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By

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Dedication

I dedicate this work firstly to the Almighty God for his spiritual support. Also to my late husband, my precious gifts Isabel and Sean, my mother Virginia Mufutratiri and my family who encouraged and gave me support from the beginning until the end of my research writing. I also dedicate this work to my esteemed friends Veron and Ryan Chiwala who helped me tirelessly, my supervisor and my fellow colleagues who gave me support, guidance and assistance in compilation of the entire research.

ABSTRACT

This study aimed to explore the students' statistical effect in Advanced students in Statistics. This study was conducted at Elevate Senior School in Goromonzi district in Mashonaland East province. It was guided by social learning. The sample included fifteen students. The study employed qualitative research which was more suitable because it enabled the researcher to acquire information from selected participants. The sample used by the researcher was drawn using a purposive sampling technique. Scientific research was done to ensure reliability and validity. The data was collected through observation administered to learners, interviews, and focused group discussion. The data was organized in the form of verbatim and word cloud. The data was revealed that to increase motivation and confidence in learners the teachers has to use real world examples in statistics, resources must be available for students who comes from low socio economic status. Teachers must have self confidence in the subject and parents has to support their children physically and emotionally.

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Table of Contents

Release form	ii
Approval Form.....	iii
Dedication.....	iv
ABSTRACT.....	v
Acknowledgments	vi
Chapter 1.....	1
Chapter Introduction.....	1
Background of the study	1
Research objectives	3
STATEMENT OF THE PROBLEM.....	4
RESEARCH QUESTIONS.....	4
SIGNIFICANCE OF THE STUDY.	4
Curriculum implementers.....	5
Assumptions of the study	6
Delimitations of the Study	7
Limitations of the study	7
Organization of the study	7
Conclusion	8
CHAPTER 2 LITERATURE REVIEW	8
CHAPTER INTRODUCTION.....	8
INTRODUCTION OF MAIN CONCEPTS.....	9
Definition of terms.....	9
STATISTICAL AFFECT.....	9
RELATED LITERATURE	10
THEORETICAL FRAMEWORK.....	11
BANDURA'S SELF EFFICACY THEORY	11
WIGFIELD AND ECCLESTONE'S EXPECTANCY-VALUE THEORY	12
CONCEPTUAL FRAMEWORK.....	13
CHAPTER SUMMARY.....	17
Chapter 3.....	18
RESEARCH METHODS	18
Introduction.....	18

RESEARCH DESIGN	18
RESEARCH METHODOLOGY	21
RESEARCH METHODS.....	23
ETHICAL CONSIDERATION.....	25
CHAPTER SUMMARY.....	26
CHAPTER 4	26
RESULTS AND DISCUSSION	27
CHAPTER INTRODUCTION.....	27
STUDY PARTICIPANTS DEMOGRAPHICS	27
DATA PRESENTATION AND DISCUSSION	29
DISCUSSION	31
CONCLUSION	31
CHAPTER 5	32
CHAPTER INTRODUCTION.....	32
Summary	33
Conclusion	34
REFERENCES.....	vii

Chapter 1

Chapter Introduction

In the era of data-driven decision-making, statistical literacy has become an essential skill for students to navigate the complexities of the modern world. However, research has consistently shown that many students struggle to develop a positive attitude towards statistics. This leads to a lack of engagement, poor performance, and a diminished ability to apply statistical concepts in real-world contexts. This phenomenon is particularly concerning in Zimbabwe, where statistics is compulsory in secondary education. This study seeks to explore the statistical effect of students at Elevate Senior School in Goromonzi District, specifically focusing on understanding the dynamics of students' attitudes towards ordinary statistics. This research aims to identify potential barriers to effective learning and provide insights for educators to develop targeted interventions by examining the factors that influence students' statistical effect. Ultimately, this study contributes to a deeper understanding of how students' attitudes toward statistics can be fostered, leading to improved academic outcomes and a more statistically literate citizenry.

Background of the study

Statistics can be perceived as challenging and intimidating. Coetzee and Van der Merwe (2010) agreed that statistics could be viewed as difficult and are slightly more negative when rating the difficulty of statistics as a subject. Many students fail to tackle statistics because of various factors. Using a factor analysis, a study by Al-Agilli et al (2012) discovered a weak correlation between students' attitudes toward mathematics and their achievement, teaching methods and practices, teacher contribution as well as classroom climate. These factors include teaching methods, statistics anxiety, curriculum design, previous experience, self-confidence, and self-efficacy can influence students' perception of learning statistics. Research has shown that attitudes towards statistics are shaped by various factors, including teaching methods, learning materials, and student

motivation (Mudzengerere, 2012). Many students with low self-efficacy in mathematical skills may perceive statistics as daunting and unapproachable.

Students may lack confidence in the subject, they feel scared of the course as compared to the initial level of fear as it was found. They took statistics as the most difficult course. Kristi (2013) states that students reported that the fact of considering themselves as not being intelligent enough helps to build up an attitude toward statistics. Students might be afraid of the course when they don't find the connection between the courses they want to pursue in the future. Also, not seeing the relevance of statistics in their everyday lives.

Gender is another factor that contributes negative attitude towards statistics, as learners believe that there is a certain gender responsible for mathematics or statistics. They believe that male students perform better than female students. Female students develop anxiety which lowers their self-esteem and end up performing poorly in the subject.

Furthermore, interest is the major factor that shapes the students' attitude towards a phenomenon. Many students have the belief that mathematics is a hard nut to crack so they didn't want to attempt. The study revealed that even the parents played a part in lowering the interest of the students by not supporting their combination when they wanted to pursue advanced levels. Parents are not encouraging them to choose statistics because they believe that it is difficult. In addition, other studies stated that demographic or academic factors may affect the development of attitudes toward statistics. The level of education of the parents constitutes a negative attitude towards statistics because students failed to get motivation from their parents. Family status also contributes to negative attitudes, for instance, some parents compare their children to other family members who failed to master statistics.

In addition to that, a lack of teacher competence also helps in scaffolding a positive attitude. If the teacher is not competent the students may develop a negative attitude. Some of the teaching methods used by the teachers might be raw and learners end up not understanding the subject content. Moreover, some students experience statistics anxiety due to a lack of mathematical knowledge, lower previous achievement, and negative experience in mathematics. Most of them struggled with mathematics during their ordinary level so the struggle extended to anxiety in

statistics at an advanced level. Students with statistics anxiety may exhibit avoidance behaviors, such as skipping classes or procrastinating on statistical tasks.

Despite so many factors that aid the development of attitudes in learning statistics, there are ways to curb these factors and increase motivation and confidence in learners so that they will perform better. Teachers must use real-world examples when teaching, this will spark interest and curiosity in the subject. For example, the teacher may use statistics to encourage students to analyze sports data, social media trends, and health issues to mention a few, since many learners are concerned about these issues. Inviting guest speakers such as those who are in the field of statistics from different departments so that learners will want to learn more. Also, incorporation of videos during the lesson thus shows how different fields are done using statistics.

In addition, to increase motivation in learners, facilitators have to use simplified terms when explaining not using too much jargon or technical language as this will create confusion in learners. Furthermore, facilitators have to use the scaffolding process to build confidence in learners. They have to help every student to master the subject content that is from simple to complex. Fong and Krause (2014) state that construction workers use scaffolding to reach higher elevations safely and securely and educators can employ growth in confidence. They might lack confidence in learning because they may not have mastered certain academic skills and strategies. Educators need to help students to reach the next level. More so, as educators we have to offer social support to learners as they come from different backgrounds and they have different beliefs about statistics.

Research objectives

The main objective of this study is to explore the attitudes toward statistics at Elevate Senior School

- Identifying the demographic of students that influence their attitudes toward statistics
- Investigating the impact of prior knowledge of mathematics on students' attitudes towards statistics
- Identifying strategies used by the teachers to promote positive attitudes toward statistics

- Comparing the attitudes of male and female students towards statistics

STATEMENT OF THE PROBLEM

Negative attitudes towards statistics have been experienced from time immemorial, but the magnitude with which it manifests itself in today's schools is alarming. Many students perform poorly in the subject which is caused by many factors. It is therefore imperative that strategies to curb this problem are devised in order to promote motivation and confidence in learners for the production of good academic results and also in future life.

RESEARCH QUESTIONS

Roberts (2004) stated research questions guide the study and usually provide the structure for presenting the results of research. The research questions in this study were:

- i. What are the attitudes of students towards statistics?
- ii. What factors influence students' attitudes toward statistics?
- iii. How do students' attitudes towards statistics impact their performance in the subject?

SIGNIFICANCE OF THE STUDY.

This study on students' statistical effect and finding ways to improve motivation and confidence holds significant importance for several reasons. By exploring students' attitudes and experiences this study aims to contribute to a deeper understanding of statistics, and education, ultimately benefiting students, educators, curriculum implementers, and the broader community.

Teachers

Through this study, the teachers will be helped with different ways of improving motivation and confidence in learning statistics. They need to use real-world examples as this connects statistical concepts to real-life scenarios, making examples more relatable and interesting. They have to personalize learning by catering to different learning styles and abilities, and offering individualized support and feedback. Furthermore, they have to encourage students with praise, recognition, and rewards for their efforts and progress. Supporting group work and peer-to-peer work where they build a sense of community and shared understanding. In addition, they've to incorporate formative assessment by providing regular and constructive feedback to help learners track their progress and identify areas for improvement. They have to encourage students to view their mistakes as this works as an opportunity for their growth and learning. Concludes by setting goals that are slightly beyond learners' current abilities, encouraging them to strive for excellence.

Learners

Learners also benefit from this study if they use the following strategies to boost their confidence in statistics. They've to set their own goals that are specific and achievable to help them master the statistical concepts. There is a proverb that says practice makes one perfect. They need to practice regularly the work on their exercises, problems, and projects as this will scaffold their proficiency. In addition, for them to be successful in statistics, they should not hesitate to seek help from their teachers and other peers whom they think they mastered the concepts. Also, they have to know how statistics applies to their interests or career goals. And, they've to embrace their mindset by believing that their abilities to learn statistics can be developed through dedication and effort. Revisiting what they've learned, taking note of what they've mastered, and being certain of the areas they need improvement also improves their perception. The use of technology strategies also enhances their understanding and engagement. Lastly, they've to balance their study sessions to avoid burnout. If they can take ownership of their learning they build confidence and also develop a deeper sense of understanding of statistics.

Curriculum implementers

This study is going to help curriculum implementers also to strategize their curriculum to support the teaching and learning of statistics. They need to offer resources that support teachers to cater for diverse learners. Teachers need proper training and support to teach statistics effectively to diverse learners. By implementing these strategies, curriculum implementers can create a supportive and inclusive learning environment that fosters a deeper understanding of statistics and prepares students for success in an increasingly data-driven.

Assumptions of the study

The following assumptions are made in this study

General assumptions

- Students' attitudes towards statistics are influenced by their learning experiences in the classroom
- The teaching methods and materials used in the statistics classroom impact students' attitudes.
- Students' prior knowledge and understanding of mathematics influence their attitudes toward statistics

Specific assumptions

- The students at Elevate Senior School are representative of other senior schools in Zimbabwe
- The student's responses to the survey or questionnaire accurately reflect their attitudes toward statistics
- The teachers' teaching methods and materials used at Elevate Senior School are typical of those used in other senior schools.

Theoretical assumptions

- The theory of planned behavior applies to this study suggesting that students' attitudes toward statistics influence their behavior

- Students' attitudes toward statistics are shaped by their perceived usefulness, interest, and confidence

Delimitations of the Study

The researcher investigated the impact of students' attitudes towards statistics and explored ways of improving motivation and confidence in the subject. The study was limited to A-level students enrolled in statistics at Elevate Senior School. The study was conducted over a single academic term. The researcher employed a mixed methods approach using surveys and interviews but did not include experimental or longitudinal designs.

Limitations of the study

Due to financial constraints and unavailability of time, the researcher focused on only one Secondary School in the Goromonzi district that was within the area in which she is stationed. The sample size was limited to only 15 students from Elevate Senior School which may not be representative of all students. Another limitation was the number of students who took part was few and no control group to compare the results. The study only focused on the negative attitudes and might have missed important factors. Furthermore, the study only relied on the student's self-reported answers which might be biased. This could have compromised the validity of the research outcome.

Organization of the study

This study consists of five chapters. Chapter one introduces the student's statistical effect in ordinary statistics. Chapter One included the background of the study, research questions and objectives, the delimitations, and limitations of the study. Chapter two presents a literature review which includes theoretical framework and conceptual framework. Researchers considered various scholarly views in an attempt to explain concepts. Chapter three describes the methodology used for the research. It includes the selection of participants, design, data collection, and statistical

procedure of the study. Chapter four presents the findings of the study. Chapter five provides a discussion of the results, conclusions, and implications for further study.

Conclusion

The main purpose of this chapter was to give the background of the study that is the reason the researcher decided to this research. The statement of the problem was given; the research questions were formulated. The assumptions also were given, and the delimitations and limitations of the study were stated. The next chapter focuses on the literature review.

CHAPTER 2 LITERATURE REVIEW

CHAPTER INTRODUCTION

The previous chapter focused on the background of the study, research questions and objectives, and the significance of the study. The purpose of this chapter is to review the relevant literature on the phenomenon of negative attitudes toward statistics and the study's implications. Concerning Zimbabwe, a lot of research still needs to be carried out to find the solutions that might help to resolve the phenomenon. This literature review looks at how students feel about statistics in regular classes and what teachers can do to increase motivation in the subject. Research shows that self-confidence, expectations, and emotional intelligence influence statistical effects. In this case, the underlying theories which underpin this research are Bandura's self-efficacy theory and Wigfield and Ecclestone's expectancy-value theory.

INTRODUCTION OF MAIN CONCEPTS

Learning statistics is important for our industrialized world. However, the research shows that students' emotions and attitudes toward statistics affect their learning and future careers.

Definition of terms

Students

In the Indonesian dictionary (2005), the student is a learner, especially in the grades of elementary, junior, and senior high school. Whilst, Alexander (2006 p4) defines students as individuals who are engaged in the process of learning, either formally or informally, and are motivated to achieve educational goals. In the same view, Wiggins and McTighe (2005), a student is a learner who is actively engaged in the educational process, seeking knowledge, skills, and understanding. Therefore, the researcher defines a student as an individual who is enrolled in any educational institution.

STATISTICAL AFFECT

Gal (2005) refers statistical effect on the feelings, emotions, and attitudes that people have toward statistics. Onwuegbuize's (2003) statistical effect encompasses the motivational, emotional, and social aspects of learning statistics. Statistical effects are the emotional and attitudinal experiences when learning statistics.

ORDINARY STATISTICS

Moore and McCabe (2005) ordinary statistics include methods of summarizing and describing data, such as measures of central tendency and variability. Johnson and Bhatt Acharya (2010) ordinary statistics provides methods for organizing and summarizing data. Therefore, ordinary statistics is the branch of statistics that deals with the collection of data to summarize and describe the main feature of a data set.

Case study

Gillharm (2000) defines a case study as an investigation to answer specific research questions that seek a range of different evidence from the case settings.

RELATED LITERATURE

Related literature is a survey of scholarly sources on a specific topic. The researcher found several factors that contribute to the negative attitude towards statistics at Elevate Senior School. Also, these negative attitude hinders the student's ability and their ability to fully grasp the concept. The researcher noticed that some students are suffering with mathematics, they feared mathematics. That phobia can be defined as a feeling of anxiety that stops one from efficiently tackling mathematical problems.

To some extent, statistics phobia is not a personal experience but it may come from the parents and teachers. The Statistics teachers also suffer from this phobia because they are relying on memorizing facts and employing only the drill to learners leaving learners not mastering the concepts of statistics. Furthermore, parents and teachers also share the belief that girls are too weak to do Statistics. A study by Gordon (2013) yielded the results that teachers regarded as having lower capabilities than boys. On the other hand, these stereotypes empower boys to become more autonomous learners than females (Femena and Peterson 2010).

In addition, negative perceptions about the girls' inability to do Statistics destroy the girl child's self-confidence. If they are labeled they look down upon themselves and they don't believe in themselves and they perceive statistics as difficult and they fear the subject. Reyes (2020) strengthened the idea of self-confidence as he urged that self-confidence is absolutely important as it has a positive significant correlation with statistics achievement.

Prior experiences in mathematics also drive the students to have or develop a negative attitude toward statistics. Students who had negative or embarrassing experiences with the subject may have an aversion to the subject. Students are being abused by their parents, teachers, and peers for giving wrong answers, they are abused verbally and physically (Fiore 2018). Some teachers, parents, and peers use statements like ' you will never pass or solving mathematics are for the

genius'. These experiences may arouse feelings of shame, frustration, helplessness, failure, and uncertainty.

Mythologization of mathematical language also hinders the performance of students because the language has hidden and mystified meanings. There is difficult jargon used that makes the subject incomprehensible and incommunicable, (Elisembregen 2009). If students aren't familiar with terms used in statistics, they will struggle to comprehend problems and communicate their solutions effectively for example understanding words like "alfa, coefficient, variable, etc. To support language development in statistics teachers, can introduce and reinforce key vocabulary through explicit, teaching, examples, and practice.

Low self-efficacy in students drives them to develop an attitude toward statistics. Bandura's theory states that what teachers and peers said to other students can made them think that they can't do Statistics. Teachers to increase motivation in students with low self-efficacy, must engage them in different activities and also encourage them to solve problems using real-world examples. For example, you need to find their area of interest in either sport or any other field.

THEORETICAL FRAMEWORK

The researcher selected Bandura's self-efficacy theory and expectancy-value theory by Wigfield and Ecclestone as theoretical frameworks underpinning this study.

BANDURA'S SELF EFFICACY THEORY

Bandura's theory posits that students with low self-efficacy intended to have negative attitude towards statistics. Students with low self-efficacy are unable to remove barriers to achieving learning (Omrod 2000). He further stated that self-efficacy is a learned process.

In addition, cognitive psychologists (Bandura and Schunk 1989) identified three factors that contribute to the development of high and low self-efficacy. Prior knowledge or experiences,

teachers' messages, and what other students have done in the subject (failure or success) are either increasing or decreasing self-efficacy. If the students don't perform well and produce poor grades in previous examinations, they develop low self-efficacy. The grade that the learner produced might have triggered the anxiety about the statistics. The theory urges teachers to help learners in organizing cognitive components of learning and memory. Guiding students so that they recognize the importance of effort and persistence for learning and achieving goals by developing a resilient self, Bandura (2004) supports. Furthermore, Omrado (2000) further stated that teachers must provide difficult tasks to students which can be achieved with effort and hard work not spoon-feeding them with easy tasks.

The theory also expresses that the messages from the teachers contributed to the development of low self-efficacy. Bandura in his theory, states that if teachers' message motivates students will develop the students' self-efficacy. If the teachers frequently guide students and help them simultaneously they may develop a negative attitude towards learning. It was supported by Schunk (2004) when he points out that it conveys the message that "I doesn't think you can do this on your own". Teachers must help learners moderately to create a positive impact rather than offering frequent guidance and supporting behaviors as this makes students dependent and feeling of worthless.

The theory continues to express that the success or failure of others may contribute to the negative attitude toward statistics. Students who struggle with calculations lack confidence and end up withdrawing themselves from other peers and avoiding interaction with them. They are afraid of being mocked because of the struggle of statistics. Failure of other peers makes them view the subject as irrelevant. In addition, if they find out that they are not going to use it in the future they will not see its significance.

WIGFIELD AND ECCLESTONE'S EXPECTANCY-VALUE THEORY

Expectancy value theory posits that students' motivation and engagement are influenced by their expectancy belief and value belief, (Wigfield and Ecclestone 2000). Students' attitudes are influenced by what they expect and value in the subject. Their expectations predict anxiety towards the statistics if they are not met. The theory is further supported by Eccles and Wigfield (2002)

when they said that expectancy beliefs depend on perceptions of the difficulty of tasks and the possibility of overcoming the difficulty to succeed. For instance, the level of expectancy beliefs of students who perceived statistics as difficult tended to be lower than the levels of their peers who viewed statistics as easy.

The theory stressed further what causes students to develop negative attitudes towards statistics. They incorporate subjective values where students have three primary values they attach to a learning task. They learn the subject if they perceive personal importance towards the given task. Eccles and Wigfield (2020) claim that students will attach attainment value to a task fit or strengthen their own perceived values self-schema or identities. They will complete a certain task if they see an opportunity.

Their theory continues to express that what inspired students to learn statistics is their intrinsic value where they have curiosity and interest in the subject. Students who have intrinsic value spend their time in the classroom doing their work. They are also engaged in a specific task for an extended amount of time because of what they value. However, negative attitudes are created when students want to complete a task because of its usefulness in the future.

CONCEPTUAL FRAMEWORK

Learning statistics is crucial as it develops critical thinking, problem-solving, and decision skills in learners. However, research suggests that students often experience anxiety, frustration, and disengaged when learning the subject. This phenomenon is known as a statistical effect. Understanding factors influencing students' statistical effect is crucial for improving teaching practice and enhancing learning outcomes.

The purpose of this conceptual framework is to provide a comprehensive and systematic approach to understanding the complex relationship between students' cognitive, emotional, and social factors that shape their statistical effect in ordinary statistics. These factors contribute to negative attitude statistical effects which can lead to decreased interest, reduced self-efficacy, and increased anxiety, ultimately hindering students' ability to develop statistical literacy.

Students' perceived ability may have a profound influence on their learning outcomes and attitudes towards statistics. Perceived ability or self-efficacy as one of the concepts under the Social Learning Theory by Bandura (1997) has served as a basis to further understand an individual's motivation to learn and their learning pursuits as it is one of the predictors of academic success. Self-efficacy is defined as self-beliefs or self-judgment that students perceive about their ability to complete a specific task Bandura (1997). It is considered one of the fundamental factors in learning basic statistical concepts in terms of attitudes, which determine the feelings, thinking, motivation, and behavior of the students.

Unfortunately, many students perceive statistics as a difficult subject even before studying statistics (Baharun and Porter 2009). Perceived level of difficulty can affect students' attitudes toward learning statistics Estrada et al (2005) and the primary concern is that a perception of difficulty will lead to avoidance or lack of learning engagement if given a choice (Fits Maurice et al 2014).

Learning practice also plays a role in optimizing academic performance (Diserth et al 2010, Kizilgunes et al 2009, Puddie and Hattie 1996, Rautopuro and Vaiisanen 2003). Learning practices are methods that a student uses to improve their understanding, integration, and retention of new information in the learning process. High achievers report a greater use of learning strategies than low achievers, although these practices may vary among students. The use of certain learning practices is said to be related to interest in learning and thus would improve students' understanding or performance (Christou and Dinov 2010, House 2003, 2005).

Zimmerman (1989, 1990) listed some self-regulated learning practices that are related to students' academic performance, self-evaluating, organizing and transforming, goal setting, and information seeking.

Eccles and colleagues (Eccles and Wigfield 2002, Wigfield and Eccles 2000, Wigfield et al 2006) about the expectancy-value theory, suggest that an individual's expectations for success and subject task values will influence performance changes, directly or indirectly. Subject task values refer to the quality of a task that contributes to the increasing or decreasing probability that an individual will send it (Eccles 2005, p109). Moreover, if students have high expectations of success but do not value a task at all, then will not feel motivated at all. Likewise, if students value a task

highly but have no expectation of success in completing it, then also will not feel motivated at all (Expectancy value theory)

Past research has demonstrated that student's academic performance is not only influenced by their learning practices but also by the teaching practices of their teachers throughout the course. Several research has shown that teachers have a substantial impact on students' performance (Chetty et al 2014, Ganyaupfu 2013, Yousef 2017). Teaching practices vary across teachers, some teachers may prefer direct instructional methods, while others may choose to employ more learner-centered strategies. Some teachers may be prone to employing rote learning, while others may emphasize understanding and the application of knowledge.

Teaching basic statistical concepts is indeed a great challenge for many teachers as they need to be able to deliver the concepts in a way that their students can understand, especially at the advanced introductory level. A majority of students are exam-oriented, hence, teachers need to explicate the rationale of learning statistics to increase students' motivation to master the knowledge. Teachers should also prioritize the setting of clear objectives around which coherent lessons can be developed so that their teaching can be more effective (Umugiraneza et al 2018). It is vital that the teaching practices used to help students understand statistical concepts well, so that not only can they perform well in their statistics course, but they can also develop sound statistical literacy.

Active learning strategies have been shown to develop statistical reasoning in students. These strategies include group projects that require students to design a study, collect and analyze data, interpret their results, write a coherent and well-argued report, and share their findings in oral presentations. It is commonly accepted that students always learn best when they're actively engaged in working on real-world problems (Sole and Weinberg 2017).

Onwuegbuize (2000) voiced a valid concern that non-cognitive variables such as students' attitudes, feelings, beliefs, and perceptions may counteract the learning atmosphere that statistics teachers attempt to create. Teachers' attention to students' perspectives is needed to make statistics an interesting subject. Ncube and Moroke (2015) listed some recommendations to develop students' learning interests and help them perform better in a subject. These include more exercises after each chapter, group assignments and presentations on how statistics can be integrated or applied

in a job setting, use of statistical software to solve practical questions and quizzes. Schau (2003) also noted the importance of student motivation and the need to use statistical thinking and knowledge appropriately.

It is very important to instil interest in learning statistics and make students understand statistics thoroughly so that they can perform well. Teaching practices have been found to exert a significant effect on students' attitudes in several studies. Apart from that, teachers' instructional practices also have been found to affect students' learning practices. Fedler (1993) established that the alignment between students' learning practices and the teachers' teaching practices leads to better recall and understanding.

The attitudes that students have towards learning also have a major impact on their performance. Attitudes as defined by Eagly and Chalken (2007) are an individual's propensity to evaluate a particular entity with some degree of favorability.

There is an increasing body of evidence to support the conviction that students' attitudes toward statistics affect their course enrollment persistence, performance, and the overall environment in the class. Schau (2003) discovered that students' attitudes toward statistics were positively related to their performance in statistics. Since students' attitudes toward statistics are related to student performance in statistics, it is hence believed that students' negative attitudes toward statistics would present a significant obstacle to their effective learning of statistics content and skills, (Mills 2004).

According to Gal et al (1997), students' attitudes toward statistics may affect the extent to which they will develop useful statistical thinking skills and apply what they have learned outside the classroom. Presumably, poor attitudes will lead to poor skills. Baker (1988) also argued that in a learning situation, attitudes are considered to be fundamental or an input variable, as well as an output or outcome variable. Therefore, it is important for researchers to thoroughly study the attitudes students have towards statistics and their relationship with performance so that interventions can be taken to increase their learning of statistics.

CHAPTER SUMMARY

This literature review highlights the complex interplay of factors influencing statistical effect. The theorist also revealed their opinions about the attitudes that contributed to the failure of the subject. Wigfield theory of expectancy indicates what students expect to promote a good or bad mood toward the statistics. Bandura in his theory also indicates that the message from the teachers, prior knowledge, and the success or failure of other peers promote the development of good or bad attitudes towards statistics. Also, the related literature points out what the researcher researched about the causes of statistical effects and ways to increase motivation towards the subject.

Chapter 3

RESEARCH METHODS

Introduction

The previous chapter dwelt on the literature review where the researcher looked at what other theories said about the research topic. This chapter focuses on the research methods, research paradigm, data collection methods, and sampling techniques. A summary at the end concludes the chapter.

RESEARCH DESIGN

Harwell (2011) says that research design is a plan or strategy that moves from the underlying philosophical assumptions to specify the selection of respondents, data gathering techniques to be used and data analysis to be done. Bencze (2005) defines research design as a family of research procedures that determine the effectiveness of action taken to improve a situation. Thus, research design is a detailed outline of how an investigation will take place. In this study, the researcher will outline how data is collected on how students develop statistical effects. The researcher researched to find ways of increasing motivation in learners, creating a safe environment, helping the students to restore their self-efficacy, and also to improve teaching practices used by the teachers. The research design for exploring students' statistical effect in ordinary statistics is the case of Elevate Senior School.

Population

According to Creswell (2012), a population is a group of individuals who have the same characteristics. Furi (2007) stated that population is the whole subject that will be investigated in research.

The target population was A-level students at Elevate Senior School. The researcher only selected a sample of fifteen participants from the school. The researcher includes boys and girls students to capture diverse perspectives and also to ensure a balanced perspective.

SAMPLE SIZE

According to Frey, Carl, and Gary (2000), a sample is a subgroup of a population. A sample can be described as a portion or subset of the research population selected to participate in a study to represent the population. Therefore, a sample can be defined as a subject from the target group. The researcher used fifteen participants as the sample in the research.

Sampling procedures

According to Boobie Earl (2007), sampling is the process of selecting students with whom to conduct research. Frey (2010) established sampling as the process of selecting a subset of units from the population. According to Free Dictionary, sampling is a selected portion of a population. This applies to sampling is whereby the researcher selects a group of people to study the entire population. The researcher used purposive sampling techniques to come up with fifteen learners.

Sampling techniques

Sampling techniques are tactics that are used to select the participants from the entire pool of population. According to Jackson (2008, 97) in most cases, it is not feasible or necessary to survey the entire population relevant to a study. As a result, one selects a sample that is representative or a subset of the entire population. However, to draw meaningful, reliable, and valid conclusions, the sample should closely reflect the study population that is it should be a representative sample. Pickard (2007,29) asserts that the method of sampling used plays a major role in any research investigation, as very often it is the characteristics, composition, and scale of the sample that gives weight to any findings that emerge from the study.

The researcher uses purposive sampling since it is a qualitative approach. Arikunto (2010) stated that purposive sampling is the technique of sampling where the researcher takes the sample based on a specific purpose. Purposive sampling is a non-probability sampling in which units are selected because they have characteristics that you need in a sample. Since it was a case study the researcher wanted the participants who provide her with in-depth information. Hence various sampling techniques are followed in empirical research depending on the research problem and objectives. The researcher incorporated purposive sampling to contribute with information-rich cases for in-depth study. The researcher selected the students purposely for a specific reason.

Convenient sampling was also used in this study. Inconvenient sampling the researcher selects participants because they are willing and available to be studied. According to Rahi (2017), convenience sampling describes the data collection process from a research population that is effortlessly reachable to the researcher. The researcher gathered the information for the students who were available at a certain time.

Research paradigm

According to Kuhn (1997), the term paradigm refers to a research culture with a set of beliefs, values, and assumptions that a community of researchers has in common regarding the nature and conduct of the researcher. A research paradigm is an all-encompassing system of interrelated practice and thinking that define the nature of inquiry along three major dimensions which are ontology, epistemology, and methodology. According to Lather (1986), research paradigms inherently reflect our beliefs about the world we live in and what to live in.

The researcher used an Interpretivism worldview to gather information. Interpretivism is a theoretical approach that directly opposes the positivist approach by stating that knowledge about society and human beings cannot be objectively known. The researcher used this approach as it helps to understand the meanings that people attach to certain behaviors and experiences. Furthermore, the studies in the Interpretivism paradigm can take the approach of different approach of different methodologies in case studies because they provide the in-depth life experiences of narrators (Tuli 2010).

There is a social interaction between the researcher and participants. The researcher mainly uses qualitative methods such as interviews to gather information. Through the interpretive approach, the researcher was able to recognize the strengths and weaknesses of interviews.

The researcher also uses the pragmatism paradigm. Pragmatism values both subjective and objective to meet research objectives. According to Creswell (2007), researchers who adopt a pragmatist position have the liberty to choose those research methods or strategies that can best answer the research questions. Therefore, the main reason for adopting a pragmatist position in this study is to have a pluralistic stance of gathering all sorts of data to best answer the research questions.

The researcher used this paradigm to find the solutions to the problems. Biesta's (2010) pragmatism seeks to understand the multiple factors, involved in people's actions in a given situation.

Philosophical assumptions.

Philosophical assumptions are basic beliefs that guide our thinking. They are like glasses through which we view the world. The researcher chooses methodological assumptions to support the study since it is a case study.

According to Creswell (2003), methodological assumptions consist of the assumptions made by the researcher regarding the methods used in the process of qualitative research. The researcher chooses the qualitative approach because it focuses mainly on the quality of people's behavior toward statistics. Following this it is a holistic nature and it gives us first-hand experience.

RESEARCH METHODOLOGY

Schwardt (2007, 195) defines research methodology as a theory of how an inquiry should proceed. Thus, research methodology is a specific way of conducting research that may incorporate multiple research methods. In this case, the researcher chose a qualitative approach to come up with in-depth knowledge about how students develop negative attitudes towards statistics and find strategies for increasing motivation and confidence in students.

Qualitative approach

The qualitative approach is an approach that is based on the feelings, opinions, and actions of people. It is based on normative not subjective and it is naturalistic, it attempts to study what happens in everyday life of people in their natural setting. In addition, it is useful to study educational settings and processes. In support of Denzin and Lincoln (2003) state that qualitative research involves interpretivism's naturalistic approach to its subjective matter, it attempts to make sense of, or to interpret, a phenomenon in terms of the meaning people bring to them.

According to Domegan and Fleming (2007), qualitative research aims to explore and discover issues about the problem at hand, because very little is known about the problem. Researchers gather in-depth knowledge from the participants as they explore what they think about statistics. A qualitative approach is designed in a manner that helps reveal the behavior and perceptions of a target audience concerning a particular topic. According to Creswell (2008), researchers using qualitative approaches tend to attend to participants' views when doing their studies, ask general open-ended questions, and collect data in natural settings as the study develops. Also, the qualitative approach comprises the following according to Gbangu (2012) that are open-ended interviews, focused group discussions, observation, and one-on-one interviews. It focuses on words rather than numbers, it helps the researcher to observe the world in its natural settings. It also helps the researcher to interpret situations to understand the meanings that people make from day-to-day life.

Furthermore, the qualitative approach is inductive and the researcher generally explores meanings and insights in a given situation (Strauss and Gorbini 2008). The researcher used open-ended questions, interviews, and observation to find out the main causes of the statistical effect. Cohen, Manion, and Morrison (2000) supported an open-ended approach to analyzing data based on research questions and theories.

The qualitative approach also refers to a range of data collection and analysis techniques that use purposive sampling and semi-structured. It aims to provide a detailed understanding of human

behavior, emotions, attitudes, and experiences (Tong et al 2018). Its purpose is to describe and interpret issues or phenomena systematically from the point of view of the individual or population being studied and to generate new concepts. The choice of methodology is directed by the questions being raised (Viswambharan and Priya 2016).

In essence, the qualitative approach helps the researcher to be a reflective teacher who does not quit but keeps on trying. It helps to find new methods of teaching and finding solutions to the problem raised. It also provides the researcher with effective ideas on how to solve conflicts among the learners.

RESEARCH METHODS

Observation

Observation is the first tool to gather information and is a direct method. The researcher observed the attitude of a learner and acted on it. Hagedorn (1993) says observation is a method of gathering data without direct questioning. Observation according to Cohen, Manion, and Morrison (2007) observation enables researchers to gather live data from naturally occurring social situations. When using this instrument, there is no need to ask other people's opinions about the behavior of the students while conducting research. The tool helps the researcher to have accurate results and helps to find ways to curb the problem.

Interviews

Meree et al (2007) defines an interview as a two-way conversation in which the interviewer asks the participants questions to gather information and to learn about the ideas, beliefs, views, opinions, and behaviors of the participants. According to Kerlinger (2003)," interviews are the most powerful forms of research". This is because interviews reduce errors and bias through follow-up questions and further probing to establish the truth. Thus, interviewing becomes a social process that requires the interviewer to be fully aware of what she or he wants to obtain. Interviews improved responses and prepared explanations of the purpose of the study which are more convincing than transmittal letters. The researcher can use open-ended questions to the participants

to be open about what they feel about the course. It also ensures 100% responses without any written work endured by respondents.

The presence of an interviewer makes respondents feel comfortable which in turn aids to know their point of view better. Interviews allow more detailed questions to be asked. It is easy for an interviewer to judge the nonverbal behavior of the respondents. Berg (2007) stresses that it enables interviewees to speak in their voice and express their thoughts and feelings. On the same contrary, Cohen (2007) adds that interviewing is a valuable method of exploring the construction and negotiating of meanings in natural settings. Since interviews involve one-on-one interaction it's time-consuming and also not all participants participate in interviews because they are limited. Thus, considering the above assertion, the advantages of using interviews can be seen too far outweigh the disadvantages. This led the researcher to adopt the method of gathering data for the study.

Focused group discussion

This is another good way the researcher used to gather information. The researcher gathers together people from similar backgrounds of experiences to discuss a specific topic. The other teachers who took part in this study sat together to discuss certain attitudes shown by the students. The discussion they had fostered a healthy discussion by bringing in diverse people who shared different thoughts and opinions. There are disadvantages to using this data collection because it brings challenges to handpick and bring together the panel audience for discussion. And also, it has an expense in terms of time to create the right questions.

Data analysis

According to Blanche and Durrheim (1999), qualitative data analysis tends to be primarily an inductive process of organizing data into categories and identifying patterns. For this study, a content analysis was followed to understand the procedures and importance of qualitative data analysis. Bubbie (1995) states that the most general guide to analyzing qualitative data involves looking for similarities and dissimilarities. The focus must be on those patterns of interactions and events that are generally common to what the researcher is studying. This type of analysis formed

the core of analyzing the qualitative data collected during the study. Patterns were identified and were then classified as themes. In-depth interviews were analyzed in themes to assess the attitudes of students toward ordinary statistics. This helped the researcher to understand these attitudes and find ways of increasing motivation.

Reliability and validity

Reliability describes the degree to which the results of a given study can be repeated or replicated under the same conditions. Validity is the qualifications of being based on truth or reason of being able to be accepted. Reliability and validity are two key aspects of all research.

Nevertheless, it is difficult to maintain these two in this study because it's based on a qualitative approach. It is difficult to replicate because it is based on the emotions and characters of people, and people's behaviors differ from each other. The nature of qualitative research methods does not lend to statistical or empirical calculations of validity. The researcher focuses on qualitative research methods that is interviews, focused group discussions, and observation to enhance truthfulness and qualitative findings. The researcher used purposive sampling and convenience sampling to come up with in-depth information.

ETHICAL CONSIDERATION

This study followed the generally established principles as laid out ethics of the school. Informed written consent was obtained from the respondents after the study aims and objectives, risks, and benefits of the participants were explained. Respondents were given the option to refuse to answer any question that they did not feel comfortable with or to decline to be interviewed at any time during the interviewing process. Furthermore, during the data collection process, the confidentiality of participants was also maintained. That is respondents were assured that their names would not be disclosed in the research report. Alternatively, in the analysis, respondents

were identified by their position held, e.g. learner X or Y. providing participants with accurate information and avoiding perpetuating myths or stereotypes about mathematics attitudes.

CHAPTER SUMMARY

The investigation into beliefs and attitudes towards mathematics in everyday life in Zimbabwe employs a mixed-methods approach. It utilizes surveys and structured questionnaires to assess students' attitudes, influenced by variables such as instructional methods and prior experiences. Research indicates that negative attitudes towards mathematics are prevalent, often stemming from traditional teaching methods that fail to engage learners. The study aims to identify these attitudes and their impact on performance, ultimately recommending improved instructional strategies to foster positive beliefs about mathematics among students in Zimbabwean schools.

CHAPTER 4

RESULTS AND DISCUSSION

CHAPTER INTRODUCTION

This chapter presents the findings of the research study and discusses their significance. It begins by providing an overview of the results, highlighting the key findings and their implications. The results are then presented in detail, in form of verbatim, and word cloud. The discussion delves into the interpretation of the results, exploring their meaning and implications in light of the research questions and hypothesis. This chapter concludes by summarizing the key findings and their implications for theory, practice, and future.

STUDY PARTICIPANTS DEMOGRAPHICS

The study participants consisted of diverse group of individuals. The sample included participants of various ages, gender and socio economic status. The participants were recruited from the students at Elevate Institute.

Age

Age has been found to be a significant factor influencing attitude towards learning of statistics. In general, young students tend to have more positive attitude towards statistics than the older students. The study was conducted amongst the Advanced level students. The students have the negative experiences with mathematics in the past. Their experiences create a lasting impression and lead to a negative attitude towards the subject. Since, they started the subject at an advanced level, some of them they didn't like mathematics and they took mathematics as a difficulty subject. At this level, they failed to value statistics in their future. Moreover, others they are just afraid of statistics. They perceive statistics as a complex and challenging subject and the fear of not understanding the subject. They hesitate to pursue it.

Socio-economic status

Different students develop negative attitude towards statistics because of their economic status. Students who comes from the families with low socio economic status their academic skills are less than those who from high socio economic status. Moreover, Aiken and Barbarin (2008) also showed that children of families with a low socio economic level experience inadequate cognitive development, language memory and emotional process. They also develop negative attitude because they lack parental support. The parental support depends on the level of parent's education. Students are suffered and tend to develop attitudes towards statistics if the parents are not supportive. Ozdemir (2019) supported by stating that family with high socio economic level are more sensitive to supporting their children.

Moreover, students who come from low socio-economic status lack confidence in the subject they may believe that they are not capable of understanding or succeeding in statistics. Also, they may not see how they are going to apply statistics to their lives or future aspirations. They may have internalized negative stereotypes about intelligence or ability, which affect their self-perception and motivation.

Gender

Specifically, gender plays a major role in perpetuating attitudes towards learning statistics. It is already known that boys perform better in mathematics than girls. Female students, may face gender stereotyping that they are less capable in statistics. This stereotyping can lead to anxiety and they avoid statistics. It becomes a challenge to the advanced level students who chose statistics as they think they are not going to do their best in the subject. Moreover, they have fewer female role models in statistics and it will be hard for them to pursue the subject. Their confidence in statistics becomes low for them to understand and apply statistical concepts. Gender biases in classrooms can create a less welcoming for female students, discouraging their participation. When these students feel excluded or undervalued they may disengage from learning statistics, leading to poorer outcomes.

DATA PRESENTATION AND DISCUSSION

Data presentation is a way of presenting gathered information in bar graphs, pie charts, verbatim, and word clouds. In this study, the researcher presents data in the form of verbatim and word cloud since it is qualitative research. The researcher presents what the participants feel about the statistics.

Verbatim

Verbatim is a way of translating the spoken words into the written texts. It is often used in legal, academic and journalistic contexts to ensure accuracy. The researcher during the interview recorded what the participants said about the negative attitude towards statistics. The researcher captured not only the content of participants' utterances but also the context in which they were spoken. This includes pauses, hesitations, tone, and emphasis, providing important insights into participants' emotional states and nonverbal behaviors.

Participants' responses

- " I failed to comprehend statistics because I doesn't have enough resources to study on my own when I'm home", said student A.
- " I hate the subject which has to do with calculations because I wasn't good at mathematics when I was doing ordinary level, and my past experiences with mathematics wasn't fair enough for me to do statistics now", said student E.
- " My parents and other peers discouraged me, when I choose statistics and it lowers my confidence towards the subject. They said what should I do with the subject and where can I use them in future", participant M said.
- " By the time when I choose the subject, I was happy to study new things, but the stereotyping comes from the teachers and other peers when I failed to interpret the questions correctly makes me think otherwise", participant K said.
- " I think the teacher himself doesn't have enough knowledge about the subject, he doesn't even showed confidence whenever teaching the new concepts ", said participant C.
- "Teaching methods used by the teacher is content based approach , he doesn't gave us the opportunity to explore ourselves, he just used the drill method while we want to find other methods by ourselves, I ended up not even listening to the lesson ", participant D said .

Solutions to the problems raised

- " The school has to gather adequate resources, for example to have enough textbooks in the library and allows us students who comes from low socio economic level to borrow textbooks and study by ourselves when we are at home", response from participant B.
- " Teachers have to give us a room to explore ourselves and let the learners be their bosses during the lessons so that we gain more experiences and understand the subject very well ", responded participant N.
- "School authorities have to assess their teachers to be sure if they can teach statistics at advanced level", participant F.
- "Teachers have to encourage and support girls who choose statistics to avoid labelling and to increase motivation the school has to give awards to the female students who decide to take statistics so that other girls students will choose the subject ", participant K .
- " Our parents have to support us physically and financially so that we do our best ", participant B.
- " The government has to offer scholarships or grants to the female students so that they can afford to go further pursuing statistics in the future " " Participant O.

Word clouds

Word cloud is a visual representation of frequently occurring words in a text. Words that appear more frequently in the text are displayed in larger font sizes or more prominent colors. The researcher recorded the reiterating words that came from the discussion and recorded the most words that came from the participants on why they developed negative attitudes towards statistics. In addition to that the word cloud provides a quick and easy way to identify the key themes and topics in a large body of text. Also, it helps to analyze the negative and positive words that are frequent and prominent which helps to identify the areas of concern and satisfaction.

Word Cloud with Underscores

prior_experiences
stereotyping
age shortage_of_resources
socio_economic_status
gender
lack_of_confidence_from_the_teachers

DISCUSSION

From the data presentation, the policymakers and educators have to take steps to address these issues. They have provided underprivileged students with equal opportunities to learn statistics, regardless of their socioeconomic background. They must offer scholarships, grants, and other financial aid to make higher education more affordable for students from low socioeconomic status families. They have to address gender bias in statistics by addressing gender bias and promote positive attitudes towards statistics. Giving examples of female statisticians and their contributions to the field. Moreover, the classroom must be inclusive where all students feel valued and respected.

CONCLUSION

Chapter 4 has provided a comprehensive overview of the research process, from defining the research problem to disseminating the findings. Throughout the chapter, the researcher emphasized the importance of a systematic and rigorous approach to research, guided by ethical principles and a deep understanding of the research process. As concluded in this chapter, it is important to reiterate the key takeaways for conducting effective research. Firstly, defining a clear and specific research problem is crucial, as it sets the foundation for the entire research process. Secondly, selecting an appropriate research design and methodology is essential to ensure the validity and

reliability of the findings. Furthermore, ethical considerations must be at the forefront of any research endeavor. Researchers have a responsibility to protect the rights and well-being of participants, maintain confidentiality, and ensure that the research is conducted in a responsible manner. Finally, effectively disseminating the research findings is imperative for ensuring the broader impact of the work. Researchers should strive to communicate their findings clearly and concisely to a variety of audiences, including academics, policymakers, and the general public.

In conclusion, the research process is a demanding but rewarding one. By following the principles and guidelines outlined in this chapter, researchers can conduct rigorous and ethical research that contributes to the advancement of knowledge and ultimately makes a positive impact on the world.

CHAPTER 5

CHAPTER INTRODUCTION

In this chapter, the researcher embarks on a journey into the realm of research, the systematic investigation of a topic. Research is the cornerstone of knowledge creation, providing empirical evidence to support or refute claims and advance our understanding of the world. Research encompasses a wide range of methods, from quantitative analysis to qualitative observation, and its applications extend across various disciplines. The researcher delves into the fundamental principles of research, exploring different types of research questions, designing effective studies, and gathering and interpreting data. Furthermore, this chapter explores the concept of statistical effect, which refers to students' emotional responses and attitudes toward statistics. The chapter

highlights the importance of considering students' statistical effects in teaching and learning statistics.

Summary

The information from the study revealed that the most prevalent causes of negative attitudes were poor teaching methods, prior experiences, gender stereotyping, lack of resources at school, and socioeconomic status. These findings tally with the observation by Tempelaar Schim Van der Leoff and Gijsselaers (2007) noted that students' attitudes and beliefs towards statistics were related to prior knowledge and lack of resources

The major cause of statistical effects at Elevate Senior School is the lack of resources, prior experiences, and gender stereotyping. Students develop attitudes because of the negative words from their parents and teachers. Theorists such as Bandura expressed that students develop low self-efficacy because of the attitude shown by the teachers towards them. The expressions that were used by the teachers towards students may have a great impact on their learning.

Furthermore, the theory of expectancy-value says that what learners expect may increase or decrease interest in the subject. When students feel like what they want to achieve in their lives doesn't need statistics they will develop a negative attitude. To increase motivation, teachers need to encourage learners to record what happened in sports, health, etc.

On suggestions to increase motivation in learners, the students from their responses and the researcher stated that the school authorities have to assess the teachers who teach statistics at advanced level and also to let them attend the workshops. Furthermore, the parents have to support their children in any way. This is corroborated by Oziener (2006) who states that parental monitoring has a protective effect. The students raised the point that parents have to support them financially which is buying them their textbooks to use them home.

Moreover, the school, before introducing the subject has to gather the resources so that learners who come from low socioeconomic status won't lag behind. The schools need to have enough textbooks to support those who come from low socio-economic levels. In addition to that, teachers should be aware of students' statistical effects and create a supportive learning environment. The

environment caters for diverse students. Furthermore, students must be provided with opportunities to practice and apply statistical concepts that can help build their confidence and reduce anxiety.

Conclusion

From the findings of this research, it can be concluded that a way of increasing motivation in learners is to create a conducive environment where learners who have a fear of statistics feel welcomed. Enough textbooks must be found at school and awards to the girls' students who take statistics to motivate other fellow students. Teachers must encourage students to explore statistics in their everyday lives.

Recommendations

Based on the findings and conclusions of the study, the researcher recommends that:

- Teachers need to vary teaching methods to avoid boredom and have a joyful learning environment.
- Parents have to work hand in hand with the school to gather the resources of their learners.
- Teachers must stop use the drill method when introducing lessons and allowing learners to apply what they know to the field of their choices.
- Awards must be given to the girls students to clear the myth that says boys do better than girls.
- School authorities has to assess the teachers of they are able to teach statistics and produce good results.
- School authorities has to conduct field trips where learners see value of statistics in different fields

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