs about statistics; the affective, or emotional, dimension, made up of the positive or negative emotions and feelings that statistics evoke; and the behavioral, or action-related, dimension, linked to actions or intentions in relation to the statistics, are the three basic dimensions of attitude toward statistics, according to Auzmendi and other authors. These instruments all have parts that, in terms of what they stand for, almost overlap.

Most of these elements and how they affect students' performance are backed by a variety of theories, including the achievement goal theory, self-efficacy theory, and self-determination theory. According to the self-efficacy theory, pupils are more likely to do better when they have a favorable opinion of their abilities. The latter is supplemented by the self-determination theory, which contends that students' perceptions of statistics (Affect) have an impact on their ability to learn. Finally, the achievement goal theory emphasizes the importance of value and effort in achieving the goal as the motivations behind behavior in a certain area.

A huge database is accessible through statistical software applications, which also make analysis and interpretation simple and guarantee that the right data is evaluated and that the results are objective and conclusive. The software knows when to analyze the mean group or median and when to claim a linear relationship to data, and it understands the requirement to develop simple-to-understand solutions while maintaining test accuracy. The best statistical analysis software provides capabilities like regression analysis,

significance tests, T-tests, F-tests, correlation, statistical process control, etc. to manage the study activity. Researchers, students, and teachers can use statistical analysis technology to make judgments based on thorough projections and outcomes. To determine correlation the app employs algorithms and machine learning. The program for statistical analysis lets researchers view the findings in a proper way (Bhat, Bilal & Tantray, Firdoos., 2021).

Emotions and a pattern of conduct make up attitudes. The difference between attitudes and beliefs must be made clear. The latter speaks of fleeting feelings brought on by recent encounters. As a strong predictor of subject retention, application, learning motivation, and performance, attitudes are essential for creating the ideal learning environment for statistics. They may be affirmative ("statistics will be required in my future employment") or negative ("statistics have no application to my [future] career").

1.3. Conceptual Framework

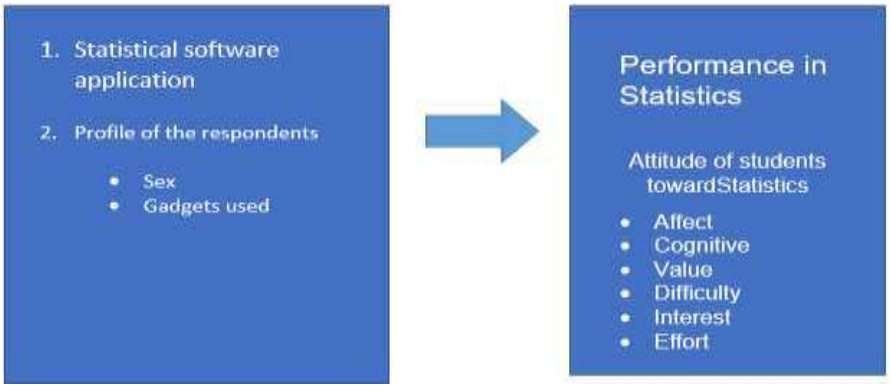


Fig. 1 – Conceptual model of the study

The conceptual framework shows the concept of investigation of the study, which undergoes the process of creation until the completion of the expected output of this research. The illustration shows the statistical software, which is independent variables that influence other variables, which comes from the evaluation of the selected respondents and the factors considered in the research. The second box shows the dependent variable, which is the performance toward statistics that can be affected by independent variable, representing the possible intervention and the findings of the research study.

Most of these factors and their relation to students' performance are supported by different theories, such as Self-efficacy Theory, Self-determination Theory, or Achievement Goal Theory.

1.4. Statement of the Problem

The study aims to determine the effect of using software application to student's attitude and achievement in statistics. Specifically, it seeks to answer the following questions:

- What is the demographic profile of the respondents in terms of?
  * Sex
  * Gadget used
- What is the Level of student's attitude toward statistics before and after usingStatistical Software platform in terms of?
  * Affect
  * Cognitive
  * Value

* Difficulty
* Interest

* Effort

• What is the level students' performance in Statistics?

• Is there a significant difference between student's attitudes and performance inStatistics before and after using Statistical Software Application?

• Is there a significant difference between student's attitudes and performance inStatistics in terms of sex and gadget used before and after using Statistical Software Application?

## 1.5. Hypotheses

The null hypotheses of this research:

- Ho: There is no significant difference between Student's attitudes andperformance in Statistics before and after using Statistical Software Application.
- Ho: There is no significant difference between student's attitudes and in performance in Statistics in terms of sex and gadgets used before and after usingStatistical Software Application.

## 1.6. Significance of the Study

This study aims to determine if there is a significant difference between the student'sattitude in Statistics before and after using Statistical Software

**Students.** To the performance and achievement in statistics

**Teachers.** To make wise strategy on how to motivate the students to learn and deal with a positive attitude toward Statistics.

**Researcher.** To know what the effect is ,of using software application on the attitude andachievement of the students toward Statistics.

**School.** To know the most effective intervention in shaping students' attitude towardsStatistics.

**Future Researchers.** This study may be used as reference for further research. This mayalso serve as a guide to those who wish to deal with this study

## 1.7. Scope and Limitation of the Study

The study focused on effect of using software application to student's attitude andperformance in Statistics. It will conduct in Laguna State Polytechnic University, Siniloan,Laguna. The respondents of the study are selected students at Laguna State PolytechnicUniversity during A.Y. 2021-2022 who taking up subjects Statistics and those who are performing data analysis for their thesis.

## 1.8. Definition of Terms

The terminologies used in this study were conceptually defined so that these may beunderstood, treated, and applied in uniform manner throughout the course study. The concept of investigation of the study, which undergoes the process of creation until the completion of the expected output of this research.

**Statistics-** The practice or science of collecting and analyzing numerical data in large quantities, especially for

the purpose of inferring proportions in a whole from those in a representative sample.
**Affect –** In this study this refers to the student's feeling.
**Cognitive -** Intellectual knowledge and skill.
**Value -** Relevance and worth in personal and professional life.
**Difficulty –** The state or condition of being difficult.
**Interest –** The state of wanting to know or learn about something.
**Effort –** Amount of work expends.
**Software application –** a computing software design to carry out a specific task otherthan one relating to the operation of the computer itself.

## 2. Review of Related Literature

We regularly generate and transport enormous amounts of data in the commercial world nowadays. Having access to so many data give a wealth of options from a commercial perspective, but how can we put the data to use? Utilizing business intelligence is the solution. Business intelligence is the name given to a category of software that gathers and combines data, visualizes information, unearths trends and insights buried within data, and aids users in making data-informed decisions. Statistical software is one of the various types of BI solutions that focus on more specialized requirements. Software for statistical analysis, often known as statistical software, refers to instruments that help with data collecting and analysis based on statistics to reveal patterns and trends. When performing data science, they frequently use statistical analysis approaches and theories like regression analysis and time series analysis. Quantitative data science includes statistical analysis. As the name implies, statistical analysis uses statistics, which is "the science that deals with the collection, classification, analysis and interpretation of numerical facts or data...by use of mathematical theories of probability," according to BI software provider SAS. "Statistical analysis" is defined as "the science of collecting, exploring and presenting large amounts of data to discover underlying patterns and trends." Descriptive statistics and inferential statistics are two crucial statistical techniques used in data analysis. Both approaches are valuable and provide unique insights. When most people hear the word "statistics," they typically think of descriptive statistics, which is the study of data that aids in the meaningful description or summarization of data.

Without drawing any conclusions outside the scope of the research or addressing any assumptions, they simplify vast amounts of data for straightforward interpretation. We can present and comprehend data more readily using descriptive statistics as opposed to processing it in its raw form. In contrast, inferential statistics enables researchers to test a hypothesis using a sample of data and then draw conclusions and generalize about the larger population. Beyond the facts at hand, inferential statistics aims to draw inferences about potential outcomes. For descriptive statistics, we select a group to investigate, measure every subject in that group, and give a precise numerical description of the group. Although descriptive statistics are useful for examining the spread and center of the data, they cannot be utilized to draw more generalizations or conclusions because they are expressed as exact numbers. For inferential statistics, we plan how to obtain a representative sample after first identifying the target population. The results will be expressed in confidence intervals and margins of errors based on the uncertainty of using a sample that cannot accurately reflect the population. This is done after studying the sample and testing hypotheses based on the sample data. Both types of statistics are at the core of the statistical analysis that drives statistical software, which is used in tandem to intelligently address business challenges. Business intelligence can benefit from statistical software in a variety of ways. Statistics may increase the value of the proprietary data that belongs to your company even further since business intelligence is the art of gathering, evaluating, and turning data into insights that can be put to use. Statistical analysis may help you plan with predictive analytics models based on previous data and provide insight into how efficiently your firm is performing. While performing statistics can be challenging, with the correct BI tools, it can be a breeze. Statistical analysis is by no means simple, and the common user may find many statistical software packages to be both complicated and downright impenetrable. Additionally, certain

tools have steeper learning curves than others, which makes them more challenging to master. Find out who will be using the product and how much expertise they have with statistics. An essential phase in the evaluation process is considering the interoperability and integration capabilities of potential statistics software. Pricing for statistical software varies from free for open-source programs like Python and R to thousands of dollars per license for more feature-rich options (Tseng, H., 2021, November 6).

All business majors need to be statistically literate, thus statistics courses in university curricula are crucial for convincing students of the value of statistics in the workplace. Particularly for students in subjects not traditionally associated with mathematics, students' experiences learning statistics are frequently a source of worry and create unfavorable opinions. Numerous research has looked into students' achievement in statistics classes. Few of these studies have addressed students' adoption of statistical software; instead, most have concentrated on students' attitudes toward statistics or statistics fear. Statistical software can be viewed as a form of facilitator that might lessen the students' resistance to learning statistics in the social sciences. Even if there are a lot of social sciences education studies on attitudes toward statistics and anxiety related to statistics, the role of statistical software support in education is still an area that hasn't been well studied. Statistical methods have grown significantly in importance in recent years in both business and scientific study, as well as in society at large. They offer important details that can only be discovered through analysis of survey data. In spite of these facts, most universities do not have many students who take statistics courses. The personal experiences that students have while learning statistics are frequently a source of worry that results in unfavorable perceptions. Students who have a favorable attitude about statistical software when learning statistics are more likely to have a positive attitude toward statistics in general and to see the value of taking statistics courses for their future employment. Therefore, it would be beneficial to pinpoint the key elements that may affect the uptake and ongoing use of statistical software (Brezavek, Parl, & Nidari, 2016).

Therefore, the definition of statistical software self-efficacy (SSSE) is the conviction that one can conduct a statistical analysis utilizing statistical software. People who have lower self-efficacy using statistical software will be more readily irritated by performance barriers and will react by lowering their judgments of their abilities to utilize statistical software. On the other hand, those who have a high level of confidence in their ability to use statistical software are less likely to be discouraged by challenging issues. They are therefore more likely to persevere in their efforts and get through whatever challenges they encounter, which supports their decision to employ statistical software. The concept of statistics learning self-efficacy (SLSE), which is comparable to statistical software self-efficacy, refers to students' confidence in their capacity to succeed in statistics learning activities. These beliefs may have a beneficial or bad impact on students' behavior (Brezavek, Parl, & Nidari, 2016).

Because of technological advancements that make it easier for individuals to learn, learning and its contents must now be delivered in a different way. Students frequently use technology in their learning. Technology is frequently used in the accounting field to study accounting information systems. Statistics also covers the topic of technology use in the classroom.

The statistics course reflects the standard exposure to research methodology and statistical evaluation, which may be helpful for many students' future employment. Software for statistics, including SPSS, Eview, and others, is available for the statistics course. Statistics is a subject that every student should be proficient in since it can improve their ability to read, summarize, interpret, and report on their final assignment. One of the most difficult and demanding subjects is statistics, which can cause emotional and cognitive reactions that might cause performance to lag. One of the subjects that causes the most concern is statistics, particularly for students who study social and humanistic disciplines. A student's attitude toward computers might be summed up as what they love or hate about them. If a student enjoys using computers, they will eventually want to utilize SPSS because they believe it is beneficial and simple to use. If a student has high confidence in using SPSS, it will be simple for him or her to use SPSS and eventually establish an intention to use it. Self-efficacy of S.P.S.S. refers to belief that students have competence to do a statistical analysis using S.P.S.S. The term "statistical learning value" refers to the benefits of statistical knowledge, such as the ability to solve problems, advance one's own thinking, and others. If students believe that understanding statistics has a specific worth, they will

consider how simple and helpful it is to use S.P.S.S. and ultimately develop the intention to apply it. A student's perception of how simple a system (like SPPS) is to use can be described as their level of belief [16]. The degree to which a person thinks that employing a particular system or program (like S.P.S.S.) would improve his or her ability to perform at work is also referred to as perception of usefulness. Previous research shows the influence of external factors (computer attitudes, S.P.S. self-efficacy, and S.P.S. learning value) on perception about ease of use and usefulness and their impact on behavioral intention to use SPSS. If students are confident in their ability to use S.P.S.S. and believe that it will improve their job performance, it will create the behavioral intention to use S.P.S.S. (Mulyani, S. R., Ridwan, M., & Ilona, D., 2019, December).

Technology's rapid advancement has significantly altered contemporary society and all facets of daily life, including politics, business and trade, and education. Modern society's growth of civilizations and nations is greatly influenced by technical innovation. Along with these, the development of information and communications technology brought about a significant shift in education in the twenty-first century. Using technology-assisted instruction, teaching and learning are currently becoming more engaging and creative (Mendezabal & Tindowen, 2017). Technology integration is seen by educators as a crucial instrument for effective teaching at all educational levels. The research conducted by Pascual (2021) on the use of technology in supplemental materials during this pandemic offers insights on how teacher-made instructional resources might benefit students. Students in the twenty-first century enjoy examining things that are close at hand or that they may explore using technology, which is one of the topics highlighted in his study, "Easy access is a key to understanding and learning."

In today's educational environment, the use of technology as a teaching aid is crucial. Education in mathematics and statistics also reflects this. Even though technology is finally being incorporated into education, it is still difficult to use for both teaching and learning. The use of technology in the classroom is still very low, even though many colleges and universities now have access to fast internet connections, professors who are trained to use educational technology, and supportive institutional policies.

Descriptive and inferential statistics are often introduced in Probability and Statistics. Traditional classroom-based statistics courses employ the textbook that is required, lectures, and frequent chalk and board exercises as teaching tools. However, recent technological advancements give educators a fresh approach to teaching statistics that is pertinent to and adaptable to the needs of the modern educational environment. Technology is increasingly being used in classrooms, and this has several benefits. The use of technology in the classroom can help students learn more actively, collaborate better, become more independent, and focus on task-based instruction, among other things. Nevertheless, despite these activities and movements, statistics is still still consistently viewed as a subject that is dull, difficult, and frightening. To perform well on exams, students often learn the relevant formulas and procedures. Additionally, memorizing equations without understanding them is low level learning (Mendezabal & Tindowen, 2017).

The research by Sto,-Tomas, M., Tindowen, D. J., Mendezabal, M. J., Quilang, P., and Agustin, E. T. As of 2019, attitude refers to a person's way of thinking, acting, and behaving. Students' learning experiences of many kinds have an impact on how they develop their attitudes. Recent research has also shown that a student's attitude toward learning a particular subject can have a favorable impact on their academic achievement, particularly if teachers take the appropriate intervention and action, including using technology-assisted education.

The attitudes of the students should also be considered as the landscape for teaching statistics shifts from the old way to one supported by technology. The following categories describe the overall attitudes of students regarding learning probability and statistics with PSPP:

a. Statistics Cognitive Competence. This refers to the positive and negative attitudes concerning a student’s knowledge and skills as applied to statistics.

b. Technology Cognitive Competence. This refers to the positive and negative attitudes concerning a student’s knowledge and skills as applied to technology and computers.

c. Learning Statistics with Technology. This refers to the positive and negative attitudes concerning a

student's attitudes to learning statistics with the aid of technology.

d. Value. This refers to the positive and negative attitudes to the worth and usefulness of statistics in students' personal and professional life.

e. Affect. This refers to the positive and negative emotions concerning statistics.

The research of M. Sto-Tomas, D. J. Tindowen, M. J. Mendezabal, P. Quilang, and E. T. Agustin (2019) examined how Grade 11 Senior High School Students used PSPP software to learn statistics, along with their attitudes and academic achievement regarding Statistics. The findings show that senior high school students have a positive view about statistics and cognitive abilities. This indicates that a moderate attitude toward the topic is present when PSPP is used. Students nevertheless stated that their competency and grasp of the topic were neither extremely high nor extremely low, despite the use of mathematical software in teaching statistics. This may be attributable to the subject's difficulty and their misconception that it is solely procedural and conceptual in nature, even though rigorous statistical analysis is required. Even though there is technology to support their study, they still struggle to grasp the material. However, the results show that using technology also makes it simple for pupils to learn statistics. The results support earlier research showing that when math and statistics topics are taught in a traditional manner, children have a negative attitude toward them. However, when technology is used in the classroom, students' interests grow, and their attitudes change for the better.

Students show a positive attitude toward learning statistics via PSPP, according to their attitude and technological cognition. This is explained by the fact that today's students are regarded as digital natives. As a result, these pupils find it simple to use computers for regular tasks like learning. According to studies, pupils in today's educational environment possessed ICT abilities, which are essential for success in the 21st century. More specifically, since they can also repair many computers hardware issues, senior high school students are good with computers and do not have any trouble using software. Students who are proficient in ICT can operate PSPP and other instructional software programs on computers with ease. As a result of their ICT-based learning approach, students will be more motivated to study statistics because the subject is simpler to understand.

Additionally, students have a positive attitude toward learning statistics using PSPP software and other forms of technology. This indicates that senior high school students have a good attitude toward using PSPP to learn statistics, which has led to their increased interest in the material and increased participation in class discussions. Students in particular thought that technology makes learning statistics enjoyable, participatory, and simple to comprehend. Because students have the opportunity to independently investigate statistical topics and issues thanks to technology like the PSPP, the classroom is becoming more learner centered. Along with value, students' attitudes regarding learning statistics with PSPP are positive. This indicates that pupils internalized the importance of the subject thanks to the use of technology in the classroom, like the PSPP. The study's findings indicate that one benefit of employing technology in statistics instruction is that it improves students' procedural and conceptual skills, but more crucially, it emphasizes the application of such skills in real-world contexts. Students specifically believed that the figures were important and applicable to their daily lives. In practical applications, statistics is widely employed across many industries and disciplines, including the social and natural sciences. Statistical methods and procedures are also used in decision making activities for making accurate inferences from a collated body of data and in the face of uncertainty.

Regarding the students' attitudes toward learning statistics with the help of the PSPP, it can be concluded that senior high school students have a positive and favorable attitude towards the topic when employing technology like the PSPP to do so. They particularly enjoy learning statistics since they are using technology, which is how most kids choose to learn most subjects. Additionally, because to the usage of technology, students increasingly enjoy learning statistics and think the topic is engaging rather than boring.

Students generally have positive attitudes on learning statistics with PSPP software. The results suggest that attitudes do really matter a lot when it comes to teaching a particular subject, like statistics. Due to the usage of technology in the class, students have positive views regarding the subject. The findings support earlier research showing that gender has little bearing on students' attitudes toward technology-assisted statistics instruction. In the meantime, it was also discovered that when students were grouped according to gender, there was no discernible difference in their attitudes toward learning statistics with the usage of PSPP. The attitudes

of students toward learning statistics using PSPP software and their academic performance are significantly correlated, to sum up. This indicates that senior high school students' good attitudes toward using technology, such as the PSPP software, to learn statistics, may result in a positive and improved academic performance. As a result, the current study demonstrates a strong and favorable correlation between attitude toward using technology to learn statistics and academic accomplishment.

Their research concludes that using computer-aided instruction, such as the PSPP, to teach Probability and Statistics to Senior High School students results in a positive and favorable attitude toward the topic. More importantly, they perform better academically because of their positive attitude toward the subjects. Since it has been discovered that senior high school students have a positive attitude toward using technology and as a result have higher academic achievement in the subject, mathematics and statistics teachers should continue to use technology-driven strategies like the PSPP in teaching the Probability and Statistics subject to these students. Technology-based probability and statistics education fosters a positive attitude toward the topic. Considering this, it is advised for math teachers to incorporate various forms of technology and computer-assisted teaching methods into their lessons while teaching statistics and math. Looking into additional technologically and computer-assisted educational strategies and activities that will similarly improve students' attitudes and academic performance in Statistics and other mathematics topics is one potential continuation of this work. Future researchers may also focus on examining and analyzing more significant aspects that affect how well kids succeed academically in statistics and other mathematics topics. To shed light on how technology genuinely affects mathematics and statistics learning, additional aspects may also be considered, such as technical abilities, procedural skills, and other characteristics.

According to the research conducted by Peiró-Signes, Trull, Segarra-Oa, & Garca-Daz, J. C. (2020) finds that pupils, particularly in secondary education, have significant anxiety and low self-confidence while dealing with statistical issues. The result of this anxiousness is subpar academic achievement. When it comes to arithmetic and disciplines that are closely related to math, like statistics, many pupils frequently struggle. These issues are frequently brought on by negative attitudes, which are a significant barrier to effective learning. Although the elements that affect students' success in statistics have drawn a lot of attention, more research on attitudes toward statistics is still required. Emotions and a pattern of conduct make up attitudes. The difference between attitudes and beliefs must be made clear. The latter speaks of fleeting feelings brought on by recent encounters. As a strong predictor of subject retention, application, learning motivation, and performance, attitudes are essential for creating the ideal learning environment for statistics. They may be affirmative ("statistics will be required in my future employment") or negative ("statistics have no application to my [future] career"). Such viewpoints may influence how much students learn and use statistical concepts, and thus, their academic success. In the learning process, attitudes cannot be seen in the open. Researchers concur that these attitudes have a variety of aspects, but they disagree on how many and how important they are. Finding these characteristics in attitudes toward mathematics and, more specifically, statistics, has been the subject of numerous research.

There have been numerous assessment tools to gauge attitudes toward statistics, beginning with the Roberts and Bilderbac-created Statistics Attitude Survey (SAS). The Attitudes Toward Statistics Scale (ATS) and the Survey of Attitudes Toward Statistics Scale (SATS) are two of the tools that are most frequently used. The ATS gauges how students feel about using statistics in their field of study and about the statistics courses they are taking. SATS uses the Affect scale, the Cognitive Competence scale, the Value scale, and the Difficulty scale to gauge how people feel about statistics. Affect measures how you feel about statistics positively and negatively; Cognitive Competence measures how you feel about your knowledge and abilities when it comes to statistics; Value measures how you feel about how valuable statistics are in your personal and professional life; and Difficulty measures how you feel about how difficult statistics is to study. According to Auzmendi and other academics, there are three main aspects of attitude toward statistics: the Behavioral dimension, which is related to actions or intentions in relation to the statistics; the Cognitive dimension, or relationship with thinking, conceptions, and beliefs about statistics; the Affective or emotional dimension, made up of positive or negative emotions and feelings that statistics evoke. These instruments all have parts that, in terms of what they stand

for, almost overlap.

Most of these elements and how they affect students' performance are backed by a variety of theories, including the achievement goal theory, self-efficacy theory, and self-determination theory. According to the self-efficacy theory, pupils are more likely to do better when they have a favorable opinion of their abilities. The latter is supplemented by the self-determination theory, which contends that students' perceptions of statistics (Affect) have an impact on their ability to learn. Finally, the achievement goal theory emphasizes the importance of value and effort in achieving the goal as the motivations behind behavior in a certain area. León-Mantero C, Casas-Rosal JC, Maz-Machado A, and Rico MEV (2020) found that having a basic understanding of statistics enables people to make informed decisions after gathering and analyzing objective data, to determine the truthfulness or falsity of the vast amount of information they receive through various mass media, to select the principles and ideas they will adhere to regarding political, social, and cultural matters, and to impartially evaluate a situation. To flourish in their teaching practice, it is crucial that instructors in all topics and fields of knowledge acquire a sufficient level of statistical literacy during their training. develop efficient ways to use the vast amounts of true, objective data that we all possess, and to give their pupils, in any given educational setting, arguments and reasoning that are supported by data. Investigative exercises are a teaching strategy that is very useful for explaining and teaching statistics. To present arguments and difficult issues clearly, reason, explain, support logical arguments, and compare and contrast hypothese, teachers-in-training must be able to collect and evaluate data using tables and charts. Given the significance of statistical knowledge for aspiring teachers, it is essential to pay close attention to all aspects of this subject's teaching and learning—not just how teachers become competent in this area, but also the affective aspects, like past experiences that may have an impact on how they teach the subject or their beliefs about statistics education, and, especially, the attitudes toward the subject that would affect their professional lives. Even though statistics is a subject that all students, regardless of the degree they have earned, must study, research has shown that students from various academic disciplines have varying attitudes toward the value that statistics they believe it will have for their future academic or professional success. Although there is no agreement on theory, a sizable and expanding body of literature has examined questions and difficulties from the behavioral sciences and education since the introduction of the idea of attitude in education. There is, however, some consensus on some points, such as the notion that attitudes are adjustable mental states since they are understood to constitute people' propensity to respond in a certain way in particular contexts. Therefore, it is feasible to step in and affect behavioral changes in individuals. It is clear from attitudes toward any field of knowledge (in this example, statistics) that one may be enthusiastic about one branch of the subject while being irritated by another; Although attitudes are often favorable when young, enthusiasms can develop at any age or level. Positive or negative attitudes are gradable according to their intensity and develop progressively over time. In certain circumstances, views regarding a subject reflect feelings towards the instructors, teachers, or activity itself. In general, educational initiatives to change students' attitudes about disciplines have not been successful. However, there is proof that integrating collaborative learning strategies into the classroom or using systematic desensitization to lessen anxiety in an individual can be successful.

Three components make up the various conceptions of attitude: the cognitive component, which refers to one's beliefs and conceptions about the subject under study; the affective component, which refers to the emotions it elicits; and the behavioral component, which refers to one's behavior or propensity to react to a specific stimulus. Low results in the instrumental and behavioral components stand out for the remaining subjects, despite an improvement in the social sciences component. The emotional and intellectual components are unaffected. It is noteworthy that prospective teachers of English, Spanish, and social sciences are valued higher than average across the board, even when one considers the many ways in which statistics in the social sciences can be used to address issues related to geography, education, the economy, and politics. Indeed, of all the participants in our study, these students are the ones who are least at ease with the topic. These findings imply that even though these students are aware that statistics should be studied in basic and secondary education and that it is a beneficial tool that every citizen may require to deal with everyday difficulties, they place a low value on the advantages this could give them in their academic work or future career performance.

They don't particularly enjoy the concept of working on the subject, but they wouldn't remove it from their curriculum (León-Mantero C, Casas-Rosal JC, Maz-Machado A, Rico MEV, 2020).

A huge database is accessible through statistical software applications, which also make analysis and interpretation simple and guarantee that the right data is evaluated and that the results are objective and conclusive. The software knows when to analyze the mean group or median and when to claim a linear relationship to data, and it understands the requirement to develop simple-to-understand solutions while maintaining test accuracy. The best statistical analysis software provides capabilities like regression analysis, significance tests, T-tests, F-tests, correlation, statistical process control, etc. to manage the study activity. Researchers, students, and teachers can use statistical analysis technology to make judgments based on thorough projections and outcomes. The program uses machine learning and algorithms to determine correlation. The statistical analysis application enables researchers to properly view the results (Bhat, Bilal & Tantray, Firdoos., 2021).

Technology has completely changed how business choices are made in the big data era. Decision-making "will never be the same; some firms are already making better judgments by evaluating complete datasets from consumers, staff, or even sensors implanted in products," claims the McKinsey Global Institute (Manyika et al., 2011, p. 5). Business professionals employ a variety of software in addition to their intuition and judgment to derive inferences from data sets and make decisions. Muenchen (2014) highlighted that identifying the software capabilities that employers are looking for would "demand a time-consuming content analysis of job descriptions" when assessing the popularity of various data analysis software (para. 17).

Some departments' faculty members didn't even teach any software. For instance, at Valparaiso University, the information and decision sciences department's professors did not instruct students on the use of statistical software, while using SPSS, SAS, and R in several classes. Excel was the program that was most useful. Only considering employment opportunities, it appears that many schools should change their minds and use SAS instead of their current choice of software. The popularity in the labor market is just one of several things to consider. The cost and time effectiveness of integrating each software into the curriculum must be considered by the faculty. Additionally, academic staff in particular departments at the school should think about the software that best suits their field of study. The aim of this study is to compile and summarize the data required for teaching statistical software. It will support academics in their software selections and assist their business counterparts in determining the finest software to advance the skills of their workforce (Ozgur, C., Dou, M., Li, Y., & Rogers, G., 2017).

Online data analysis is taught to users through Minitab's Quality Trainer. This multimedia course has interactive quizzes with immediate feedback and animated tutorials that bring statistical concepts to life. So that knowledge may be applied right away, practical exercises take the user through applying statistics with Minitab Statistical Software. Programs that offer supplementary features and commands are called add-ins. Microsoft Excel add-ins can be used for a wide range of tasks, including data analysis, presentations, investments, business, personal, utilities, and productivity applications. and structure. The Analysis Toolpak, Solver, MegaStat, and PHStat are all components of data analysis. Access codes for MegaStat and PHStat are included with the textbook. Since STEM (science, technology, engineering, and mathematics) is currently in the spotlight, students and employees may already be familiar with Microsoft Excel or other spreadsheet programs. Burdeane (O. Burdeane, personal communication, January 29, 2014) elaborated on this familiarity by saying that "because MegaStat looks and acts like Excel, practically anyone could use it to generate some output with just a few minutes of trainingThe 53-page tutorial PDF - complete with a step-by-step process to using each test that MegaStat performs, and pictures at every step - will probably provide sufficient guidance to successfully use this software. MegaStat can perform a variety of statistical operations: descriptive statistics, frequency distributions, probability, confidence intervals, and a variety of other tests (McGraw-Hill Education, 2014).

Software created specifically for the social sciences, SPSS, or Statistical Package for the Social Sciences, was first introduced in 1968. After afterwards, SPSS was bought by several businesses, culminating with the current owner, International Business Machines (IBM), during which time the product's user base grew. To better reflect the expanded diversity of its clientele, the organization's previous acronym was changed to

Statistical Product and Service Solutions. It is one of the most popular statistical software programs used in the social and behavioral sciences, along with Minitab. Customers can purchase individual SPSS software packages by selecting the one they believe will best meet their needs, but SPSS also offers packages that are significantly more affordable than purchasing the products separately. The three bundles offered by SPSS are ordinary, professional, and premium. SPSS offers four alternatives for each of these bundles: a concurrent user license, a concurrent user initial fixed term license, an authorized user license, and an authorized user initial fixed term license. Customers must choose between two options when deciding whether to buy SPSS: authorized user or concurrent user, and user license against initial fixed term license. User licenses are perpetual, although initial limited term licenses are only valid for a year. A concurrent user is the right for a single person to use the program at a particular moment, but it does not specify who this person must be. An authorized user is a single licensee who purchases the right to use the software. Although SPSS does resemble common spreadsheet programs like Excel and is quite similar to Excel in terms of use, the cells cannot be modified in a spreadsheet-like manner (Ozgur, C., Dou, M., Li, Y., & Rogers, G.,2017).

Furthermore, SPSS software offers a platform for statistical tests that is far more practical. In contrast, with SPSS, the user merely needs to "choose a variable and supply the value to compare with [the] sample" and click "Ok." For example, doing a one-sample t-test in Excel (without a plug-in) requires the user to perform several separate computations (Robbins, 2012, para. 4). The fact that SPSS connects numerically coded data to its original meaning is another benefit (Robbins, 2012). This SPSS function is extremely useful because most data is now kept electronically in a numerical format. The statistics base, advanced statistics, bootstrapping, custom tables, and regression features are all included in SPSS's standard bundle. The features for categories, data preparation, decision trees, forecasting, and missing values are also included for the customer who purchases the professional pack.

Due to their accessibility and affordability, Excel add-ins are ideal for small businesses and projects, while the effective handling of massive amounts of data by SPSS, SAS, and R makes them ideal for major projects and corporations. Excel's MegaStat feature, as was found at the beginning of the study, can carry out several crucial statistical operations that users seeking to comprehend smaller data sets can make use of for cheap financial cost and training cost. MegaStat can only handle a particular volume of data, as was already mentioned. Therefore, more complex software, such as SPSS, SAS, or R, is needed for larger data sets. Each statistical package has its own advantages and disadvantages, so it can be difficult to decide which software is appropriate for analyzing these huge data sets. Consequently, the goal of this study was to examine their characteristics (Ozgur, C., Dou, M., Li, Y., & Rogers, G., 2017).

Tengku Siti Meriam Tengku Wook, Hazura, and Tengkus Ashaari, Noraidah, and Judi, Hairulliza, and Mohamed participated in the study. Statistics is a structural approach to problem-solving that is widely employed in many industries, including information and communication technology (ICT), according to (2011) (ICT). As a result, Statistics is now one of the required disciplines in Malaysia's higher education institutions. A required course at the Faculty of Information and Science Technology is statistics and probability (FTSM), This seeks to introduce students to the fundamental statistical ideas and methods used in both research and industry. Student absences during the course are something of quite a concern, according to certain observations by the academic staff who are teaching the topic. Due to the technical nature of the course, absentee students run the risk of falling behind and not understanding the concepts, many of which are interconnected. The outcomes of students taking Statistics and Probability in FTSM should be enhanced in light of this. In addition to non-cognitive elements like attitude, perception, interest, anticipation, and motivation, difficulties in learning the statistics subject are also influenced by cognitive aspects including the student's intellectual capacity to perform well in the subject. These two elements could make it difficult to study statistics and use the abilities in regular work. The term attitude has been defined in a variety of ways by earlier researchers. It's crucial to do attitude research to get people's opinions on a topic. Affective is a factor used to gauge how students express their feelings about the statistics course. Statements about the student's interest in, lack of feeling threatened by lack of feeling disappointed by, enjoyment of, and lack of stress when completing a statistics issue and following the course are the items used to measure the expression. The cognitive competence, or the student's attitude

toward the knowledge and intellectual ability to apply the statistics information, is the second factor in assessing attitude. The items used to measure this attitude are claims that students do not, based on their way of thinking, have difficulties understanding the concept of statistics, can learn statistics by making the fewest calculation errors, and have an understanding of the formula and statistics concept. The third element in evaluating a student's attitude toward a statistics course is value. This section evaluates a person's attitude toward the value, applicability, and benefits of statistics for themselves and their professional lives. Statements demonstrating that statistics is beneficial, necessary, and relevant in their studies as well as in daily life and careers are the items used to assess this attitude. The difficulty component comes next, which evaluates how one feels about the challenges of grasping the topic. This involves the complexity of the subject's calculations as well as how simple a formula is to understand. Other signs of the component include how simple the course is to complete, how little discipline is required, and how little a new way of thinking about statistics is required. A factor in determining a student's propensity for the subject is interest. The student's interest in utilizing statistics, comprehending the statistical data, applying statistics in conversation with others, and learning statistics are all factors considered when evaluating this attitude. One of the factors evaluated is the student's effort. Students that demonstrated a strong work ethic are classified as having a favorable attitude toward statistics. Statements on the student's intent to complete all assignments, put in significant study time, and attend every lecture in the subject are used to evaluate this component.

In order to motivate students to comprehend statistical concepts, advance their statistical skills, and value the information in their daily lives, it is also crucial to do research on how students feel about the statistics subject. The knowledge of statistics can help researchers and scientists find solutions to issues in many different sectors. The academic staff must pay close attention to the perspectives and attitudes of the students to make this course entertaining, not frustrating, less terrifying, and more effective for the students. Lecturers must be aware of how students' actions change in response to their learning experiences and the results of their accomplishments. endeavors to increase their understanding and attempts to use statistics-related knowledge and abilities in their daily lives. The academic staff should develop a proper strategy based on further study to balance the attitudes and perceptions of the students toward this subject. Lecturers must exert every effort to make learning and teaching more engaging and to connect the concepts they are teaching with students' daily lives and fields of study to motivate them to learn and apply statistics (Ashaari, Noraidah & Judi, Hairulliza & Mohamed, Hazura & Tengku Wook, Tengku Siti Meriam Tengku Wook., 2011).

Students should be familiar with statistics because they will need to use it in their assignments or studies. Practically every major, especially those in education, offers courses in research technique that will cover the fundamentals of statistics, including calculation and application. Today's world revolves around a collection of digitalized and numerical data. Without our knowledge or consent, the media has exposed us to the significance of statistical literacy. For instance, we need to arm ourselves with fundamental statistical information in order for the news to make sense to us. It will assist in determining economic development, weather forecasts, spotting disease spreaders, polling for elections, and medical research. This justifies the requirement for early exposure to statistical literacy (Rosli, M. K., Maat, S. M., & Rosli, R., 2017).

According to Maat, Zakaria, and Rosli (2016), the students' statistical anxiety was moderate. The student's math proficiency may have an impact on their attitude and fear around statistics (Lai, Tanner, &Stevens, 2011). According to Koh and Zawi (2014), as students did not use mathematics for a period prior to continuing their education, their arithmetic skills may be "rusty."

In the investigation by Maat, S. M., & Rosli, R. 2017), they discovered that graduate students have a neutral mindset. In other words, the pupils are not overly negative or overly happy. Since 55.3 percent of respondents in this poll said that statistics is a difficult and complex course, students must strive harder to overcome challenges in these classes. Additionally, they need to establish an effective strategy for learning statistics and get beyond any obstacles. Because of this, it's important to study wisely rather than cramming. The results indicated that the kids' anxiety level is moderate. It supported the research done by Siti Mistima et al (2016) using the help of the Statistical Anxiety Questionnaire (SAQ) tool. Despite the claim made by Koh and Mohd Khairi (2014) that students did not display their concern, a high level of anxiety was seen in statistical

courses. This study established a substantial inverse relationship between statistical anxiety and attitude toward statistics. Negative relationship suggests that when a pupil has a good attitude, their anxiety will go down. Anxiety and attitude are related to one another. As students acquire the information and statistical substance, positive attitudes will help them have fewer worries about statistics. Higher levels of anxiety will lead to lower levels of student competency, which will lead to decreased achievement and a negative attitude toward statistics. It is relevant both ways because a decreased anxiety level will raise student competency levels by enhancing their statistical understanding and producing positive outcomes. It will also result in a favorable shift in student attitudes. The goal of studies on statistics education challenges is to raise student statistical literacy rates. Overall, there was a moderate amount of student apprehension and attitudes about the study's statistics.

According to Saidi, S. S., and Siew, N. M.'s study According to (2019), students have long considered statistics to be one of the most difficult academic subjects. The mechanics of statistics, which entail entering numbers into the appropriate formula, are distinct from understanding statistical principles. Students who comprehend statistical principles can read, use, and interpret tables, graphs, and maps as well as tools like percentage, ratio, measures of spread, central tendency, and variability (Australian Bureau of Statistics, n.d.). Measures of central tendency is one of the statistical ideas that students frequently struggle to grasp. Along with the measure of variability, which consists of mean, mode, and median, the measure of central tendency is one of the statistical concepts in descriptive statistics. Only a few studies have concentrated on how well students comprehend mode and median, while most studies have concentrated on how well students grasp the mean. Numerous earlier studies also showed that in order for students to correctly answer statistical questions, they had to shift their attention away from memorizing the formula and toward understanding the computational component. However, their comprehension of the mean notion is shown to be poor, as many students find it challenging to explain. Woldemicheal (2015) goes on to say that students' understanding problems were exacerbated by how abstract the statistical principles behind the measures of central tendency were.

Along with helping students understand statistics better, one of the objectives of statistics education is to promote a good attitude toward statistics (Liau, Kiat & Nie, 2015). It's critical to have a growth mindset during learning to master the fundamentals of the subjects being studied (Ghulami, Ab Hamid, & Zakaria, 2015). According to Ashaari, Mohamed, and Tengku Wook (2011), it is crucial to evaluate students' attitudes toward statistics to help them better grasp the subject, develop their statistical literacy, and value the information in general. Students that have a bad attitude about this subject will find it challenging to learn the material efficiently. The concept of the measures of central tendency is introduced to students under the Malaysian Primary School Standard Mathematics Curriculum in the Fifth Grade (Curriculum Development Division, 2014), where they are instructed on how to recognize the mode, median, mean, and range from the provided data and taught to determine these measures for sets with up to 10 data values. The principles of mode, median, and mean are taught to pupils in ninth grade to help them solve difficulties (Curriculum Development Division, 2011). Meanwhile, in the tenth grade, students learn how to comprehend and apply the concepts of mode, median, and mean for grouped data (Curriculum Development Division, 2012). There is, however, scant evidence to support studies that investigated Malaysian students' attitudes toward statistics and their comprehension of measures of central tendency.

Few research has examined gender differences in students' comprehension of central tendency measures, and there are currently relatively few published works on the subject.

Value refers to the attitudes about the utility, importance, and worth of statistics in personal and professional life. Affect refers to the student's feelings toward statistics, whether they have positive or negative thoughts concerning statistics. While Difficulty relates to attitudes regarding the difficulty of statistics as a discipline, Cognitive Competence refers to attitudes regarding intellectual knowledge and skills as they relate to statistics. Interest measures each student's level of interest in statistics, while effort measures how much time and effort each student puts into learning statistics (Saidi, S. S., & Siew, N. M., 2019).

In contrast, Judi, Ashaari, Mohamed, and Wook (2011) highlighted that students' attitudes about statistics fall into one of two categories, either positive or negative, in their study of students' profiles based on those attitudes. Students who have a positive attitude toward statistics are more likely to succeed in the subject and

are better equipped to apply their classroom learning in real-world situations. A negative attitude toward statistics, on the other hand, typically causes students to become unfocused in class and show little interest in statistics.

According to earlier research, students' opinions regarding the subject of statistics and their academic success are positively correlated. For instance, Emmioglu and Capa-(2012) Aydin's study found a continuous link between students' views about statistics and achievement in statistics. Additionally, Rosli and Maat (2017) discovered a moderately positive relationship between post-graduate students' attitudes about statistics and their performance. Most of the earlier research focused on the connection between students' attitudes and academic success, and earlier researchers also employed this attitude variable to forecast students' academic success. All levels of education, including secondary school students, have relatively limited research on the relationship between students' attitudes toward statistics and their comprehension of the measures of central tendency.

According to Zhang et al. (2012), students' attitudes about statistics can have a significant impact on how well they comprehend statistical ideas and procedures. Additionally, the attitudes of the students toward statistics have an impact on whether they will acquire practical statistical thinking abilities and employ their knowledge of statistics in their future professional careers. Previous research has consistently indicated that students' attitudes toward the intellectual knowledge and abilities applied to statistics (Cognitive Competence) have a substantial impact on the students' progress in statistics. For instance, Naccache (2012) found that Cognitive Competence and Motivation are the three main elements that affect students' performance in a statistics course in Lebanon. The students' performance in their Statistics course was influenced by the effort and affect components of the Survey Attitude Toward Statistics (SATS-36). Chiesi and Primi (2015) make the argument that Cognitive Competence, Affect, and Mathematical Knowledge may have an impact on the psychology of students' statistics performance at the University of Florence in Italy. On the other hand, the research by Milic, Masic, Milin-Lazovic, Trajkovic, Bukumiric, and Savic (2016) revealed that the medical students' Cognitive Competence score on the SATS-36 had a substantial impact on their GPA (Grade Point Average). Students with good attitudes towards statistics will be able to develop statistical thinking, use statistical knowledge to solve everyday problems, and have a motivation to pursue more advanced statistical courses in the future, claim Mohamad Judi, Ashaari, Mohamed, and Tengku Wook (2011). Students that have a bad attitude toward statistics will exhibit uneasiness in the classroom. These results prompted a further important inquiry: Do rural secondary school pupils' attitudes toward statistics have an impact on their comprehension of the measures of central tendency?

According to Saidi's study, students had a moderate level of grasp of central tendency measurements. Overall, it was discovered that students understood the Definition of the measures of central tendency quite well. However, many students struggled to respond correctly to the question that tested their knowledge of the definition of mode. This suggests that the students might not be familiar with the notion of mode and may be perplexed by the terms mean, mode, and median. Students' grasp of the Properties of the Measures of Central Tendency was found to be lacking. According to the findings, most students did not comprehend the concept of robustness in measures of central tendency, which implies that they still did not understand the effect of extreme value or outlier in the data. Additionally, most students did not recognize that mean, median, and mode are different forms of average, according to their responses to the questions that evaluated their comprehension of the Problem and Representation construct. In addition, most students struggled with selecting the sort of average that would best represent the provided data (whether the extreme value was present or not). This suggests a failure to comprehend both the extreme value or outlier idea and the concept of representative value for measures of central tendency. Similar findings were made about the students' knowledge of the Argument and Proof construct. The outcome of the descriptive analysis reveals that students' attitudes about statistics were generally favorable. The findings showed that, except for Value, students felt positively about all aspects of their attitudes toward statistics. After showing increased enthusiasm for effort, students showed higher enthusiasm for cognitive competence, interest, difficulty, affect, and value. This showed that students, in addition to believing in their cognitive capacity to understand and study statistics, made significant effort, and worked hard to learn the topic in order to attain better results. In addition, the students expressed the opinion

that statistics is a subject that is simple, easy for most people to understand, and not challenging to study. Additionally, it was discovered that the students had a keen interest in statistics and believed that the subject was not difficult or terrifying. The study's findings disagreed with those of Zhang et al. and Ghulami et al. (2015). (2016). (2012) who said that college students had a bad opinion of statistics pertaining to the Difficulty component. Because of the students' varying educational backgrounds, the results may have varied. In comparison to secondary school pupils, students in higher levels of education were exposed to more tough, challenging, and complex statistical concepts and methodology. In general, the study found that male students understood the measures of central tendency more well than female students did. In terms of the gender gap based on the constructs, it was discovered that male students outperformed female students across the board. The only constructs that demonstrated a significant gender difference were Properties, Problem and Representation, and Procedure. Regarding the students' attitudes about statistics, the findings showed that there was no discernible gender difference in those attitudes. In addition, there was no evidence of a gender difference in the components. The study's findings did not agree with those of Chiesi and Primi (2016), who found that female students had a more pessimistic outlook and lacked confidence when learning statistics. Researchers found that as compared to male students, female students tend to underestimate their talents and have less favorable opinions toward quantitative fields. The findings showed that there were no significant and extremely weak negative associations between students' attitudes toward statistics and their comprehension of the measures of central tendency. Effort was shown to be the only component of attitudes toward statistics that was negatively significant and weakly linked with students' knowledge of the measures of central tendency. One way to view this is that students who used a learning style that was heavily effort-based might not have been able to understand statistical ideas better. This discovery will have a significant impact on the field of statistics education, where intensive study does not always result in a solid grasp of statistical ideas. The study's findings revealed that students' perceptions of their statistical knowledge and application abilities may have an impact on how well they comprehend statistical ideas. The students' understanding of statistical ideas will be improved the more confident they are in their statistical knowledge and application skills. However, the study also revealed that even students who voluntarily put up a lot of effort to learn statistics may not always have a solid grasp of the measures of central tendency. The study's findings also imply that students' perceptions of the complexity of statistics may affect how well they comprehend measures of central tendency. In other words, statistical ideas were less understood by pupils who found it challenging to study them.

The various learning styles and tactics used by pupils should be considered by educators. Additionally, it would be beneficial to look into whether teaching strategies and course materials can enhance students' knowledge of statistical ideas and attitudes toward statistics. This study has also provided strong evidence that math or statistics teachers should be more attentive to how their students learn statistics and should assist them to find the most effective methods for studying statistics and overcoming their learning challenges.

Numerous research conducted on undergraduate students revealed that students' attitudes toward statistics vary depending on their sex and prior statistical expertise. Teachers who teach or desire to teach statistics now must measure students' attitudes toward statistics. Any instructional steps could be disastrous if the perception or attitudes of the students are unknown. The researcher attempted to shed light on two crucial variables—"sex" and "previous knowledge"—that are significantly related to the problem of postgraduate students' attitudes toward statistics through this study. For statisticians to create effective lessons in the future, they will need to be able to formulate a hypothesis based on observations of their classes or student backgrounds (American Journal of Educational Research., 2018).

In that teacher "add value" to student outcomes, teachers are of great importance as a level of analysis for a variety of instructional and accountability purposes. It is commonly known that group-level constructs must be taken into consideration when addressing critically relevant topics about the effects of group contexts (Marsh et al., 2012; Schweig, 2014; Stapleton et al., 2016).

There is a rapidly expanding interest in assessing students' attitudes as a way to determine teacher performance due to the significance of students' academic attitudes as a learning outcome (Blazar & Kraft, 2017). Research on the multidimensional component structure of attitude data is important before more firm

conclusions can be drawn about the type and extent of teacher effects on students' attitudes, according to evidence-based instructional innovation and policymaking. According to the research of Norshahidi, N. D., Ismail, N. H. S. D., Abidin, S. Z., and N. F. Abd Razak (2021), statistics is a structural method that is employed in many fields, including education, and plays a crucial part in scientific investigations to enhance our lives. Statistics is a foundational subject at higher education institutions in Malaysia. Introduction to Statistics is a required course for students in the Faculty of Business and Management at the University of Technology MARA. Because they think that attitudes regarding statistics are crucial to the teaching and learning process and necessitate individualized feedback, educators and students have performed several research on these attitudes.

In their research, Male, H., and Lumbantoruan, J. H. Several pupils may find it exceedingly challenging to learn statistics in 2021 owing to their lack of background knowledge and disinterest in the topic. However, understanding and using statistics may come naturally to some students who specialize in mathematics. Undergraduate students who study statistics at the university level may find it challenging to use the statistical software and interpret the results. The lecture is another subject that all students must take. The social science students are now having trouble with this lecture. Most undergraduate social science students, unlike scientific students, view this as a challenge to their understanding of the subject. Some students confessed during a conversation that they find it difficult to understand statistics while looking at tables. They claimed they needed more time to focus on calculations and how to translate numerical data into meaningful language. This is consistent with what Ashaari et al. (2011) stated, according to which learners struggle to understand statistics due to both cognitive and non-cognitive aspects. They went on to say that the non-cognitive factor dealt with attitudes, perceptions, interests, expectations, and motivation while the cognitive factor dealt with intellectuality. According to the pre-discussion with some of the social science students, statistics is the subject that they find the most difficult. Some pupils find the subject to be both essential and frightening. However, they must take the course and absorb it to comprehend how statistics will be used in their final writing project. The difficulty of the subject has also made it uninteresting, which has demotivated the pupils and reduced their interest in it. Others might tend to see the topic negatively. The reason why most undergraduate students still have a low competency level when dealing with statistics may be the most questioned question. There are several variables that might affect a student's performance, including attitudes, motivation, anxiety, learning abilities, aptitudes, IQ, age, and personality. It is stated that pupils with optimistic beliefs may be more enthusiastic about performing statistics. Those who hold unfavorable views, however, would struggle and lack knowledge. Today, statistics are effectively used across a wide range of academic disciplines. To the best of the writers' knowledge, very few studies on statistics have been conducted by academics. Very few papers in the Indonesian context discussed how students felt about statistics.

In their study, Afifah and Wicaksana (2014) discovered that students' perceptions of statistics are often rated as positive.

Cahyawati, Wahyudin, and Prabawanto (2018) noted in another study that the results did not demonstrate variations in attitudes at the start and conclusion of learning in each dimension. It did not demonstrate a causal link between student attitudes toward statistics and the outcomes of statistics education.

In the sphere of education, statistics are seen as a subject that is vital to learn. It is studied not just at the university level but also at the high school level. One of the lectures offered at the undergraduate level is statistics. It aids students in comprehending and using quantitative techniques. A subfield of mathematics is statistics. Descriptive and inferential statistics are the two main branches of statistics, according to Chattopadhyay and Chattopadhyay (2014). When describing a set of data that has simply been gathered, descriptive statistics are utilized. Using data obtained on a small portion of the population, inferential statistics is used to generate predictions or comparisons about a larger group (a population). The study of attitudes and perceptions regarding statistics is related to both cognitive and non-cognitive aspects.

Another phrase for a person's perspective or viewpoint on something is perception. It is thought that successful learning might happen when students have a positive perspective of their education. This is consistent with research by Gunawan, Murniarti, and Male (2019). It is determined that the study's findings fall within the

perceptual category of good. However, failure results when they have false perceptions. In this study, the term "perception" refers to the respondents' prior knowledge of how they perceive the actual circumstance and condition.

In a study on gender differences in statistics anxiety, Mandap (2016) found that mathematics and perception are parts of statistics anxiety, which is consistent with Bond et al's (2012) assertion that perception deals with the interaction between cognitive and non-cognitive elements. As a result, perception is crucial since it has an impact on how well students learn any given subject. Based on the results of the data analysis and discussion of the Male study, it can be said that most students generally agreed with all the assertions made about perceptions when it comes to how they view statistics. This is evident from the first three sentences, which show that they were able to specify the statistical distribution, measurement, and method. The only areas where they diverged were in their opinions of how well statistics might be used to convey results and how simple they appeared to be. Most pupils demonstrated their strong feelings regarding statistics when it came to their views on statistics. Most of them agreed that comprehending statistics required a lot of discipline and that doing statistics required a strong attitude toward cognitive competency. Next, with regards to the difficulties of statistics despite their enjoyment and understanding of the statistical formula. Most students indicated that they worked hard for their statistics module and would complete all the tasks when asked about their opinions toward the usefulness and value of statistics in professional and personal life. Although they claimed to be interested in using statistics, many expressed anxieties about the exam and result interpretations. Teachers or lecturers of statistics are hoped to encourage the students as well as alter the method they teach the statistics in an easy and enjoyable way so that all the challenges may be eliminated, as the present study aims to find out the students' perceptions and attitudes toward statistics. For future research, it is suggested to conduct similar study to enrich the knowledge and to find out what has been left for a betterment.

More and more schools, universities, and teacher preparation programs are realizing the importance of statistics. To improve one's financial prospects, find job, stay employment, and find better employment, one must understand the significance of this maths component. Regardless of their subject of study, it is crucial to introduce students who pursue degree, diploma, or certificate programs to introductory statistics or fundamental statistics courses. Students seemed to have a poor perception of statistics, even though many scholars have emphasized the significance of this course and how important it is for obtaining future work. Instead of seeing statistics as a useful tool, many students see it as a barrier to academic success. This perspective is consistent with the findings of other researchers who found that students who completed this course experienced anxiety related to statistics. The result of this anxiousness seemed to be negative effects and a lack of desire, which reduced interest in courses on fundamental statistics. Students that exhibit anxiety about statistics, false beliefs, a lack of curiosity, and a lack of desire will eventually exhibit a weak attitude toward the use of statistics and data analytics. The students' academic performance and conceptual understanding will be impacted as a result. Academic performance and conceptual understanding are vital in ensuring students' success in studying core statistical topics. According to a study, there is a correlating relationship between statistical attitudes and anxiousness. Furthermore, it was mentioned that students' attitudes about statistics can affect their academic performance, either positively or negatively, depending on whether they are positive or negative. Students' present, as well as futures, might be impacted by negative views regarding statistics. A subfield of mathematics is statistics. This field is heavily utilized in daily life. Since learning statistics is essential, the Institute of Teacher Education Malaysia has made this course required for all students pursuing its preparatory program for the bachelor's degree in education (PPISMP) (IPGM). In fact, statistics are taught at every level of education, from kindergarten to university. Additionally, it was clear that all undergraduate programs, both domestically and internationally, included a statistics course. Students' attitudes about statistics may have an impact on their level of confidence, which in turn may influence how well they perform in statistical courses (Mustam, A. A., Adnan, M., Johnny, J., & Setambah, M. A. B., 2020, April).

Overall, it was clear that the pre-service teachers in this study had a reasonable level of familiarity with statistics. Therefore, it is likely that students work more or exert more effort to get through their challenges when taking statistics courses as part of their academic curriculum. The study's correlation analysis revealed a

tenuous association between attitude and gender, chosen major, and college location. It appears that there are no distinctions between these three elements' relationships to attitudes toward statistics. The results of this study indicate that pre-service instructors on these universities need to have their subpar attitude about statistics addressed. This issue is significant because pre-service instructors take statistics as a preparation course to help them develop a foundational understanding of statistics. The ability to master this course will help future teachers in their research for their senior project. In addition, research is an integral aspect of an educator's life. To carry out simple assessments and interpret their results to further improve students' abilities and performance at school, educators must have a solid understanding of fundamental statistics (Mustam, A. A., Adnan, M., Johnny, J., & Setambah, M. A. B., 2020, April).

For students, statistics is a tough subject that is frequently accompanied by worries that could have an impact on statistical performance. The use of statistics is widespread, and it has a substantial impact on many professions. However, students are fully aware of how challenging statistical courses may be (Sandoz, Butcher, & Protti, 2017). The term "statistical fears" refers to any issues that arise when working with statistics, regardless of the nature or degree of statistical analysis used. (Chiu, 2013) offer a broader statistical description of the unpleasant emotional stimulation that people may experience while dealing with statistics in any way and at any time. An unfavorable attitude toward statistics, which is connected to but distinct from mathematical concerns, precedes this emotional condition. Additionally, according to Macher, Paechter, Papousek, Ruggeri, Freudenthaler, and Arendasy (2013), Cruise and Wilkins (1980) identified six elements in statistical concerns: statistical value, interpretation concerns, fears of exams and classes, fears of asking for help, and fear of the statistical teacher.

Numerous poor learning practices will be shown to students that have high statistical worries. The findings of this methodical survey study offer insight into the connection between statistical concerns and statistical accomplishments as well as the factors involved. The instructional strategies they employ for kids who are having statistical-related challenges may potentially be reevaluated by educators based on statistical conceptions. Different instructional methods, like as computer-assisted instruction, might lessen anxieties, and enhance statistical performance. It is advised that students interact with actual obtained data to stress the statistical approaches presented. Teachers can affect how their pupils feel about statistics among other things by talking to them about their worries and offering them solutions (Ghani, F. H. A., & Maat, S. M., 2018).

Students majoring in social sciences are required to take statistics, which gives them the knowledge and abilities they need to comprehend, interpret, and conduct research. However, statistics courses are frequently perceived by students as obstacles to earning their degrees, and they experience significant anxiety when taking them. According to researchers, for pupils to succeed, they must have a favorable attitude toward statistics. To preserve and improve students' good attitudes toward statistics, it is crucial to understand the causes and consequences of those beliefs. Although attitude is crucial to students' success in statistics and their ability to use their knowledge of statistics outside of the classroom, there is disagreement on the definition of the construct of attitude. While some scholars believe attitudes are more emotionally than cognitively based, others believe attitudes are more closely related to beliefs. However, most people think that attitude refers to subjective reactions to numbers, whether they are favorable or unfavorable. The relationship between students' attitudes toward statistics and their achievement has been examined using several attitude components, including value, anxiety, fear, cognitive competence, expectancy of success, affect, and curiosity. A causal model can be used to depict the causal relationships between the attitude components and statistical achievement. Researchers have created statistics attitude models that explain the links between attitude elements and statistical achievement using their own teaching experiences, theories of second language acquisition, findings from earlier studies, and Eccles and colleagues' expectancy-value theory.

For the first time, Sorge and Schau developed and tested their "Statistics Attitudes-Achievement Saturated Model" using the expectancy-value theory. This model argued that four attitude components—difficulty, cognitive competence, affect, and value—are associated to statistical achievement. They discovered that prior performance and emotion were directly related to statistical success. Additionally, achievement was indirectly related to prior performance and difficulty via cognitive ability and later mood. However, the results showed

that value was not connected to success (Ghaderizefreh, S., & Hoover, M. L., 2017). The current investigation by Hoover, M. L., and S. Ghaderizefreh (2017) examined the function of academic control, task value, and the teacher's instructional style on students' emotions in a graduate statistics class, as well as the impact of these emotions on their effort and accomplishment, using the control-value theory as a framework. These findings are generally in line with the model put out, in that students' ratings of the instructional quality, task value, and sense of control of their teacher had an impact on their academic emotions, which in turn had an impact on their effort and performance in the course. Not all academic emotions, nevertheless, were considered in each step of the model. Numerous studies have determined that the emotion of concern in statistics is anxiety. However, our findings showed that while perceived task value had an impact on anxiety, instructional characteristics and students' feelings of task control had no impact. Furthermore, although higher anxiety was linked to worse achievement, student effort in the course was unaffected. The instructional characteristic, perceived task value, or task control had no impact on students' levels of boredom; nonetheless, they put less effort into their work, and boredom was unrelated to their performance in the course. The emotion that was most impacted by the antecedent variables was anger (or frustration).

## 3. Research Methodology

This chapter contains the Research design, Sampling technique, Research instrument, Data gathering, and procedure and Statistical tool used by the researcher to find out theEffect of using statistical software applications to students' attitude and performance in statistics.

### 3.1. Research Design

In this study, the researcher used a Descriptive Research Design using the one – group pretest and posttest design, to determine the influence of utilization of statistical software applications to students' attitude toward Statistics and performance in Statistics.

### 3.2. Sampling Technique

Respondents in this study were students at Laguna State Polytechnic University Siniloan Campus who's taking the course of Statistics and data analysis with software application. The sampling technique is done by using probability sampling which is simplerandom sampling technique. With the use of computer-generated number, the researcher can be able to choose who will be the respondents.

### 3.3. Research instrument

The data will be collected using a questionnaire SATS 36 (Survey Attitudes Toward Statistics). The questionnaire consists of 36 items with the following composition:

- Affect, consist of 6 items
- Cognitive competence, consists of 6 items
- Value, consists of 9 items
- Difficulty, consists of 7 items
- Interest, consists of 4 items
- Effort, consists of 4 items

7-point Likert scale for satisfaction is used to measure the student's attitude towardstatistics

Strongly Agree 7

| | |
|---|---|
| Agree | 6 |
| Somewhat Agree | 5 |
| Neither Agree nor Disagree | 4 |
| Somewhat Disagree | 3 |
| Disagree | 2 |
| Strongly Disagree | 1 |

3.4. Data Gathering and Analysis Statistical Tool

To answer the following questions in this study, the following statistical tools will be used.

| **Analysis** | **Statistical Tool** |
|---|---|
| * Profile of the respondents in terms of:<br>• Sex<br>• Socio Economic Status | Frequency Percentage |
| * Level of students' attitude toward statistics before and after using Statistical Software application in terms of:<br>• Affect<br>• Cognitive<br>• Value<br>• Difficulty<br>• Interest<br>• Effort | Mean<br>Rank |
| * Student's performance in Statistics | Mean<br>Standard dev. |
| * Test of difference between before and after using Statistical Software on the students' attitudes and achievement in Statistics | Wilcoxon rank test and Paired T-test |
| * Test of difference between before and after using Statistical Software on students' attitudes and achievement in Statistics in terms of sex | Mann Whitney Independent T-test |
| * Test of difference between before and after using Statistical Software on students' attitudes and achievement in Statistics in terms of gadgets used | Kruskal Wallis |

## 4. Presentation, Analysis, and Interpretation of Data

This chapter deals with the presentation, analysis, and interpretation of the data gathered to determine the Effect of Utilization of Statistical Software Applications on Students Attitude and Performance in Statistics.

Table 1 presents the frequency distribution of the demographic profile of the respondents in terms of sex and gadgets used. The table shows that most of the respondents are female having a frequency of 24 out of 30 or (80%) of the respondents are female. In terms of gadgets used, most of the respondents are using mobile phone having a frequency of 19 with the percentage of (63.3%), followed by using both mobile phone and laptop having a frequency of 16 and a percentage of (20%) and the least are those who are using laptop only with a frequency of 5 and a percentage of (16.7%).

Numerous research conducted on undergraduate students revealed that students' attitudes toward statistics vary depending on their sex and prior statistical expertise. Teachers who teach or desire to teach statistics now have to measure students' attitudes toward statistics. Any instructional steps could be disastrous if the perception or attitudes of the students are unknown.

Through this study, the researcher tried to draw light on two important variable, “sex” and “prior knowledge” which are significantly related to the issue of attitude towards statistics of postgraduate students. So that, in future the teachers of statistics can draw a hypothesis by seeing the class or from the background of the student to make a proper lesson (American Journal of Educational Research., 2018).

Research carried out Crux Research Inc. found that smartphone and laptop ownership amongst American college students was 78% and 86% respectively in July 2014 (Marketing Charts, (2014).

Table 1: Demographic profile of the respondents

| **Sex** | **Frequency (f)** | **Percentage** |
|---|---|---|
| **Male** | 6 | **20%** |
| **Female** | 24 | **80%** |
| **Total** | 30 | **100%** |
| **Gadgets used** | **Frequency (f)** | **Percentage** |
| **Laptop** | 5 | **16.7%** |
| **Mobile phone** | 19 | **63.3%** |
| **Mobile phone and laptop** | 16 | **20.0%** |
| **Total** | 30 | **100%** |

Table 2 presents the level of student’s attitudes toward statistics before and after using statistical software application in terms of affect. The table shows that the highest mean level is the statement, I will like statistics with the mean of (4.20) before and increaseafter using statistical software application to (5.40) with a verbal interpretation neither agreenor disagree to agree after they learned on how to use statistical software application. While the lowest mean before using statistical software is the statement, I do not get frustrated going over statistics test in class with the mean of (3.46 and increase to 4.97) with the verbal interpretation from somewhat disagree to somewhat agree.

The general mean shows that attitude toward statistics in terms of affect increasefrom 3.78 to 5.05 after

they learned on how to use statistical software application with theverbal interpretation of neither agree nor disagree to somewhat agree.

Naccache (2012) found that the Cognitive Competence, Effort, and Affect components of the Survey Attitude towards Statistics (SATS-36) influenced the students' achievement in their Statistics course. The study examined the elements that affect students' performances in a statistics course in Lebanon. Chiesi and Primi (2015) make the argument that Cognitive Competence, Affect, and Mathematical Knowledge may have an impact on the psychology of students' statistics performance at the University of Florence in Italy. In their 2016 paper Milic, Masic, Milin-Lazovic, Trajkovic, Bukumiric, and Savic study, nonetheless, revealed a substantial correlation between medical students' GPA and their Cognitive Competence score on the SATS-36 (Grade Point Average). Students with good attitudes towards statistics will be able to develop statistical thinking, use statistical knowledge to solve everyday problems, and have a motivation to pursue more advanced statistical courses in the future, claim Mohamad Judi, Ashaari, Mohamed, and Tengku Wook (2011). Students that have a bad attitude toward statistics will exhibit uneasiness in the classroom.

Table 2: Level of student's attitudes toward statistics before and after using statistical software application in terms of affect

| Affect | Before | | | After | | |
|---|---|---|---|---|---|---|
| | Mean | Verbal Interpretation | Rank | Mean | Verbal Interpretation | Rank |
| I will likestatistics | 4.20 | Neither Agree norDisagree | 1 | 5.40 | Agree | 1 |
| I do not feelinsecure when I must do statistics problem | 3.63 | Neither Agree norDisagree | 4 | 4.97 | Somewhat Agree | 3.5 |
| I do not get frustrated going over statistics tests in class | 3.46 | Somewhat disagree | 6 | 4.97 | Somewhat Agree | 3.5 |
| I do not be under stress During statistics Class | 3.50 | Somewhat disagree | 5 | 4.80 | Somewhat Agree | 6 |
| I will enjoytaking statistics | 4.03 | Neither Agree norDisagree | 2 | 5.33 | Agree | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| courses | | | | | | |
| I am not scared by statistics | 3.86 | Neither Agree norDisagree | 3 | 4.83 | Somewhat Agree | 5 |
| **General Mean** | **3.78** | **Neither Agree norDisagree** | | **5.05** | **Somewhat Agree** | |

Table 3 presents the level of student's attitudes toward statistics before and after using statistical software application in terms of Cognitive competence. The table showsthat the highest mean level is the statement, I can learn statistics with the mean of (4.83) and increased to (5.80) after they learned on how to use statistical software application with a verbal interpretation from somewhat agree to agree. While the lowest mean beforeusing statistical software is the statement, I do not make a lot of math errors in statistics with a mean of (3.40) and (4.53) after they learned on how to use statistical software application with the verbal interpretation of both somewhat agree.

The general mean shows that attitude toward statistics in terms of cognitive competence increase from (4.02 to 5.08) after they learned on how to use statistical software application with the verbal interpretation of neither agree nor disagree tosomewhat agree.

When it comes to applying intellectual knowledge and abilities to statistics, cognitive competence is referred to. The current investigation by Hoover, M. L., and S. Ghaderizefreh (2017) examined the function of academic control, task value, and the teacher's instructional style on students' emotions in a graduate statistics class, as well as the impact of these emotions on their effort and accomplishment, using the control-value theory as a framework. Most of them agreed that comprehending statistics required a lot of discipline and that doing statistics required a strong attitude toward cognitive competency. Cahyawati, Wahyudin, and Prabawanto (2018) noted in another study that the results did not demonstrate variations in attitudes at the start and conclusion of learning in each dimension. It did not demonstrate a causal link between student attitudes toward statistics and the outcomes of statistics education.

Table 3. Level of student's attitudes toward statistics before and after using statistical software application in terms of cognitive competence

| **Cognitive competence** | **Before** | | | **After** | | |
|---|---|---|---|---|---|---|
| | **Mean** | **Verbal Interpretation** | **Rank** | **Mean** | **Verbal Interpretation** | **Rank** |
| I do not have trouble understandingstatistics because of how I think | 3.73 | Neither Agree norDisagree | 4 | 4.87 | Somewhat Agree<br>Somewhat Agree | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| I have an idea of what's goingon in this statistics course | 4.17 | Neither Agree norDisagree | 3 | 5.17 | Somewhat Agree | 3 |
| I do not makea lot of math errors in statistics | 3.40 | Somewhat disagree | 6 | 4.53 | Agree | 6 |
| I can learnstatistics | 4.83 | Somewhat Agree | 1 | 5.80 | Somewhat Agree | 1 |
| I will understandstatistics questions | 4.27 | Neither Agree norDisagree | 2 | 5.30 | | 2 |
| I do not find itdifficult to understand statistical concepts | 3.70 | Neither Agree norDisagree | 5 | 4.80 | Somewhat Agree | 5 |
| **General mean** | 4.02 | Neither Agree norDisagree | | 5.08 | Somewhat Agree | |

Table 4 presents the level of student's attitudes toward statistics before and after using statistical software application in terms of Value. The table shows that the highest mean level is the statement, statistics are not worthless with the mean of (6.00) and increased to (6.53) after they learned on how to use statistical software application with a verbal interpretation from agree to strongly agree. While the lowest mean before using statistical software is the statement, I will have applications for statistics in my professionwith a mean of (4.84) and (5.97) after they learned on how to use statistical software application with the verbal interpretation somewhat agree to agree.

The general mean shows that attitude toward statistics in terms of value increase from (4.02) to (5.08) after they learned on how to use statistical software application with the verbal interpretation of neither agree nor disagree tosomewhat agree.

This field is heavily utilized in daily life. Since learning statistics is essential, the Institute of Teacher Education Malaysia has made this course required for all students pursuing its preparatory program for the bachelor's degree in education (PPISMP) (IPGM). In fact, statistics are taught at every level of education, from kindergarten to university. Additionally, it was clear that all undergraduate programs, both domestically and internationally, included a statistics course. Students' attitudes about statistics may have an impact on their level of confidence, which in turn may have an effect on how well they perform in statistical courses (Mustam, A. A., Adnan, M., Johnny, J., & Setambah, M. A. B., 2020, April)

Table 4: Level of student's attitudes toward statistics before and after using statistical software application in terms of value

| Value | Before | | | After | | |
|---|---|---|---|---|---|---|
| | Mean | Verbal Interpretation | Rank | Mean | Verbal Interpretation | Rank |
| Statistics arenot worthless | 6.00 | Agree | 1 | 6.53 | Strongly agree | 1 |
| Statistics should be required part of my professional training | 5.60 | Agree | 2 | 6.17 | Strongly agree | 4.5 |
| Statistical skills will make me more employable | 5.47 | Agree | 4 | 6.27 | Strongly agree | 2 |
| Statistics is useful to the typical professional | 5.53 | Agree | 3 | 6.23 | Strongly agree | 3 |
| Statistical thinking is applicable in my life outside my job | 5.23 | Somewhat Agree | 5 | 6.17 | Strongly agree | 4.5 |
| I use statistics in my everyday life | 4.93 | Somewhat Agree | 8 | 5.83 | Agree | 9 |
| Statistics conclusions are presented in everyday life | 5.07 | Somewhat Agree | 7 | 5.87 | Agree | 8 |
| I will have applications for statistics in my Profession | 4.83 | Somewhat Agree | 9 | 5.97 | Agree | 6.5 |
| Statistics is relevant in mylife | 5.10 | Somewhat Agree | 6 | 5.97 | Agree | 6.5 |
| **General mean** | 5.30 | Somewhat Agree | | 6.11 | Agree | |

Table 5 presents the level of student's attitudes toward statistics before and after using statistical software application in terms of Difficulty. The table shows that the highestmean level is the statement, statistics are highly technical with the mean of (5.13) and increased to (5.73) after they learned on how to use statistical

software application with a verbal interpretation from somewhat agree to agree. While the lowest mean before using statistical software is the statement, statistics formula is easy to understand, and statistics is not a complicated subject with a mean of (3.73) both before and (5.13 and 5.20) after theylearned on how to use statistical software application with the verbal interpretation of neither agree nor disagree to somewhat agree.

The general mean shows that attitude toward statistics in terms of cognitive competence increase from (4.43 to 5.48) after they learned on how to use statistical software application with the verbal interpretation of somewhat agree to agree.

Concerning the difficulty of statistics even though they enjoy and understand the formula of statistics. In terms of attitudes about relevance on worth of statistics in professional and personal life, most of the students said that they work hard for their statistics module, and they would complete all the assignments. Although they stated that they are interested in using statistics, the test and results interpretations would make them anxious. As the presents study is to find out the students' perceptions and attitudes towards statistics, teachers or lecturers of statistics are hoped to encourage the students as well as varying the way they teach the statistics in simple and fun way so that all the difficulties may be minimized.

Table 5. Level of student's attitudes toward statistics before and after using statistical software application in terms of difficulty

| **Difficulty** | **Before** | | | **After** | | |
|---|---|---|---|---|---|---|
| | Mean | Verbal Interpretation | Rank | Mean | Verbal Interpretation | Rank |

| | | | | | | |
|---|---|---|---|---|---|---|
| Statistics formulas are easy to understand | 3.73 | Neither Agree norDisagree | 6.5 | 5.13 | Somewhat Agree | 6.5 |
| Statistics isnot complicatedsubject | 3.73 | Neither Agree norDisagree | 6.5 | 5.20 | Somewhat Agree | 5 |
| Statistics is asubject quickly learned by most people | 3.80 | Neither Agree norDisagree | 5 | 5.13 | Somewhat Agree | 6.5 |
| Learning statistics requires a great deal of discipline | 4.77 | Somewhat Agree | 4 | 5.80 | Agree | 1 |
| Statistics involves massive computations | 4.93 | Somewhat Agree | 2.5 | 5.67 | Agree | 4 |
| Statistics arehighly technical | 5.13 | Somewhat Agree | 1 | 5.73 | Agree | 2 |
| Most people must learn a new way of thinking to dostatistics | 4.93 | Somewhat Agree | 2.5 | 5.70 | Agree | 3 |
| **General mean** | **4.43** | **Somewhat Agree** | | **5.48** | **Agree** | |

Table 6 presents the level of student's attitudes toward statistics before and after using statistical software application in terms of Interest. The table shows that the highestmean level is the statement, I' am interested in statistics with the mean of (4.93) and increased to (5.93) after they learned on how to use statistical software application with a verbal interpretation from somewhat agree to agree. While the lowest mean before usingstatistical software is the statement, I 'am interested in using statistics with a mean of (4.67) increased to (5.83) after they learned on how to use statistical software application with the verbal interpretation from somewhat agree to agree.

The general mean shows that attitude toward statistics in terms of cognitive competence increase from (4.79 to 5.48) after they learned on how to use statistical software application with the verbal interpretation of somewhat agree to agree.

According to the study of Male, H., & Lumbantoruan, J. H. (2021), studying Statistics to several students might be very difficult to understand due the lack of knowledge of the statistics and low interest of the subject. Meanwhile, Judi, Ashaari, Mohamed, and Wook (2011) in their study of students' profiles based on attitude towards statistics explained that the students' attitude towards statistics is divided into two categories, either positive or negative. A positive attitude towards statistics could contribute to the students' achievement

in statistics and enable students to develop statistical thinking skills, to apply knowledge acquired in everyday life. Meanwhile, a negative attitude towards statistics generally makes students lose focus in the class and lack interest in statistics.

Table 6: Level of student's attitudes toward statistics before and after using Statistical Software Application in terms of Interest:

| **Interest** | **Before** | | | **After** | | |
|---|---|---|---|---|---|---|
| | Mean | Verbal Interpretation | Rank | Mean | Verbal Interpretation | Rank |
| I am interested in being able to communicate statistical information to others. | 4.73 | Somewhat Agree | 3 | 5.67 | Agree | 4 |
| I am interested inusing statistics. | 4.67 | Somewhat Agree | 4 | 5.83 | Agree | 2 |
| I am interested in understanding statistical information | 4.83 | Somewhat Agree | 2 | 5.80 | Agree | 3 |
| I am interested inlearning statistics | 4.93 | Somewhat Agree | 1 | 5.93 | Agree | 1 |
| **General mean** | **4.79** | **Somewhat Agree** | | **5.48** | **Agree** | |

Table 7 presents the level of student's attitudes toward statistics before and after using statistical software application in terms of Effort. The table shows that the highest mean level is the statement, I plan to study hard for everyday statistics test with the meanof (5.10) and increased to (6.07) after they learned on how to use statistical software application with a verbal interpretation from somewhat agree to agree. While the lowest mean before using statistical software is the statement, I plan to work hard in my statisticscourse with a mean of (4.87) increased to (5.87) after they learned on how to use statistical software application with the verbal interpretation from somewhat agree to agree.

The general mean shows that attitude toward statistics in terms of cognitive competence increase from (5.00 to 5.88) after they learned on how to use statistical software application with the verbal interpretation of somewhat agree to agree. It means that the attitude toward statistics of the respondents in terms of effort increase after they learned on how to use statistical software application.

Effort refers to the amount of effort students spend on learning statistics (Saidi, S. S., & Siew, N. M., 2019). Effort was found to be negatively significant and weakly correlated with the students' understanding of the measures of central tendency. One interpretation of this is that students who employed a learning style that is strongly effort-based might not enable the student to gain more understanding about statistical concepts. This finding will have a strong impact on statistics education, where studying with great effort does not bear a good understanding of statistical concepts.

Table 7: Level of student's attitudes toward statistics before and after using Statistical Software Application in terms of Effort:

| Effort | Before | | | After | | |
|---|---|---|---|---|---|---|
| | Mean | Verbal Interpretation | Rank | Mean | Verbal Interpretation | Rank |
| I plan to complete allmy statisticsassignment | 5.07 | Somewhat Agree | 2 | 5.73 | Agree | 4 |
| I plan to workhard in my statistics course | 4.87 | Somewhat Agree | 4 | 5.87 | Agree | 2 |
| I plan to study hard for everyday statistics test | 5.10 | Somewhat Agree | 1 | 6.07 | Agree | 1 |
| I plan to attend every statistics class session | 4.97 | Somewhat Agree | 3 | 5.83 | Agree | 3 |
| **General Mean** | **5.00** | **Somewhat Agree** | | **5.88** | **Agree** | |

| SCALE | RANGE | INTERPRETATION |
|---|---|---|
| **1** | 6.17 – 7.00 | Strongly agree |
| 2 | 5.31 – 6.16 | Agree |
| 3 | 4.45 – 5.30 | Somewhat Agree |
| 4 | 3.59 – 4.44 | Neither Agree nor Disagree |
| 5 | 2.73 – 3.58 | Somewhat disagree |
| 6 | 1.87 – 2.72 | Disagree |
| 7 | 1.00 – 1.86 | Strongly Disagree |

Table 8 presents the mean Level of attitude of the students toward statistics beforeand after using statistical software application. The table shows the mean level of attitudetoward statistics in terms of Affect increases from (3.78 to 5.05), and its verbal interpretationturns from neither agree nor disagree into somewhat agree. In terms of Cognitive competence, table shows that the level of attitude toward statistics increases from (4.02 to 5.08), and its verbal interpretation turns from neither agree nor disagree into somewhatagree. In terms of Value, table shows that the level of attitude toward statistics increasesfrom (5.03 to 6.11), and its verbal interpretation turns from somewhat agree into agree. Interms of Difficulty table shows that the level of attitude toward statistics increases from (4.43 to 5.48), and its verbal interpretation turns from neither agree nor disagree into agree.

In terms of Interest, table shows that the level of attitude toward statistics increases from (4.79 to 5.81), and its verbal interpretation turns from somewhat agree into agree. In termsof Effort, table shows that the level of attitude toward statistics increases from (5.00 to 5.88), and its verbal interpretation turns from somewhat agree into agree. It means that the level of attitude toward statistics increases after they learn on how to use statistical software application. According to the Guidelines for Assessment and Instruction in Statistics Education (GAISE; 2016), the biggest change and recommendation in teaching statistics from the previous decade was increased statisticsmodule in an Indonesian university (Jatnica, 2015). Jatnica found that after using SPSS for the duration of the module, students felt that their knowledge and skills in statistics increased but their grades decreased.

Table 8. Mean level of student's attitude toward statistics before and after using statistical software application

| AFFECT | Mean | Verbal Interpretation |
|---|---|---|
| **Before** | 3.78 | Neither agree nor Disagree |
| **After** | 5.05 | Somewhat agree |
| **COGNITIVE COMPETENCE** | | |
| **Before** | 4.02 | Neither agree nor Disagree |
| **After** | 5.08 | Somewhat agree |
| **VALUE** | | |
| **Before** | 5.03 | Somewhat agree |
| **After** | 6.11 | Agree |
| **DIFFICULTY** | | |
| **Before** | 4.43 | Neither agree nor Disagree |
| **After** | 5.48 | Agree |
| **INTEREST** | | |
| **Before** | 4.79 | Somewhat agree |
| **After** | 5.81 | Agree |
| **EFFORT** | | |
| **Before** | 5.00 | Somewhat agree |
| **After** | 5.88 | Agree |

| SCALE | RANGE | INTERPRETATION |
|---|---|---|
| **1** | 6.17 – 7.00 | Strongly agree |
| 2 | 5.31 – 6.16 | Agree |
| 3 | 4.45 – 5.30 | Somewhat Agree |
| 4 | 3.59 – 4.44 | Neither Agree nor Disagree |
| 5 | 2.73 – 3.58 | Somewhat disagree |
| 6 | 1.87 – 2.72 | Disagree |
| 7 | 1.00 – 1.86 | Strongly Disagree |

Table 9 presents the performance of the students before and after using softwareapplication. The table shows that the average performance of the students increases afterthey learned on how to use statistical software application in Statistics. It is from (88%) became (91%) with the standard deviation of (5) before and (3.44) after they learned on howto use statistical software application.

Naccache (2012) in her study of investigating the factors that influence students' performancesin a statistics course in Lebanon, revealed that Cognitive Competence, Effort, and Affect components in Survey Attitude towards Statistics (SATS-36) influenced the students' achievement in their Statistics course. Meanwhile, Chiesi and Primi (2015) posit that Cognitive Competence, as well as Affect and mathematical knowledge could affect the psychology of students' achievements in statistics at the University of Florence in Italy. Milic, Masic, Milin-Lazovic, Trajkovic, Bukumiric, and Savic (2016)'s study on the other hand showed that the medical students' Cognitive Competence score in SATS-36 had significant influence with student' GPA (Grade Point Average). According to Mohamad Judi, Ashaari, Mohamed, and Tengku Wook (2011), students with positive attitudes towards statistics will be able to develop statistical thinking, use statistical knowledge to solve daily life problems, and have a desire to follow more advanced statistical courses in the future.

Table 9: Performance of the students in Statistics before and after using statistical software application

| Average Performance | Mean | Standard Deviation |
|---|---|---|
| **Before** | 88 % | 5.00 |
| **After** | 91 % | 3.44 |

Table 10 presents the test of difference before and after the students learn on howto use statistical application on the level of attitude towards Statistics. With the use of Wilcoxon rank test, it was found that there is a significant difference between the level ofattitude of the students before and after they used statistical software in terms of value, interest, and effort, since their (P-value < 0.05 alpha level of significance) thus, to reject null hypothesis. On the other hand, affective, cognitive competence interpreted as a highly significant. Since the (P value = .000) whichis less than .001, thus, to reject null hypothesis. The table shows that utilization statistical software has a positive effect to the student's attitude towards statistics. According to (Jatnica, 2015) found that after using SPSS for the duration of the module, students felt that their knowledge and skills in statistics increased.

Table 10: Test of difference between student's attitudes in Statistics before andafter using Statistical Software Application.

| Variables | Standardized TestStatistic | P value | Interpretation |
|---|---|---|---|
| **Affect** | 4.086 | .000 | Highly Significant |
| **Cognitive** | 3.481 | .000 | Highly Significant |
| **Value** | 3.446 | .001 | Significant |
| **Difficulty** | 3.824 | .000 | Highly Significant |
| **Interest** | 3.232 | .001 | Significant |
| **Effort** | 3.048 | .002 | Significant |

Table 11 presents the test of difference between before and after the students learn on how to use statistical software application on the Performance in Statistics. Withthe used of Paired Ttest as a statistical tool, the result reveals that there is a significant difference between before and after the students learned on how to use statistical software application. Since( P value =.009) which is less than .05 alpha level of significance thus, to reject null hypothesis. The table shows that using statistical softwarehas an effect to the student's performance in statistics.

In contrast to the result on the study of (Jatnica, 2015). Jatnica found that after using SPSS for the duration of the module, students felt that their knowledge and skills instatistics increased but their grades decreased. It Implies that instructors must guide thestudents in using statistical software application, it does not mean that students must always be dependent on statistical software application in solving statistics problem but must also practice on how to solve manually to familiarize those formula, symbols and terminologies used in Statistics.

Table 11. Test of difference between student's performance in Statistics beforeand after using statistical software application

| Variables | N | T value | P value | Interpretation |
|---|---|---|---|---|
| **Before and after** | 30 | 2.780 | .009 | Significant |

Table 12 presents the test of difference between before and after using statisticalsoftware on students' attitude toward Statistics when it classified in terms of sex. The result reveals that there is no significant difference between male and female before as well as after utilization of statistical software application on students' attitude toward statistics when it classified in terms of sex. Since the P value obtained are all greater than .05 alpha level of significance, thus fail to reject null hypothesis.

Literature on gender differences in attitudes toward statistics report contradictory results. Some authors reported that men expressed more positive attitudes toward statistics than women (e.g., Auzmendi, 1991; Tempelar & Nijhuis, 2007), Others found nogender differences. (e.g., Estrada, Batanero, Fortuny, & Diaz, 2005; Judi, Ashaari, Mohamed, &Wook, 2011; Schau, Stevens, Dauphinee, and Del Vecchio 1995; Wisenbeker et al., 2000)

Table 12: Test of difference between student's attitudes in Statistics before and after using Statistical Software Application when classified in terms of sex.

| Variables | | Computed value | P value | Interpretation |
|---|---|---|---|---|
| **Affective** | Before | 71.500 | .979 | Not Significant |
| | After | 64.000 | .677 | Not Significant |
| **Cognitive** | Before | 60.000 | .533 | Not Significant |
| | After | 60.000 | .533 | Not Significant |
| **Value** | Before | 69.500 | .897 | Not Significant |

| | | | | |
|---|---|---|---|---|
| | After | 50.500 | .263 | Not Significant |
| **Difficulty** | Before | 70.500 | .938 | Not Significant |
| | After | 67.500 | .815 | Not Significant |
| **Interest** | Before | 67.500 | .814 | Not Significant |
| | After | 68.500 | .854 | Not Significant |
| **Effort** | Before | 69.500 | .896 | Not Significant |
| | After | 67.000 | .792 | Not Significant |

Table 13 presents the test of difference between before and after using statisticalsoftware on students' performance toward Statistics when it classified in terms of sex. With the used of independent Ttest, the result reveals that there is no significant differencebetween male and female before as well as after utilization of statistical softwareapplication on students' performance toward statistics when it classified in terms of sex. Since the P value obtained are all greater than .05 alpha level of significance, thus fail to reject null hypothesis.

Bond et al (2012 said that perception deals with interaction between cognitive and non-cognitive factors. Mandap (2016) conducted a study dealing with gender differences in statistics anxiety, this study showed that mathematics and perception belong to statistics anxiety components. Therefore, perception is essential because it can affect the students' success of learning any subject.

Table 13. Test of difference between student's performance in Statistics before andafter using statistical software application when classified in term of sex

| **Variables** | **Tvalue** | **P value** | **Interpretation** |
|---|---|---|---|
| **Before** | .161 | .873 | Not Significant |
| **After** | .550 | .586 | Not Significant |

Table 14 presents the test of difference between before and after using statisticalsoftware on students' attitudes toward Statistics when it classified in terms of gadgets used. With the use of Kruskal Wallis as a statistical tool, the result reveals that there is no significant difference among 3 gadgets used before as well as after utilization of statistical software application on students' attitude toward statistics when it classified in terms of gadgets. Since the p value obtained are all greater than .05 alpha level of significance, thus fail to reject null hypothesis.

It means that the attitudes toward statistics of the students are in the same level regardless of what gadgets they are using. Previous studies investigated student's device choice ( Casidy et al., 2014: Dahlstrom & Warraich, 2012)., however fewer studies havelooked specially at which devices students choose for certain academic tasks.

Table 14: Test of difference between student's attitudes in Statistics before andafter using Statistical Software Application when classified

in terms of gadgets used.

| Variables | | Computed value | P value | Interpretation |
|---|---|---|---|---|
| **Affective** | Before | 5.543 | .063 | Not Significant |
| | After | 0.345 | .842 | Not Significant |
| **Cognitive** | Before | 4.194 | .123 | Not Significant |
| | After | 0.828 | .661 | Not Significant |
| **Value** | Before | 2.535 | .282 | Not Significant |
| | After | 2.629 | .269 | Not Significant |
| **Difficulty** | Before | 5.800 | .055 | Not Significant |
| | After | 3.553 | .169 | Not Significant |
| **Interest** | Before | 4.218 | .121 | Not Significant |
| | After | 3.256 | .195 | Not Significant |
| **Effort** | Before | 3.985 | .136 | Not Significant |
| | After | 2.558 | .278 | Not Significant |

Table 15 presents the test of difference between before and after using statisticalsoftware on students' performance toward Statistics when it classified in terms of gadgetsused. The result reveals that there is no significant difference between male and female before as well as after utilization of statistical software application on students' attitude toward statistics when it classified in terms of gadgets used. Since the P value obtained are all greater than .05 alpha level of significance, thus fail to reject null hypothesis.

Based on statistical constructs, educators should consider re-evaluating the teaching methods that they use to students who are facing statistical related problems. Different teaching techniques such as computer-assisted teaching can reduce fears and thus improve statistical achievement. To emphasize statistical methods taught, it is recommended that students should engage with actual collected data. Among other ways in which teachers can influence students' feelings towards statistics, it is to discuss their concerns and give them a way to overcome their concerns (Ghani, F. H. A., & Maat, S. M., 2018).

Table 15. Test of difference between student's performance in statistics beforeand after using statistical software application when classified in terms of gadgets used.

| Variables | F Value | P value | Interpretation |
|---|---|---|---|
| **Before** | 0.245 | .785 | Not Significant |
| **After** | 0.017 | .983 | Not Significant |

## 5. Summary, Conclusions and Recommendations

This chapter presents the summary of the research, generalization on the findings,conclusion for the research, and recommendation for the solution of the problem discovered in the study.

### 5.1. Summary of Findings

Majority of the respondents are female having a frequency of 24 out of 30 or 80%and most of the respondents are using mobile phone having a frequency of 19 with the percentage of 63.3%, followed by using both mobile phone and laptop having a frequencyof 16 and a percentage of 20% and the least are those who are using laptop only with a frequency of 5 and a percentage of 16.7%.

With the use of Wilcoxon rank test, it was found that there is a significant differencebetween the levels of attitude of the students before and after they used statistical softwarein terms of value, interest, and effort, since their P value obtained are less than 0.05 alphalevel of significance thus, to reject null hypothesis. On the other hand, affective, cognitive competence interpreted as a highly significant. Since the P value obtained is which is less than .001, thus, to reject null hypothesis. With the used of PairedTtest as a statistical tool, the result reveals that there is a significant difference between before and after the students learned on how to use statistical software application. Since (P value = .009) which is less than .05 alpha level of significance thus, to reject null hypothesis.

It is also reveals that there is no significant difference in terms of sex on the attitudes toward statistics before and after the utilization of statistical software applicationas well as to their performance. Since the P value obtained are all greater than .05 alphalevel of significance, thus fail to reject null hypothesis. While in terms of gadgets used, it is also reveals that there is no significant difference among three kinds of gadgetsused on the student's attitude toward statistics as well as to their performance in statistics,thus fail to reject null hypothesis.

### 5.2. Conclusions

After the thorough analysis, it is concluded that utilization of statistical software application has a positive effect on the performance and attitude toward statistics in termsof affective, cognitive, value, difficulty, interest, and effort. Since its mean level of attitudetoward statistics increases as well as to their performance after they learned on how to use statistical software application. According to (Jatnica, 2015) found that after using SPSS for the duration of the module, students felt that their knowledge and skills in statistics increased.

On the other hand, it is also concluded that male and female students have no significant difference when it comes to their attitudes toward statistics before and after they used statistical software application regardless of what gadgets they are using.

### 5.3. Recommendations

Based on the findings of the study, the following recommendations were made:

- It is recommended to motivate students who are taking up statistics subjects to build up a positive attitude toward statistics in terms of, not only to affect and cognitive competence but also to value the importance of statistics inour everyday life. Given the importance of statistics, it is worthwhile

to examinestudent's attitude toward statistics.

- It is recommended in introducing different kinds of statistical software application to become knowledgeable in using technology. But not to become dependent on it in solving statistics problem. The researcher also recommendsbecoming balance in using statistical software application if it will not affect or decrease the level on performance of the students in Statistics.
- It is recommending utilization of statistical software application especially to those who are taking advanced statistics with data analysis to boosttheir confidence in computing statistical problems and to enhance their interest and improve their attitude toward statistics in terms of effort and difficulty.
- This study recommed for further research by futureresearchers.

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