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THE IMPACT OF SCIENCE TEACHING METHODS ON PUPILS ACADEMIC PERFORMANCE IN UPPER PRIMARY IN PRIMARY SCHOOLS.

A CASE STUDY, PINGIRE SUB COUNTY

BY

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BU/UP/2022/0264

A RESEARCH REPORT SUBMITTED TO THE FACULTY OF SCIENCE AND EDUCATION IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A BACHELORS DEGREE IN EDUCATION PRIMARY OF BUSITEMA UNIVERSITY

AUGUST , 2024

DECLARATION

I, ATANY JOHN , declare that this report is my original work and has not been submitted any other award of a degree and published at any Institution of Higher Learning.

.... 1st/10/2024

ATANY JOHN **Date**

APPROVAL

I certify that this report satisfies the partial fulfillment of the requirements for the award of the degree in primary Education of Busitema University.

Mrs BIRUNGI TEDDY

Signature.............................. ..Date....1/10/2024.........

DEDICATION

I dedicate this report to my lovely wife and children, and my very supportive parents. May God richly bless and reward

ACKNOWLEDGEMENT

First and foremost, I acknowledge Almighty God whose blessings, provision and grace made this academic journey a success story.

Secondly, I acknowledge my supervisor, for guiding me on how best to go about the research subject. I also acknowledge the authors whose works have been cited in this work.

Last but least, I am sincerely grateful to my family members, wife and children, colleagues and friends, May the Almighty God bless them all.

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LIST OF ABBREVIATION

AP -	Academic Performance
DV -	Domestic Violence
FGD -	Focus Group Discussion
FP -	Family Planning
HIV/AIDS -	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
KI -	Key Informant
LE -	Pupil' Absenteeism
STM -	Science Teaching Methods
TFR -	Total Fertility Rate
UNICEF -	United Nations International Children's Emergency Fund
WHO -	World Health Organization

ABSTRACT

The purpose of this study was to assess the impact of science teaching methods on pupils' academic performance in upper primary schools in Pingire Sub-County, Serere District. The study was guided by three specific objectives: to establish the methods used in teaching science, to evaluate the impact of these methods on pupils' academic performance, and to identify strategies to improve academic performance in science. A cross-sectional survey design was used, and data was collected from a representative sample at one point in time to make inferences about the target population. The sample size of 356 was determined using Krejcie and Morgan's (1970) table for sample size for research activities at a confidence level. Out of the 356 selected respondents, all filled and returned the questionnaires. Both close-ended and open-ended questionnaires were designed and used, with the closed-ended items generating quantitative data.

The findings of the study revealed that 58% (205 respondents) always used inquiry-based learning (IBL) in their science classes. A significant majority, 84% (300 respondents), agreed that project-based learning (PBL) enhanced pupils' understanding of scientific concepts. Additionally, 54% (191 respondents) of the teachers always used IBL in their science classes, and 84% (300 respondents) consistently incorporated IBL in their teaching to improve performance.

In conclusion, the study highlighted significant insights into the methods used in teaching science in upper primary, the impact of these methods on pupils' academic performance, and strategies to enhance performance. It was evident that IBL and PBL were widely utilized and highly valued by educators for their effectiveness in fostering critical thinking and a deeper understanding of scientific concepts. The incorporation of technology and blended learning also emerged as important elements, though opinions on their effectiveness and usage were mixed. Despite the promising results, challenges such as overreliance on technology and the limited use of innovative models like the flipped classroom were noted. Overall, the findings underscore the importance of employing diverse and effective teaching strategies to improve science education outcomes in upper primary settings.

Based on the study's findings, it is recommended that schools promote the adoption of IBL techniques across all science classes to foster critical thinking and problem-solving skills among pupils. Educators should strive to incorporate technology-enhanced learning tools more frequently to engage pupils and make science more interactive. Schools should encourage the use of PBL in science education to enhance pupil engagement and understanding. Developing guidelines and support systems for implementing PBL can help teachers integrate this method more effectively into their teaching practices

CHAPTER ONE: INTRODUCTION

1.0 Introduction

This section described the background to the study, the statement of the problem, objectives of the study, research questions, scope of the study,significance of the study and conceptual framework.

1.1Background of the study

The background of this research report was presented in fours ways, i.e. the historical background, conceptual background, theoretical background and contextual background .

1.1.1 Historical background

Globally, the study conducted by (UNICEF,2023), in developed countries like USA, China, Canada and United Kingdom found out that teaching methods that emphasize active learning, such as inquiry-based learning and project-based learning, have been shown to increase pupils engagement. When pupils are actively involved in their learning process conducting experiments, solving problems, or collaborating on projects they tend to have higher levels of motivation and interest. This engagement often translates into better retention of knowledge and improved academic performance (Malin,2020). Similarly the study conducted by (WHO, 2022), in Canada observed that, using of technology to provide personalized learning experiences or employing cooperative learning strategies where pupils with different abilities work together can promote better academic outcomes (Tomlinson, 2001).

In primary schools across sub-Saharan Africa, teaching methods in science subjects have a significant impact on pupils' academic performance (World Bank,2020). In Nigeria, a study by Oludipe (2012) emphasized the effectiveness of inquiry-based learning, demonstrating that pupils taught through this method showed improved understanding and retention of scientific concepts compared to those taught via traditional methods. Similarly, in Ghana, Osei-Akoto (2013) investigated the use of collaborative learning strategies and found that they enhanced pupils' engagement and academic performance in science by fostering teamwork and critical thinking skills. In Ethiopia, a study by Asfaw (2014) highlighted the positive effects of technology-enhanced learning environments, where the integration of digital tools in science education improved pupils' motivation and achievement. These studies collectively underscore that employing diverse, pupil-centered teaching methods—such as inquiry-based learning, collaborative strategies, and technology integration—can significantly enhance pupils' academic performance in science subjects by promoting active engagement, critical thinking, and better retention of knowledge.

In East Africa, teaching methods in science subjects in primary schools are crucial for enhancing pupils' academic performance. In Kenya, a study by Wambugu and Changeiywo (2018) examined the effects of using the cooperative learning method in science education, finding that it significantly improved pupils' understanding and performance by encouraging peer interaction and collective problem-solving. Similarly, in Uganda, Nakabugo et al. (2010) investigated the impact of active learning strategies, such as group work and hands-on experiments, on pupils' science performance, concluding that these methods foster deeper understanding and retention of scientific concepts. In Tanzania, Mtitu (2014) explored the use of inquiry-based learning in primary science education, demonstrating that pupils engaged in this method showed enhanced critical thinking skills and better academic outcomes. These studies collectively illustrate that employing diverse, pupil-centered teaching methods, including cooperative learning, active learning strategies, and inquiry-based learning, significantly boosts pupils' academic performance in science subjects by promoting active engagement, critical thinking, and effective knowledge retention.

In Uganda, the National Curriculum Development Centre (NCDC) and the Directorate of Education Standards (DES), have set standards that define quality pedagogical practices, the standards spell out what the teachers should be able to do in the process of teaching. It was prompted by the fact that despite Government's initiatives to improve the quality of education in the country, the quality of pedagogical practices has been manifested in various ways. For instance ,there has been reportedly poor scheming and lesson planning by teachers; more use of teacher-centred rather than pupil-centred methods; and dominant application of theoretical rather than practical approaches to the teaching of sciences (UNEB, 2011; MoES, 2012; Uganda National Council for Science and Technology Report (UNCST, 2012).

In Serere District, performance in Science subject is a challenge to many pupils despite government's effort to make Science subject compulsory. On the other hand, pupil's academic performance in Pingire Sub-County seems to be lacking the concepts used in science. This therefore prompted the researcher to carry out a study to establish the impact of teaching methods on pupil' academic performance in Science in upper primary in Pingire Sub-County.

1.1.2 Conceptual background

According to Alber (2016), he defined science as a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe. Science involves observing, experimenting, and drawing conclusions about the natural world, utilizing empirical methods to gather data and evidence. It is a disciplined way of exploring phenomena, aiming to discover universal principles through meticulous investigation and analysis.

Pupils refers to children, who are enrolled in educational institutions such as primary schools. Pupils are individuals undergoing formal education, acquiring foundational knowledge, skills, and values under the guidance of teachers. They represent a diverse group with varying abilities, interests, and learning styles, requiring tailored educational approaches to support their development.(Buratine ,2011).

According to Bandura(2019), he defined teaching methods as the principles and methods employed by teachers to enable pupil learning. These methods are determined partly on subject matter to be taught and partly by the nature of the pupil. Teaching methods encompass a wide range of strategies, techniques, and approaches used to convey information and facilitate learning. They are essential tools that educators use to create an effective learning environment, engage pupils, and achieve educational objectives.

According to Osteen (2020), he defined academic performance as the extent to which a pupil, teacher, or institution has achieved their short or long-term educational goals. Academic performance is often measured through assessments such as exams, quizzes, assignments, and standardized tests. It reflects the level of understanding, knowledge, and skills that pupils have acquired in their educational journey. High academic performance indicates that pupils have effectively mastered the curriculum and are capable of applying their knowledge and skills in various contexts.

Upper primary schools refers educational institutions that provide education to pupils in the upper years of primary education. In many educational systems, upper primary schools typically encompass grades or classes 4 to 7. These schools build upon the foundational knowledge and skills acquired in lower primary grades, focusing on more advanced academic subjects, including mathematics, science, language arts, social studies, and physical education. (Alton,2014)

1.1.3 Theoretical background

Constructivist theory

Constructivist theory posits that pupil actively construct their own understanding and knowledge of the world through experiencing things and reflecting on those experiences. Developed by Jean Piaget in the 1930s and advanced by Lev Vygotsky in the 1970s, this theory promotes active engagement and critical thinking, encourages pupil to build on their prior knowledge and experiences, and supports deeper understanding and retention of concepts. However, it can be time-consuming and resource-intensive, may overwhelm pupils with less foundational knowledge, and requires highly skilled teachers to facilitate learning. Constructivist theory supports the notion that science teaching methods, such as inquiry-based learning and project-based learning, enhance pupils' academic performance by engaging them actively in the learning process. By constructing their own understanding through experiments and exploration, pupils develop critical thinking and problem-solving skills, leading to a deeper and more retained comprehension of scientific concepts.

Social learning theory

Social learning theory emphasizes that learning occurs within a social context and can happen purely through observation or direct instruction, even in the absence of motor reproduction or direct reinforcement. Developed by Albert Bandura in (1961) and advanced by Bandura in the 1970s and 1980s with further research on observational learning and self-efficacy, this theory highlights the importance of observational learning and modeling, encourages collaborative learning and peer interaction, and supports the development of social skills and behaviors. However, it may not address individual cognitive processes sufficiently, overemphasizes the social context which can undervalue individual differences, and requires appropriate models and environments for effective learning. Social learning theory underpins collaborative learning methods in science education; by working together in groups, pupils observe and imitate peers and teachers, enhancing their understanding of scientific concepts. This approach not only improves academic performance but also develops essential social and communication skills, making the learning process more holistic and engaging.

1.1.4 Contextual background

In Serere District, performance in Science subject is a challenge to many pupils despite government's effort to make Science subject compulsory. On the other hand, pupil's academic performance in Pingire Sub-County seems to be lacking the concepts used in science. This therefore prompted the researcher to carry out a study to establish the impact of teaching methods on pupil' academic performance in Science in upper primary in Pingire Sub-County. Despite efforts to improve science education, many pupils continue to perform poorly, with recent statistics showing that only 45% of pupils achieve passing grades in science subjects (Dan,2022). The problem is exacerbated by a lack of effective teaching methods, insufficient teacher training, and inadequate resources (UWEZO,2018). These issues lead to a shallow understanding of scientific concepts, low retention rates, and decreased motivation among pupils (UNEB,2023). The government's initiatives, such as the introduction of inquiry-based learning and technology-enhanced classrooms, have shown some promise but are hindered by poor implementation and lack of teacher support (Ministry of Education and Sport,2017). It was against this background that the researcher picked up an interest in assessing the impact of science teaching methods on pupil's academic performance in upper primary in primary schools in Pingire Sub County.

1.2 Statement of the problem.

The main purpose of teaching at any level was to bring out a significant change in the pupil (Tebabal & Kahssay, 2011), and this was dependent on the methods of teaching employed by teachers. Most of the traditional methods were teacher-centered with no activity for the pupil, making them passive and therefore obtaining knowledge from the teacher without building their engagement level with the subject matter. This approach was least practical, more theoretical, and focused on memorization. Despite efforts to improve science education, many pupils continued to perform poorly, with recent statistics showing that only 45% of pupils achieved passing grades in science subjects (Dan, 2022). The problem was exacerbated by a lack of effective teaching methods, insufficient teacher training, and inadequate resources (UWEZO, 2018).

These issues led to a shallow understanding of scientific concepts, low retention rates, and decreased motivation among pupils (UNEB, 2023). The government's initiatives, such as the introduction of inquiry-based learning and technology-enhanced classrooms, showed some promise but were hindered by poor implementation and a lack of teacher support (Ministry of Education and Sport, 2017). Local authorities also attempted to address the issue by providing additional training for teachers and improving school infrastructure, yet these measures were not sufficient to bridge the gap (Mutembe, 2021).

Significant gaps remained, including the need for more consistent teacher training programs, better integration of teaching methods, and increased resource allocation to schools (Waiswa, 2019). Conducting this research was crucial to identify the most effective teaching strategies and provide actionable recommendations to enhance science education. It was against this background that the researcher picked up an interest in assessing the impact of science teaching methods on pupils' academic performance in upper primary in primary schools in Pingire Sub-County

1.3 The purpose of the study.

The purpose of this study was to assess the impact of science teaching methods on pupils academic performance in upper primary in primary schools in Pingire sub county.

1.4 Objectives of the study.

This study was guided by the following specific objectives:

i) To establish the methods used in teaching science in in upper primary in Pingire sub-county, Serere District.
ii) To find out the impact of teaching methods on pupil’ academic performance in Science in upper primary in Pingire sub-county, Serere District.

iii) To identify strategies to improve academic performance in Science in upper primary in Pingire sub-county, Serere District.

1.5 Research questions.

i) What are the methods used in teaching science in in upper primary in Pingire sub-county, Serere District?
ii) What is the impact of teaching methods on pupil' academic performance in science in upper primary in Pingire sub-county, Serere District?
iii) Suggest strategies to improve academic performance in science in upper primary in Pingire sub-county, Serere District.

1.6 The scope of the study

1.6.1 Geographical scope.

The study was conducted in Pingire Sub-County, Serere District, which lies to the south of Soroti City and is approximately 37 km by road from Soroti City via Serere Town to Pingire Sub-County Headquarters. This study focused on five primary schools in Pingire Sub-County: Omiriai Primary School, Pingire Primary School, Sambwa Primary School, Obutet Primary School, and Olwa - Kasilo Primary School. These schools were selected due to their accessibility to the researcher.

1.6.2 Content Scope

The study focused on:

1. Examining the nature of teaching methods used by teachers in the teaching of Science in upper primary in Pingire Sub-County, Serere District.
2. Investigating the impact of teaching methods on pupils' academic performance in Science in upper primary in Pingire Sub-County, Serere District.
3. Identifying strategies to improve academic performance in Science in upper primary in Pingire Sub-County, Serere District.

1.6.3 Time Scope

The issue of poor teaching methods in Science, particularly by teachers in upper primary in Pingire Sub-County, Serere District, has persisted for over fifteen years and has contributed to poor performance in Science in upper primary. This study focused on the problem over the past five years, from 2019 to the present.

1.7 Significance of the Study

The findings of this research were useful to the following groups:

Policymakers

- The study provided evidence-based insights on effective teaching methods, enabling policymakers to formulate educational policies that enhance Science education.
- Data from the study guided the allocation of resources towards the most effective teaching methods and professional development for teachers.
- Findings influenced the design and revision of Science curricula to incorporate effective teaching strategies.

Stakeholders (School Administrators and Teachers)

- Teachers adopted the most effective teaching methods identified by the study, leading to improved pupil performance.
- School administrators implemented strategies that supported effective teaching methods, such as targeted teacher training and appropriate classroom resources.
- Parents were informed about effective teaching methods and supported their children's learning at home, fostering a collaborative approach to education.

Researchers

- The study provided a basis for future research on teaching methods and academic performance, particularly in the context of Science education in upper primary schools.

- Researchers utilized the study's methodologies and findings to design similar studies in other regions or subjects, contributing to the broader field of educational research.
- The study added to the existing body of knowledge on the relationship between teaching methods and academic performance, offering data and insights referenced in future studies.

Academicians

- Academicians involved in teacher education used the study's findings to develop and improve training programs for pre-service and in-service teachers.
- The study encouraged academicians to explore and advocate for innovative teaching methods that enhance Science education.
- Findings from the study were published in academic journals, contributing to scholarly discussions and the advancement of educational theories and practices.

1.8 Conceptual framework

(Independent Variable)

Teaching methods

- Inquiry-based learning
- Collaborative learning
- The integration of technology
- Project-based learning
- The flipped classroom model
- Direct instruction
- Blended learning

(Dependent Variable)

Academic Performance

- Level of performance
- National performance
- Quality of education
- Grades and Test Scores
- Engagement in Classroom Activities

Source: (UNESCO,2020)

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Introduction

This chapter was devoted to reviewing literature relevant to the problem, based on the research objectives. The researcher reviewed studies conducted by other scholars that were related to the area of this study. The literature review was organized according to the following research objectives

2.1 The methods used in teaching science

Inquiry-based learning (IBL) has garnered significant support among educators. According to Bybee (2014), IBL fosters critical thinking and enhances problem-solving skills by engaging pupils in the scientific process. Minner, Levy, and Century (2019) found that pupils who participate in inquiry-based activities exhibit improved understanding and retention of scientific concepts compared to those taught through traditional methods. Despite its advantages, some researchers have highlighted challenges associated with IBL. Kirschner, Sweller, and Clark (2006) argued that IBL can overwhelm pupils, especially those with limited prior knowledge, due to its reliance on self-guided exploration. They suggested that novice pupil benefit more from direct instruction that provides clear guidance and structured learning.

Collaborative learning, where pupils work together to solve problems and complete tasks, has been praised for promoting deeper understanding and social skills. Johnson, Johnson, and Smith (2019) noted that collaborative learning encourages pupil engagement and helps develop communication and teamwork abilities. A meta-analysis by Springer, Stanne, and Donovan (1999) reported that collaborative learning positively impacts pupil achievement and attitudes towards science. Conversely, some scholars have pointed out potential downsides to collaborative learning. Slavin (2018) acknowledged that while collaborative learning can be beneficial, it may also lead to unequal participation among group members, with some pupils dominating the discussion and others contributing minimally. Moreover, Webb (2008) emphasized the importance of effective group dynamics and teacher facilitation to ensure all pupils benefit equally.

The integration of technology in science education has been widely advocated. According to Hsu, Lai, and Hsu (2015), digital tools and resources can enhance the learning experience by providing interactive simulations and access to vast information. Hwang and Tsai (2019) found that technology-enhanced learning environments improve pupils' motivation and engagement, leading to better academic performance in science subjects. However, some researchers have raised concerns about the overreliance on technology. Clark (2014) argued that technology, in itself, does not improve learning outcomes; rather, the instructional design and implementation are crucial. In a more recent study, Sung, Chang, and Liu (2016) cautioned that without proper integration and support, technology can distract pupils and hinder their learning process.

Project-based learning (PBL) has been endorsed for its ability to connect theoretical knowledge with real-world applications. Thomas (2017) asserted that PBL promotes active learning and helps pupils develop critical thinking and problem-solving skills. Krajcik and Blumenfeld (2006) found that pupils engaged in PBL demonstrate increased motivation and a deeper understanding of scientific concepts. Despite its benefits, PBL has its detractors. Savery (2017) pointed out that PBL requires significant time and resources to implement effectively, which can be a barrier for some schools. Moreover, Kirschner, Sweller, and Clark (2016) criticized PBL for potentially overwhelming pupils, especially those who lack foundational knowledge and self-regulation skills.

The flipped classroom model, where pupils review instructional content at home and engage in hands-on activities in class, has gained popularity. Bergmann and Sams (2012) highlighted that this approach allows for more personalized instruction and active learning during class time. According to Bishop and Verleger (2013), the flipped classroom can improve pupil engagement and performance in science education.However, some researchers have expressed reservations about the flipped classroom model. Strayer (2012) noted that pupils might struggle with the increased responsibility for their own learning outside the classroom. Furthermore, Lo and Hew (2017) emphasized the need for careful planning and support to ensure that all pupils can access and benefit from the flipped classroom approach.

Direct instruction, characterized by structured lessons and clear guidance from the teacher, remains a widely used method in science education. According to Rosenshine (2012), direct instruction is particularly effective for teaching foundational knowledge and skills. Stockard et al. (2018) found that pupils in direct instruction settings often outperform their peers in other instructional models, especially in standardized assessments.On the other hand, critics of direct instruction argue that it can lead to passive learning. Freire (2010) criticized traditional, teacher-centered approaches for stifling creativity and critical thinking. Additionally, Hmelo-Silver, Duncan, and Chinn (2017) contended that while direct instruction is useful for foundational learning, it should be complemented with other methods to foster deeper understanding and application of scientific concepts.

Blended learning, which combines traditional classroom instruction with online components, has been lauded for its flexibility and effectiveness. Garrison and Vaughan (2018) reported that blended learning environments support diverse learning styles and improve pupil outcomes. Graham (2013) found that blended learning can enhance pupil engagement and achievement in science education. Nevertheless, some researchers have identified challenges with blended learning. Oliver and Trigwell (2014) pointed out that the success of blended learning depends on the effective integration of online and offline components, which can be difficult to achieve. Additionally, Means et al. (2013) highlighted that access to technology and digital literacy skills are critical factors that can influence the effectiveness of blended learning**.**

2.2 The impact of teaching methods on pupil' academic performance in Science

Inquiry-Based Learning (IBL) involves pupils actively participating in the scientific process through questioning, exploring, and experimenting. Proponents such as Bybee (2014) argue that IBL promotes critical thinking, problem-solving skills, and a deeper understanding of scientific concepts. Minner, Levy, and Century (2010) found that pupils engaged in IBL showed significant improvements in their understanding and retention of scientific knowledge compared to traditional instructional methods. However, Kirschner, Sweller, and Clark (2006) contended that IBL could be overwhelming for pupils with limited prior knowledge, as it demands a high level of self-guided exploration. They argued that novice pupil might benefit more from structured guidance and direct instruction, which provides clearer learning pathways.

Collaborative learning, which involves pupils working together to solve problems and complete tasks, is praised for enhancing understanding and social skills. Johnson, Johnson, and Smith (2014) emphasized that collaborative learning fosters pupil engagement and communication skills, contributing to better academic performance. Springer, Stanne, and Donovan (1999) conducted a meta-analysis indicating that collaborative learning has a positive impact on pupil achievement and attitudes towards science. Despite its benefits, Slavin (2011) highlighted potential issues such as unequal participation, where dominant pupils might overshadow less confident peers. Webb (2008) noted that effective group dynamics and teacher facilitation are crucial for maximizing the benefits of collaborative learning and ensuring all pupils are actively involved.

Technology-Enhanced Learning (TEL) leverages digital tools and resources to enhance the educational experience. Hsu, Lai, and Hsu (2015) demonstrated that TEL could make science more accessible and engaging through interactive simulations and information resources. Hwang and Tsai (2011) reported that TEL environments significantly boost pupil motivation and engagement, leading to improved academic performance in science. Clark (1983) cautioned that technology alone does not inherently enhance learning outcomes; the effectiveness depends on the instructional design. Sung, Chang, and Liu (2016) warned that without proper integration, technology could distract pupils rather than support their learning, emphasizing the need for thoughtful implementation.

Project-Based Learning (PBL) emphasizes active learning through projects that apply scientific concepts to real-world scenarios. Thomas (2000) argued that PBL promotes critical thinking and problem-solving skills, linking theoretical knowledge with practical applications. Krajcik and Blumenfeld (2006) found that pupils involved in PBL showed higher motivation and deeper understanding of scientific content. However, Savery (2016) pointed out that PBL requires significant time and resources, posing challenges for some schools. Kirschner, Sweller, and Clark (2006) also criticized PBL for potentially overwhelming pupils who lack foundational knowledge, suggesting a balance between guided instruction and project work.

The flipped classroom model involves pupils learning new content at home through videos and readings, while class time is used for hands-on activities and discussions. Bergmann and Sams (2012) highlighted that this approach allows for more personalized and interactive learning. Bishop and Verleger (2013) found that flipped classrooms could enhance pupil engagement and performance in science education.Strayer (2012) noted that the flipped classroom model requires pupils to take more responsibility for their learning outside of class, which can be challenging for some. Lo and Hew (2017) stressed the need for careful planning and support to ensure all pupils benefit from this model.

Direct instruction, characterized by structured lessons and clear teacher guidance, is favored for its effectiveness in teaching foundational knowledge. Rosenshine (2019) asserted that direct instruction is particularly beneficial for learning essential skills and concepts. Stockard et al. (2018) found that pupils in direct instruction settings often outperform their peers in other instructional models, especially on standardized assessments. Critics like Freire (2010) argued that direct instruction can lead to passive learning, stifling creativity and critical thinking. Hmelo-Silver, Duncan, and Chinn (2007) suggested that while direct instruction is useful for foundational learning, it should be supplemented with other methods to encourage deeper understanding and application of scientific concepts.

Blended learning combines traditional classroom instruction with online learning components. Garrison and Vaughan (2008) reported that blended learning supports diverse learning styles and improves pupil outcomes by offering flexibility and accessibility. Graham (2013) found that blended learning enhances pupil engagement and achievement in science education. Oliver and Trigwell (2005) pointed out that the success of blended learning depends on the effective integration of online and offline components, which can be challenging. Means et al. (2013) emphasized that access to technology and digital literacy skills are critical factors influencing the effectiveness of blended learning, highlighting the digital divide as a potential barrier.

2.3 Strategies to improve academic performance in Science

Inquiry-Based Learning (IBL) emphasizes pupil engagement through questioning, exploring, and experimenting. Bybee (2014) argues that IBL fosters critical thinking and problem-solving skills, essential for mastering scientific concepts. Minner, Levy, and Century (2010) conducted a meta-analysis showing that pupils engaged in IBL exhibit superior understanding and retention of scientific knowledge compared to traditional methods. Kirschner, Sweller, and Clark (2006) challenge the effectiveness of IBL, particularly for novice pupil. They argue that the lack of structured guidance can overwhelm pupils, hindering their learning. Instead, they advocate for more direct instructional methods that provide clear, scaffolded support to help pupils build foundational knowledge before engaging in inquiry-based activities.

To address these concerns, teachers can blend IBL with guided instruction, gradually reducing support as pupils gain confidence. Studies in various educational contexts, including the U.S., Finland, and Singapore, indicate that when appropriately scaffolded, IBL can significantly enhance pupils' scientific inquiry skills and overall academic performance (Pedaste et al., 2015; Furtak et al., 2012).

Collaborative learning involves pupils working together to solve problems and complete tasks, leveraging collective knowledge and skills. Johnson, Johnson, and Smith (2014) highlight that collaborative learning enhances understanding and social skills, promoting a deeper grasp of scientific concepts. Springer, Stanne, and Donovan (1999) found that collaborative learning positively impacts pupil achievement and attitudes towards science. Despite its benefits, Slavin (2011) notes potential issues such as unequal participation, where some pupils may dominate the discussion while others contribute minimally. Webb (2008) stresses the importance of effective group dynamics and teacher facilitation to ensure equitable participation and maximize learning outcomes.

Teachers can foster effective collaborative learning by carefully designing group activities, assigning roles, and providing clear guidelines. Research from diverse educational settings, including Europe, Asia, and North America, indicates that well-structured collaborative learning activities can significantly improve pupils' academic performance and engagement in science (Gillies, 2016; Laal & Ghodsi, 2012). TEL integrates digital tools and resources into the learning process, making science education more interactive and accessible. Hsu, Lai, and Hsu (2015) demonstrate that TEL can enhance the learning experience by providing interactive simulations and access to extensive information. Hwang and Tsai (2011) report that TEL environments improve pupils' motivation and engagement, leading to better academic performance in science. Clark (1983) warns that technology alone does not improve learning outcomes; effective instructional design is crucial. Sung, Chang, and Liu (2016) caution that without proper integration, technology can distract rather than enhance learning, emphasizing the need for thoughtful implementation.

Effective TEL requires integrating technology into the curriculum meaningfully, aligning it with educational goals and providing teacher training. Studies from countries with advanced educational technology infrastructure, such as South Korea and Japan, show that well-implemented TEL can significantly boost pupils' understanding and interest in science (Chiu, 2013; Hwang et al., 2019).

PBL emphasizes active learning through projects that apply scientific concepts to real-world scenarios. Thomas (2010) argues that PBL promotes critical thinking and problem-solving skills, linking theoretical knowledge with practical applications. Krajcik and Blumenfeld (2016) found that pupils involved in PBL demonstrate higher motivation and a deeper understanding of scientific content. Savery (2014) points out that PBL requires significant time and resources, posing challenges for some schools. Kirschner, Sweller, and Clark (2016) criticize PBL for potentially overwhelming pupils who lack foundational knowledge, suggesting a balance between guided instruction and project work.

Teachers can implement PBL by designing projects that align with curriculum standards and providing adequate resources and support. Research from diverse educational contexts, including Australia and the U.K., indicates that PBL can significantly enhance pupils' academic performance and engagement in science when appropriately integrated (Bell, 2018; English & Kitsantas, 2013). The flipped classroom model involves pupils learning new content at home through videos and readings, while class time is used for hands-on activities and discussions. Bergmann and Sams (2012) highlight that this approach allows for more personalized and interactive learning. Bishop and Verleger (2019) found that flipped classrooms can improve pupil engagement and performance in science education. Strayer (2018) notes that the flipped classroom model requires pupils to take more responsibility for their learning outside of class, which can be challenging for some. Lo and Hew (2017) emphasize the need for careful planning and support to ensure all pupils benefit from this model.

Teachers can implement flipped classrooms by creating or curating high-quality instructional videos and providing structured in-class activities. Studies from various regions, including North America and Europe, indicate that flipped classrooms can significantly enhance pupils' understanding and application of scientific concepts (Lage, Platt, & Treglia, 2018; Abeysekera & Dawson, 2015). Direct instruction involves structured lessons and clear teacher guidance, providing a foundation for learning complex scientific concepts. Rosenshine (2018) asserts that direct instruction is particularly effective for teaching essential skills and knowledge. Stockard et al. (2018) found that pupils in direct instruction settings often outperform their peers in other instructional models, especially in standardized assessments. Freire (2010) criticizes direct instruction for potentially leading to passive learning, stifling creativity and critical thinking. Hmelo-Silver, Duncan, and Chinn (2017) suggest that while direct instruction is useful for foundational learning, it should be supplemented with other methods to encourage deeper understanding and application of scientific concepts.

Teachers can use direct instruction to introduce new concepts and provide a solid knowledge base before moving on to more pupil-centered approaches. Research from various educational settings, including the U.S. and Canada, indicates that direct instruction can be highly effective when combined with interactive and inquiry-based activities (Adams & Engelmann, 2015; Archer & Hughes, 2019). Blended learning combines traditional classroom instruction with online components, offering flexibility and accessibility. Garrison and Vaughan (2018) report that blended learning supports diverse learning styles and improves pupil outcomes. Graham (2013) found that blended learning can enhance pupil engagement and achievement in science education. Oliver and Trigwell (2015) point out that the success of blended learning depends on the effective integration of online and offline components, which can be challenging. Means et al. (2013) highlight that access to technology and digital literacy skills are critical factors influencing the effectiveness of blended learning.

Teachers can implement blended learning by integrating online resources, such as videos and interactive simulations, with traditional classroom activities. Studies from countries with robust digital education initiatives, such as Finland and the Netherlands, indicate that blended learning can significantly enhance pupils' academic performance and engagement in science (Halverson et al., 2017)

2.4 Summary of literature review

The review of teaching methods for science education highlights the varied approaches to enhancing academic performance. Inquiry-based learning (IBL) promotes critical thinking and problem-solving but can overwhelm novice pupil, necessitating a blend with guided instruction. Collaborative learning fosters engagement and social skills but requires effective group dynamics and facilitation to ensure equitable participation. Technology-enhanced learning (TEL) makes science interactive and accessible, though its success depends on thoughtful integration and instructional design. Project-based learning (PBL) connects theoretical knowledge to real-world applications, but its implementation can be resource-intensive and challenging for some pupils. The flipped classroom model enhances personalized and interactive learning, though it requires careful planning and pupil responsibility. Direct instruction is effective for foundational knowledge but should be complemented with interactive approaches to foster deeper understanding. Blended learning combines traditional and online methods, offering flexibility and improved engagement, though it relies on the effective integration of both components and access to technology. Each method offers unique advantages and challenges, suggesting a balanced and thoughtful approach to teaching science for optimal pupil outcomes.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter presents the research design, area of study, study population, sample size, sampling techniques, data collection, data analysis, research procedure, data quality control, and ethical considerations.

3.1 Research Design

A cross-sectional survey design was used, in which data was collected from a representative sample at one point in time to make inferences about the target population (Mugenda & Mugenda, 2019). This enabled the researcher to collect data from a cross-section of participants and later extrapolate the results to cover the entire population. The design was also preferred because after the study, it was not necessary to perform follow-up with the participants. The qualitative approach was used to treat qualitative data such as the respondents' views narratively, and the quantitative method was used to present statistical information. This provided a strong backing to what was already known through previous research.

3.2 Area of the Study

The study was conducted in Pingire sub-county, Serere District, which lies in the southern direction from Soroti City and is approximately 37 km by road from Soroti City via Serere Town to Pingire sub-county Headquarters. This study was carried out in five primary schools found in Pingire sub-county: Omiriai Primary School, Pingire Primary School, Sambwa Primary School, Obutet Primary School, and Olwa - Kasilo Primary School. These schools were selected because of their location, which was within reach of the researcher.

3.3 Study Population

The study population is defined as the proposed set of people, events, or subjects to which a researcher wishes to generalize the findings. The estimated population of this study consisted of about 4,502 people, including head teachers, teachers, and pupils from upper primary schools, mostly pupils in primary four to seven classes in the five selected primary schools in Pingire sub-county, Serere District. The target population included 86 teachers, 4,411 pupils, and 5 head teachers, totaling 4,502 respondents

Table 1: Population of respondents

Respondents	**Number**
Head teachers	5
Teachers	4411
Pupils	86
TOTAL	**4502**

3.4 Sample Size

3.4.1 Sample size

The sample size was determined from (Krejcie &Morgan 1970), table for sample size for research activities at confidence level .Sample size of 356 from a population of 4502 was selected, of these 356 respondents filled and returned the questionnaires (Sample size table below)

NO	**STRATUM**	**N**	**S**
1	Head teachers	5	5
2	Pupil/Pupils	4411	280
3	Teachers	86	69
TOTAL		**4502**	**356**

Source: Krejcie &Morgan

Table 3.1

Table for Determining Sample Size of a Known Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384

Note: N is Population Size; S is Sample Size *Source: Krejcie & Morgan, 1970*

3.4.2 Sampling techniques

Systematic sampling technique was used to sample commercials from each block. Systematic Therefore, the study used a sample size of 356 participants which were distributed as shown in table in table 2.

Table 2: Distribution of the Respondents

Respondents	Study Population	Sample Size	Sampling Techniques
NO	**STRATUM**	**N**	
Head teachers	5	5	Purposive sampling
Pupil/Pupils	4411	280	Simple Random
Teachers	86	71	Purposive sampling
TOTAL	**4502**	**356**	

Source: Field Data, 2024

3.4.3 Sampling Procedure

The following sampling techniques will be used to select respondents for the study.

3.4.4 Random Sampling

Kakooza (2015) defined simple random sampling as a probability-based technique in which each member of a subset has an equal chance of being chosen. Larry et al. (2017) concurred that when a researcher intends to mirror the population, the best way is to use an Equal Probability of Selection Method (EPSEM). This is because an EPSEM, also called simple random sampling, gives each individual member of the population an equal chance of being selected for inclusion in the sample. This method was administered using a simple lottery method in which participants were chosen randomly. This technique was used to select teachers and pupils to take part in the study.

3.4.5 Purposive Sampling

Leedy (2017) viewed purposive sampling as a non-probability sampling technique that entirely depends on the researcher's interest and judgment informed by the characteristics of the sample. Larry et al. (2017) agreed that in using purposive sampling, a researcher specifies the characteristics of the population of interest and then locates individuals who have those characteristics. In this study, the researcher used an expert sampling form of purposive sampling because it enabled him to obtain valuable knowledge from the head teachers and teachers chosen for this study.

3.5 Data Collection Instruments

3.5.1 Questionnaire

Both close-ended and open-ended questionnaires were designed and used in this study. The closed-ended questionnaire items helped to refocus the study on a specific number of items that generated quantitative data. The open-ended questionnaire items, on the other hand, were used to generate qualitative data or provide explanations for the closed-ended questionnaire items. This enabled the researcher to obtain a high response rate during data collection due to the simplicity of the questionnaire items. It was administered to head teachers and teachers chosen to participate in the study.

3.5.2 Interview Guide

The researcher conducted face-to-face interactions with respondents. Interviews were conducted with the help of an interview guide to solicit data from the pupils. This enabled the researcher to obtain detailed information about the problem being investigated and encouraged respondents' active participation in the study.

3.6 Data Processing and Analysis

3.6.1 Data Processing

Data processing was done in stages right from the field after every other session of the study. Raw data was processed into meaningful information. The process involved editing, with a view of checking the completeness and accuracy of the information. Data was edited to detect and eliminate errors.

3.6.2 Data Analysis and Presentation

Data analysis involves the process of creating meaning from raw data or giving meaning to raw data (Amin, 2005). In the process of data analysis, responses to the questionnaire and interview questions were tallied to obtain frequencies. These were converted into percentages using basic statistics to enable the researcher to measure the degree of relevance that the respondents attached to their responses. Quantifiable data was tabulated to simplify analysis and interpretation of the findings. Qualitative data was used to generate meaningful expressions to anchor the findings of the study and was presented in the questionnaires.

3.7 Data Quality Control

3.7.1 Validity of Instruments

Validity is the extent to which research results can be accurately interpreted and generalized to other populations (Kakooza, 2015). To establish validity, the instruments were given to two experts to evaluate the relevance of each item to the objectives of the study. The experts rated each item on the scale: very relevant (5), not sure (4), agree (3), disagree (2), and strongly disagree (1). The researcher only considered items rated as 4 and 3 in the instruments.

3.7.2 Reliability of the Instruments

According to Larry et al. (2015), reliability measures the consistency of research instruments to come out with the same result each time it is used under the same condition. This was ascertained by carrying out a pilot study to ensure that the questions and answers obtained were consistent and accurate. A pilot study involved 10% of the sample projected (Mugenda & Mugenda, 2019), comprising 36 respondents who were eligible to participate in the final study.

3.8 Ethical Considerations

During this study, the privacy and confidentiality of participants' responses were upheld. Plagiarism was controlled by duly acknowledging the works of other authors and individuals whose views were used to support the findings. Participation in the study was voluntary, and respondents had the right to refrain from participating in the study. Finally, both verbal and written consent was obtained from the respondents taking part in the study.

CHAPTER FOUR

DATA PRESENTATIONS ANALYSIS AND INTERPRETATION OF FINDINGS

4.0 Introduction

This chapter presented and discussed the findings of the study. Data was gathered from staff members of Pingire Sub County

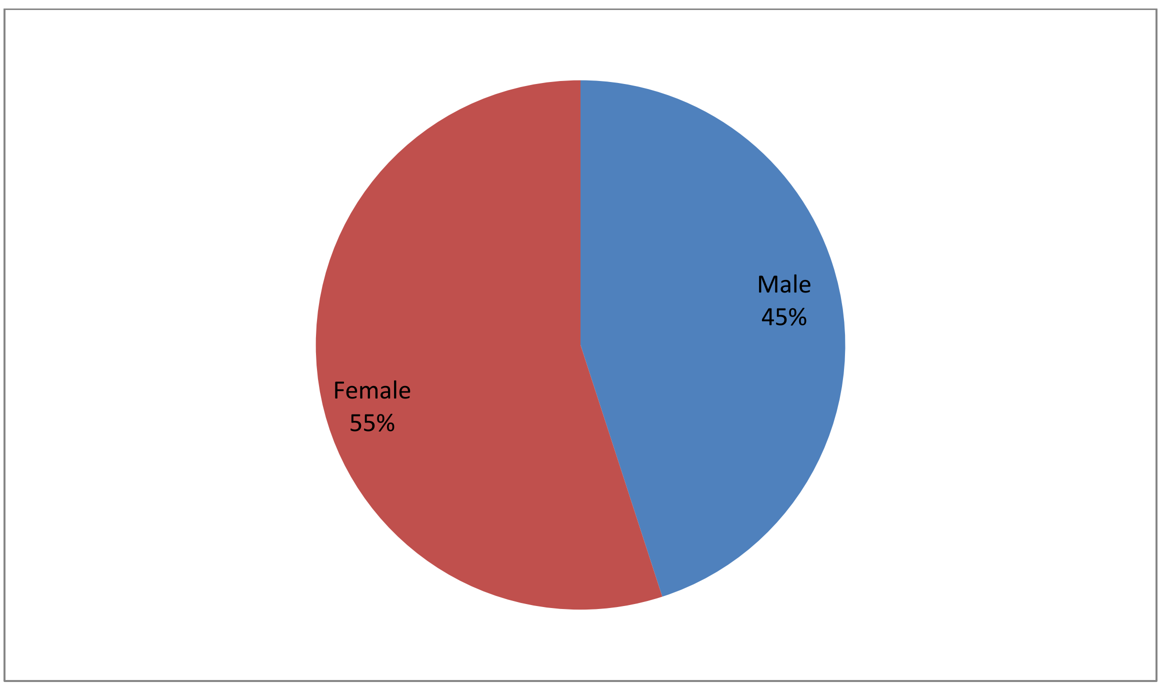
4.1 Demographic characteristics of respondents

This section includes gender, age, education qualification and experience of respondents

4.1.1 Gender of respondents

Respondents were analyzed on the basis of their gender and the responses are shown in Figure 1 below:

Figure 1; below showing gender of despondence



Source: primary data, (2024)

Figure 1 above illustrates the gender distribution of the respondent's .The male respondents were 159 making 45% and female respondents were 197 representing 55%. The statistical data from figure .1 above shows that there were more females than males.

4.1.2 Age of the respondent

Age is an important variable and is a primary basis of demographic classification in vital statistical census and surveys (URT), 2009). Respondents were analyzed according to their age and the responses given are as shown in table 3 below

Table 3: Showing the age of the respondents

Age bracket	Frequency	Percentage (%)
8-30	197	55
31-40	65	18
41-50	50	14
50and above	44	13
Total	356	100

Source: primary data,(2024)

Table 3 above illustrates the age distribution of the respondents,197(55%) of the respondents were within the age brackets of 8-30years, 65(18%) were within the age bracket of 31-40years ,50(14%) were within the brackets of 41-50years,while 44(13%) of the respondents were 50 and above .This implies that majority of the respondents were above the age of 18 years.

4.1.3 Education level of respondents

Education is regarded as a key to better opportunities for employment, accessibility to information, service and make actions with regard to survival and development (Nkurunzinza, 2006). Table 4 summaries of the respondents' education level.

Table 4: showing education qualification of respondents

Education level	Frequency	Percentages (%)
Primary	241	68
Certificate	65	18
Graduate	50	14
Post Graduate	0	0
Total	356	100

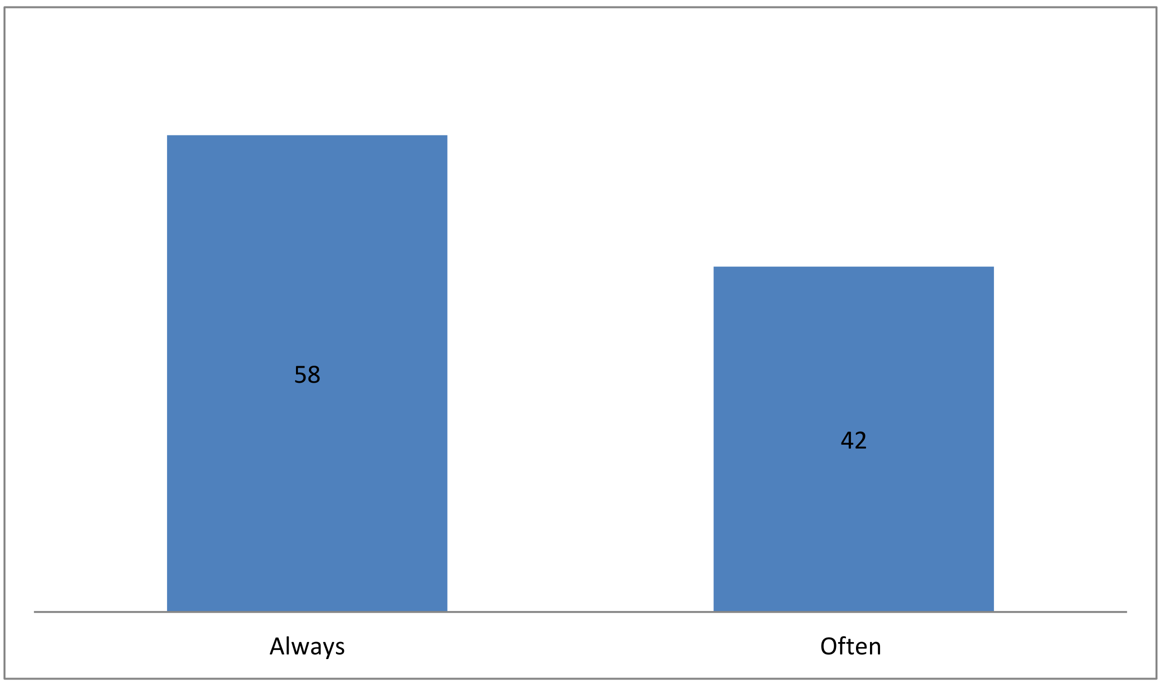
Source: primary data, (2024)

The statistical data in table 3 above shows that most of the respondents were having primary with 241(68%) followed by certificates with 65(18%), followed by graduates 50(14%), post graduates none. This implies that majority of the respondents had primary level

4.2.0 THE METHODS USED IN TEACHING SCIENCE IN IN UPPER PRIMARY

The respondents were asked various questions about the methods used in teaching science in upper primary thus, the respondents were asked how often do you use inquiry-based learning (IBL) in your Science classes

Figure 2: How often do you use inquiry-based learning (IBL) in your Science classes



Source: primary data, (2024)

The majority of the respondents, accounting for 58% (205 respondents), always used inquiry-based learning (IBL) in their Science classes. In contrast, 42% (151 respondents) reported that they often used IBL. This indicates a high level of adoption of IBL among the teachers, suggesting a strong preference for this method to engage students in scientific inquiry and active learning.

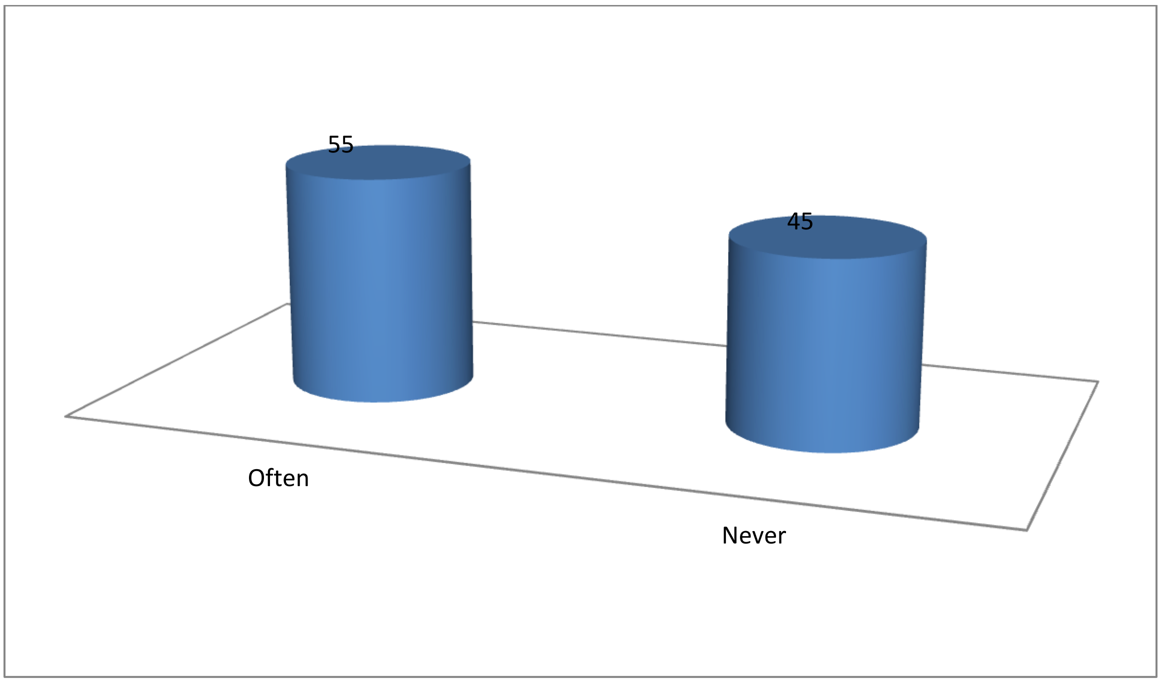
Table 5: To what extent do you agree that collaborative learning improves pupil engagement in Science

Response	Frequency	Percentages
To small extent	166	47
To great extent	189	53
Neutral	1	0
Total	356	100

Source: primary data, (2024)

53% (189 respondents) of the participants agreed to a great extent that collaborative learning improves pupil engagement in Science. Conversely, 47% (166 respondents) believed that it improves engagement only to a small extent.

Figure 3: How frequently do you incorporate technology in your Science teaching



Source: primary data,(2024)

55% (197 respondents) indicated that they often incorporated technology in their Science teaching. However, 45% (159 respondents) reported that they never used technology in their classes. This suggests a moderate use of technological tools in teaching, with more than half of the respondents frequently utilizing these resources to enhance their instructional methods.

Table 6: Do you believe that project-based learning (PBL) enhances pupils' understanding of scientific concepts

Response	**Frequency**	**Percentages**
Agree	300	84
Disagree	56	16
Total	356	100

Source: primary data,(2024)

A significant majority, 84% (300 respondents), agreed that PBL was beneficial in this regard, while 16% (56 respondents) disagreed. This overwhelming support for PBL indicates its perceived effectiveness in facilitating deeper comprehension of scientific ideas among students.

Table 7: How effective do you find the flipped classroom model in teaching Science

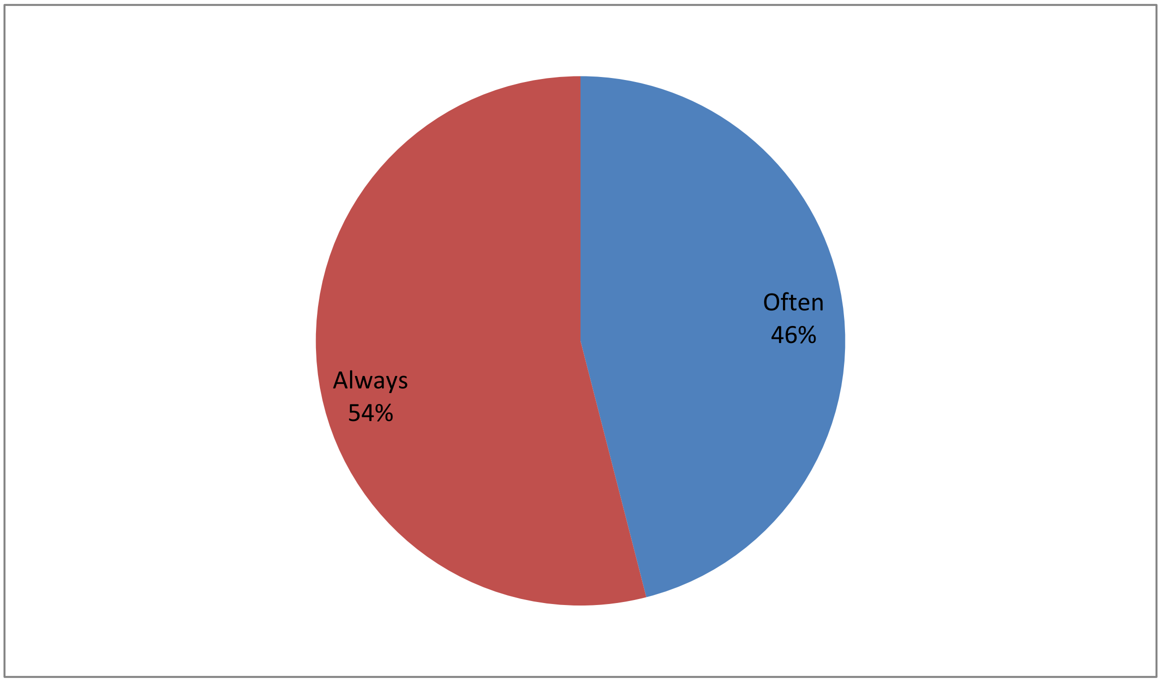
Response	**Frequency**	**Percentages**
Very Ineffective	120	34
Ineffective	160	45
Effective	76	21
Total	356	100

Source: primary data,(2024)

A considerable portion of the respondents, 45% (160 respondents), found it ineffective, and 34% (120 respondents) considered it very ineffective. Only 21% (76 respondents) deemed it effective. These findings suggest that the flipped classroom model might not be widely accepted or successfully implemented among the teachers, indicating potential challenges or a lack of familiarity with this approach

4.3.0 THE IMPACT OF TEACHING METHODS ON PUPIL' ACADEMIC PERFORMANCE IN SCIENCE

Figure 4: How often do you use inquiry-based learning (IBL) to teach Science



Source: primary data,(2024)

54% (191 respondents) of the teachers always used inquiry-based learning (IBL) in their Science classes, while 46% (165 respondents) reported using it often. This high frequency of IBL use reflects its widespread adoption and suggests that teachers believe in its effectiveness for enhancing student engagement and understanding in Science.

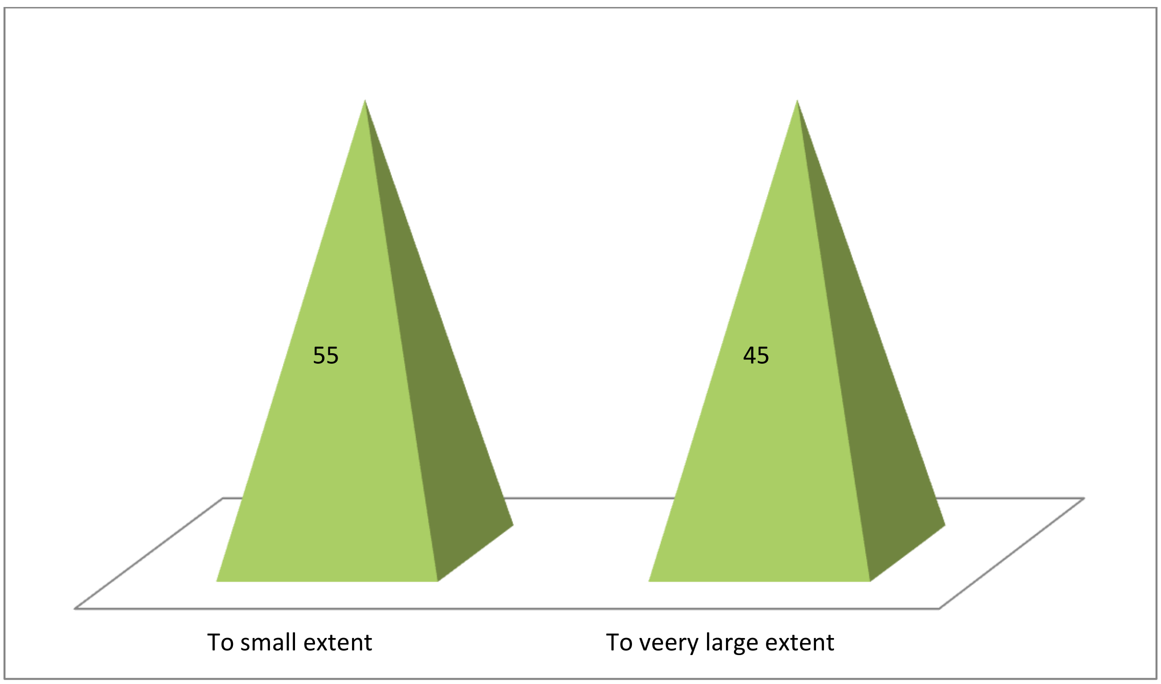
Table 8: How would you rate the impact of collaborative learning on pupils' academic performance in Science

Response	Frequency	Percentages
Very Negative	1	0
Very positive	189	53
Positive	166	47
Total	356	100

Source: primary data, (2024)

53% (189 respondents) rated the impact of collaborative learning on pupils' academic performance in Science as very positive, while 47% (166 respondents) rated it as positive. Only one respondent viewed the impact as very negative.

Figure 5: To what extent do you integrate technology-enhanced learning (TEL) in your Science lessons



Source: primary data,(2024)

55% (197 respondents) integrated technology-enhanced learning (TEL) to a small extent in their Science lessons, whereas 45% (159 respondents) used it to a very large extent. This indicates a moderate level of TEL integration, with a significant portion of teachers incorporating technology into their teaching, though there remains room for increased usage to further enhance learning outcomes

Table 9: show how effective do you find project-based learning (PBL) in improving pupils' academic performance in Science

Response	Frequency	Percentage (%)
Very effective	197	55
Effective	65	18
Neutral	50	14
Very Ineffective	44	13
Total	356	100

Source: primary data, (2024)

55% (197 respondents) found project-based learning (PBL) to be very effective in improving pupils' academic performance in Science, and 18% (65 respondents) rated it as effective. However, 14% (50 respondents) were neutral, and 13% (44 respondents) considered it very ineffective.

Table 10: How frequently do you use the flipped classroom model in your Science teaching

Education level	Frequency	Percentages (%)
Never	241	68
Rarely	65	18
Sometimes	50	14
Total	356	100

Source: primary data, (2024)

68% (241 respondents) never used the flipped classroom model in their Science teaching, 18% (65 respondents) rarely used it, and 14% (50 respondents) used it sometimes. This indicates a low frequency of flipped classroom model usage, suggesting that this teaching method is not widely adopted or may be less familiar to teachers. Further training and support might be needed to encourage its implementation

4.4.0 STRATEGIES TO IMPROVE ACADEMIC PERFORMANCE IN SCIENCE IN UPPER PRIMARY

The respondents were asked on the strategies to improve academic performance in Science in upper primary and the results were as indicated in the table below;

Table 11: How often do you incorporate Inquiry-Based Learning (IBL) in your Science teaching

Response	Frequency	Percentages
Rarely	56	16
Always	300	84
Total	356	100

Source: primary data,(2024)

A majority, 84% (300 respondents), always incorporated Inquiry-Based Learning (IBL) in their Science teaching, while 16% (56 respondents) reported using it rarely. This high level of IBL usage suggests that it is a favored method among teachers for engaging pupils in scientific inquiry and hands-on learning.

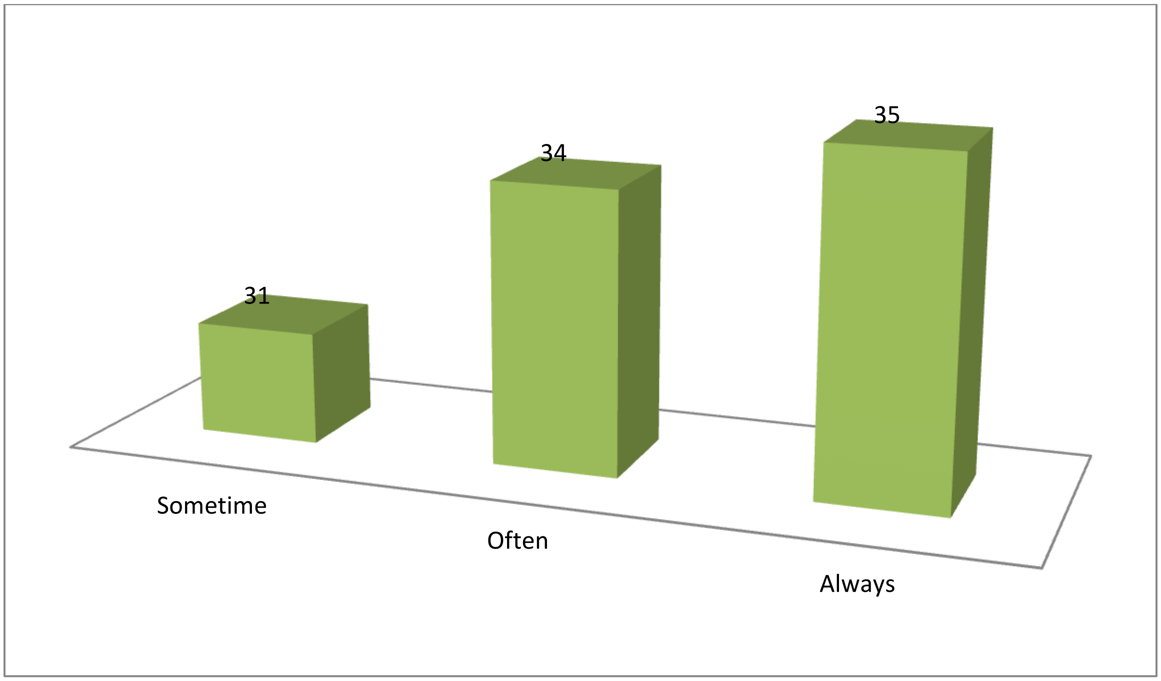
Table 12: To what extent do you believe IBL enhances pupils' critical thinking and problem-solving skills

Response	Frequency	Percentages
To a large extent	191	54
To small extent	165	46
Total	356	100

Source: primary data,(2022)

54% (191 respondents) believed that IBL enhances pupils' critical thinking and problem-solving skills to a large extent, whereas 46% (165 respondents) felt it did so to a small extent. These findings indicate a general consensus among teachers that IBL positively impacts students' higher-order thinking skills, although some variability in perception exists.

Figure 6: How frequently do you use collaborative learning in your Science classes



Source: primary data,(2024)

17, 35% (125 respondents) always used collaborative learning in their Science classes, 34% (120 respondents) often used it, and 31% (111 respondents) sometimes used it. The widespread use of collaborative learning reflects its perceived effectiveness in fostering teamwork and interactive learning among pupils.

Table 13: How effective do you find blended learning in supporting diverse learning styles

Response	**Frequency**	**Percentages (%)**
Very effective	241	68
Ineffective	65	18
Effective	50	14
Total	356	100

Source: primary data, (2024)

68% (241 respondents) found blended learning to be very effective in supporting diverse learning styles, 14% (50 respondents) found it effective, and 18% (65 respondents) found it ineffective. This suggests that most teachers view blended learning as a valuable approach for accommodating different learning preferences and enhancing overall educational outcomes, though some skepticism about its effectiveness remains

CHAPTER FIVE

DISCUSSSION OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.0 Introduction

This chapter presents the discussion of findings ,conclusion and recommendation of the study, the chapter also suggests areas for further research, conclusion were drawn based on the content analysis ,research questions and objectives of the study as well as the findings of the study thereof, recommendations were made based on content analyzed and the findings of the study

5.1 Discussion of findings

5.1.1 Discussion of findings on the methods Used in Teaching Science in Upper Primary

The study revealed that 58% (205 respondents) always used inquiry-based learning (IBL) in their Science classes. These findings aligned with Bybee (2014), who argued that IBL fosters critical thinking and enhances problem-solving skills by engaging pupils in the scientific process. Similarly, Minner, Levy, and Century (2019) found that pupils participating in inquiry-based activities exhibited improved understanding and retention of scientific concepts compared to those taught through traditional methods.

Regarding collaborative learning, 53% (189 respondents) agreed to a great extent that it improves pupil engagement in Science. This finding was consistent with Johnson, Johnson, and Smith (2019), who noted that collaborative learning encourages pupil engagement and helps develop communication and teamwork abilities.

Incorporation of technology in Science teaching was reported by 55% (197 respondents), who indicated they often used it, while 45% (159 respondents) never used technology in their classes. These findings were in agreement with Hwang and Tsai (2019), who found that technology-enhanced learning environments improve pupils' motivation and engagement, leading to better academic performance in science subjects. However, some researchers raised concerns about overreliance on technology.

A significant majority, 84% (300 respondents), agreed that project-based learning (PBL) enhanced pupils' understanding of scientific concepts, while 16% (56 respondents) disagreed.

This finding was in agreement with Thomas (2017), who asserted that PBL promotes active learning and helps pupils develop critical thinking and problem-solving skills. Krajcik and Blumenfeld (2006) found that pupils engaged in PBL demonstrated increased motivation and a deeper understanding of scientific concepts.

5.1.2 Discussion of findings on the Impact of Teaching Methods on Pupils' Academic Performance in Science

The study found that 54% (191 respondents) of the teachers always used inquiry-based learning (IBL) in their Science classes. This finding was consistent with Bybee (2014), who argued that IBL promotes critical thinking, problem-solving skills, and a deeper understanding of scientific concepts. Minner, Levy, and Century (2010) found that pupils engaged in IBL showed significant improvements in their understanding and retention of scientific knowledge compared to traditional instructional methods.

Regarding collaborative learning, 53% (189 respondents) rated its impact on pupils' academic performance in Science as very positive. This finding was in agreement with Springer, Stanne, and Donovan (1999), who conducted a meta-analysis indicating that collaborative learning has a positive impact on pupil achievement and attitudes towards Science. Despite its benefits, Slavin (2011) highlighted potential issues such as unequal participation, where dominant pupils might overshadow less confident peers.

The integration of technology-enhanced learning (TEL) was reported by 55% (197 respondents) to a small extent, whereas 45% (159 respondents) used it to a very large extent. These findings were consistent with Hsu, Lai, and Hsu (2015), who demonstrated that TEL could make Science more accessible and engaging through interactive simulations and information resources. Hwang and Tsai (2011) reported that TEL environments significantly boost pupil motivation and engagement, leading to improved academic performance in Science.

The study found that 68% (241 respondents) never used the flipped classroom model in their Science teaching, 18% (65 respondents) rarely used it, and 14% (50 respondents) used it sometimes. These findings were in agreement with Bergmann and Sams (2012), who highlighted that this approach allows for more personalized and interactive learning. Bishop and Verleger

(2013) found that flipped classrooms could enhance pupil engagement and performance in Science education. However, Strayer (2012) noted that the flipped classroom model requires pupils to take more responsibility for their learning outside of class, which can be challenging for some. Lo and Hew (2017) stressed the need for careful planning and support to ensure all pupils benefit from this model.

5.1.3 Discussion of findings on the Strategies to Improve Academic Performance in Science in Upper Primary

The majority, 84% (300 respondents), always incorporated Inquiry-Based Learning (IBL) in their Science teaching as a way of improving performance. This finding was in agreement with Amon (2018), who revealed that the majority of respondents used IBL in their Science teaching as a way of improving performance.

Regarding the enhancement of critical thinking and problem-solving skills through IBL, 54% (191 respondents) believed it to a large extent, whereas 46% (165 respondents) felt it did so to a small extent. This finding was not fully consistent with Bybee (2014), who argued that IBL fosters critical thinking and problem-solving skills, essential for mastering scientific concepts. Minner, Levy, and Century (2010) conducted a meta-analysis showing that pupils engaged in IBL exhibit superior understanding and retention of scientific knowledge compared to traditional methods.

The effectiveness of blended learning in supporting diverse learning styles was found by 68% (241 respondents) to be very effective, 14% (50 respondents) found it effective, and 18% (65 respondents) found it ineffective. This finding was in agreement with Oliver and Trigwell (2015), who noted that blended learning combines traditional classroom instruction with online components, offering flexibility and accessibility. Garrison and Vaughan (2018) reported that blended learning supports diverse learning styles and improves pupil outcomes. Graham (2013) found that blended learning can enhance pupil engagement and achievement in Science education. However, Oliver and Trigwell (2015) pointed out that the success of blended learning depends on the effective integration of online and offline components, which can be challenging.

5.2 Conclusion

In conclusion, the study highlighted significant insights into the methods used in teaching Science in upper primary, the impact of these methods on pupils' academic performance, and strategies to enhance performance. It was evident that inquiry-based learning (IBL) and project-based learning (PBL) were widely utilized and highly valued by educators for their effectiveness in fostering critical thinking and deeper understanding of scientific concepts. The incorporation of technology and blended learning also emerged as important elements, with mixed opinions on their effectiveness and usage. Despite the promising results, challenges such as overreliance on technology and the limited use of certain innovative models like the flipped classroom were noted. Overall, the findings underscore the importance of employing diverse and effective teaching strategies to improve Science education outcomes in upper primary settings.

5.3 Recommendation

Based on the study's findings, the following recommendations were proposed to enhance Science education in upper primary:

Schools should promote the adoption of IBL techniques across all Science classes to foster critical thinking and problem-solving skills among pupils. This can be achieved through targeted teacher training and the development of IBL-focused curricula.

Educators should strive to incorporate technology-enhanced learning tools more frequently to engage pupils and make Science more interactive. Providing additional resources and training on effective technology use can help overcome the current challenges and ensure that technology is used to its full potential.

Schools should encourage the use of PBL in Science education to enhance pupil engagement and understanding. Developing guidelines and support systems for implementing PBL can help teachers integrate this method more effectively into their teaching practices.

Teachers should be encouraged to use collaborative learning techniques to improve pupil engagement and teamwork skills. Professional development programs can provide strategies and best practices for effectively implementing collaborative learning in Science classes.

Schools should consider adopting blended learning models to support diverse learning styles and provide flexible learning opportunities. Ensuring that online and offline components are well-integrated and supported can maximize the benefits of blended learning.

Schools should pilot and evaluate innovative teaching models, such as the flipped classroom, to determine their effectiveness and suitability for improving Science education. Providing support and resources for these models can help address potential challenges and enhance their implementation.

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APPENDIX I: QUESTIONNAIRE TO THE HEADTEACHERS AND TEACHERS.

Dear Sir/Madam,

I am a student of Busitema University pursing a degree in Primary Education .I am conducting a research about the " the impact of science teaching methods on pupils academic performance , a a case study of Pingire sub county, Serere District.. Findings from this research will hereafter be submitted to Busitema University as a partial fulfillment of the award of a degree in Primary Education

The information required is purely for academic purpose and will be treated with strict confidentiality. I therefore request you to spare some of your valuable time to fill this questionnaire.

Thank you.

……………………………

SECTION A: Bio Data of Respondent

Please tick the appropriate response below:-

1. Gender Male ☐ Female ☐

2. Age A. 18-30 ☐ B. 31-40 ☐ C. 41-50 ☐ Above 50 ☐

3. Education qualification (tick the appropriate response)

Level .of education	**Response**
a) Certificate	
b) Graduate	
c) Post Graduate	
d) Others (specify)	

4. How long have you served this organization?

A. Below 5 years ☐ B. 6-10 years ☐ C. 11- 15 years D. Above 15 years ☐

Section B: The methods used in teaching science in in upper primary

1. How often do you use inquiry-based learning (IBL) in your Science classes?
   - Never
   - Rarely
   - Sometimes
   - Often
   - Always
2. To what extent do you agree that collaborative learning improves pupil engagement in Science?
   - Strongly Disagree
   - Disagree
   - Neutral
   - Agree
   - Strongly Agree
3. How frequently do you incorporate technology in your Science teaching?
   - Never
   - Rarely
   - Sometimes
   - Often
   - Always
4. Do you believe that project-based learning (PBL) enhances pupils' understanding of scientific concepts?
   - Strongly Disagree
   - Disagree
   - Neutral
   - Agree
   - Strongly Agree
5. How effective do you find the flipped classroom model in teaching Science?
   - Very Ineffective
   - Ineffective
   - Neutral
   - Effective
   - Very Effective

Section C: The impact of teaching methods on pupil' academic performance in Science

1. How often do you use inquiry-based learning (IBL) to teach Science?
   - Never
   - Rarely
   - Sometimes
   - Often
   - Always
2. How would you rate the impact of collaborative learning on pupils' academic performance in Science?
   - Very Negative
   - Negative
   - Neutral
   - Positive
   - Very Positive
3. To what extent do you integrate technology-enhanced learning (TEL) in your Science lessons?
   - Not at all
   - To a small extent
   - To a moderate extent
   - To a large extent
   - To a very large extent
4. How effective do you find project-based learning (PBL) in improving pupils' academic performance in Science?
   - Very Ineffective
   - Ineffective
   - Neutral
   - Effective
   - Very Effective
5. How frequently do you use the flipped classroom model in your Science teaching?
   - Never
   - Rarely

- Sometimes
- Often
- Always

Section D: Strategies to improve academic performance in Science in upper primary

1. How often do you incorporate Inquiry-Based Learning (IBL) in your Science teaching?

- Never
- Rarely
- Sometimes
- Often
- Always

2. To what extent do you believe IBL enhances pupils' critical thinking and problem-solving skills?

- Not at all
- To a small extent
- To a moderate extent
- To a large extent
- To a very large extent

3. How frequently do you use collaborative learning in your Science classes?

- Never
- Rarely
- Sometimes
- Often
- Always

4. How effective do you find TEL in improving pupils' motivation and engagement in Science?

- Very ineffective
- Ineffective
- Neutral
- Effective
- Very effective

5. How well do you believe TEL environments improve pupils' academic performance in Science?

- Not well at all
- Slightly well
- Moderately well
- Very well
- Extremely well

6. Do you receive adequate training to integrate technology effectively into your Science teaching?

- Never
- Rarely
- Sometimes
- Often
- Always

APPENDIX II: INTERVIEW GUIDE FOR PUPILS

I am a student of Busitema University pursing a degree in Primary Education .I am conducting a research about the " the impact of science teaching methods on pupils academic performance , a a case study of Pingire sub county, Serere District.. Findings from this research will hereafter be submitted to Busitema University as a partial fulfillment of the award of a degree in Primary Education

The information required is purely for academic purpose and will be treated with strict confidentiality. I therefore request you to spare some of your valuable time to fill this questionnaire.

Thank you.

……………………………

Please write the appropriate response below:-

1.Sex……………..

2. Age………………

3.Favorite subject………………….

4.Can you describe a time when you asked questions and explored topics in your science class?

…………………………………………………………………………………………………

………………………………………………………………………………………………..

5.How did that help you understand the subject better?

…………………………………………………………………………………………………

………………………………………………………………………………………………..

6.Do you find it easier to learn when you get to explore and experiment with scientific ideas on your own?

…………………………………………………………………………………………………

………………………………………………………………………………………………..

7.Why or why not?

…………………………………………………………………………………………………

………………………………………………………………………………………………..

8.Have you worked in groups during your science lessons?

……

……………………………………………………………………………………………………..

9.How did working with your classmates help you understand the material?

……

……………………………………………………………………………………………………..

10.What do you think are the benefits and challenges of learning science in a group setting?

……

……………………………………………………………………………………………………..

11.What kinds of digital tools or resources have you used in your science class?

……

……………………………………………………………………………………………………..

12.How do these tools help you learn better?

……

……………………………………………………………………………………………………..

13Do you think using technology makes science lessons more interesting?

……

……………………………………………………………………………………………………..

14.What do you enjoy most about learning science through projects?

……

……………………………………………………………………………………………………..

15bHave you ever watched videos or read materials at home before learning about them in your science class?

……

……………………………………………………………………………………………………..

16.How does this method help you?

…………………………………………………………………………………………………

……………………………………………………………………………………………..

17.How do you feel about doing hands-on activities and discussions in class after learning the basics at home?

…………………………………………………………………………………………………

……………………………………………………………………………………………..

18.Do you prefer when your science teacher gives clear and structured lessons?

…………………………………………………………………………………………………

……………………………………………………………………………………………..

19.How do these lessons help you learn better?

…………………………………………………………………………………………………

……………………………………………………………………………………………..

20.What do you think are the benefits of having a teacher guide you step-by-step through new scientific concepts?

…………………………………………………………………………………………………

……………………………………………………………………………………………..

21.Have you experienced learning science through a combination of online resources and classroom activities?

…………………………………………………………………………………………………

……………………………………………………………………………………………..2

22.How did this approach work for you?

…………………………………………………………………………………………………

……………………………………………………………………………………………..

23.What do you like about having both online and in-person elements in your science lessons?

…………………………………………………………………………………………………

……………………………………………………………………………………………..

24. Which method of learning science do you find most effective and why?

…………………………………………………………………………………………………

………………………………………………………………………………………………..

25. How do different teaching methods help you stay interested and engaged in science **class?**

…………………………………………………………………………………………………

……………………………………………………………………………………………….

END

Thank you very much for your participation

APPENDIX III: WORK PLAN

ACTIVITY	**MONTHS IN 2024**						
	March	**April**	**MAY**	**June**	**July**	**August**	**Sept**
Topic selection and problem identification	■						
Collection of literature	■						
Writing a research proposal		■	■				
Final proposal submission				■			
Data Collection				■			
Data analysis and report writing					■	■	
Submission of research report							■

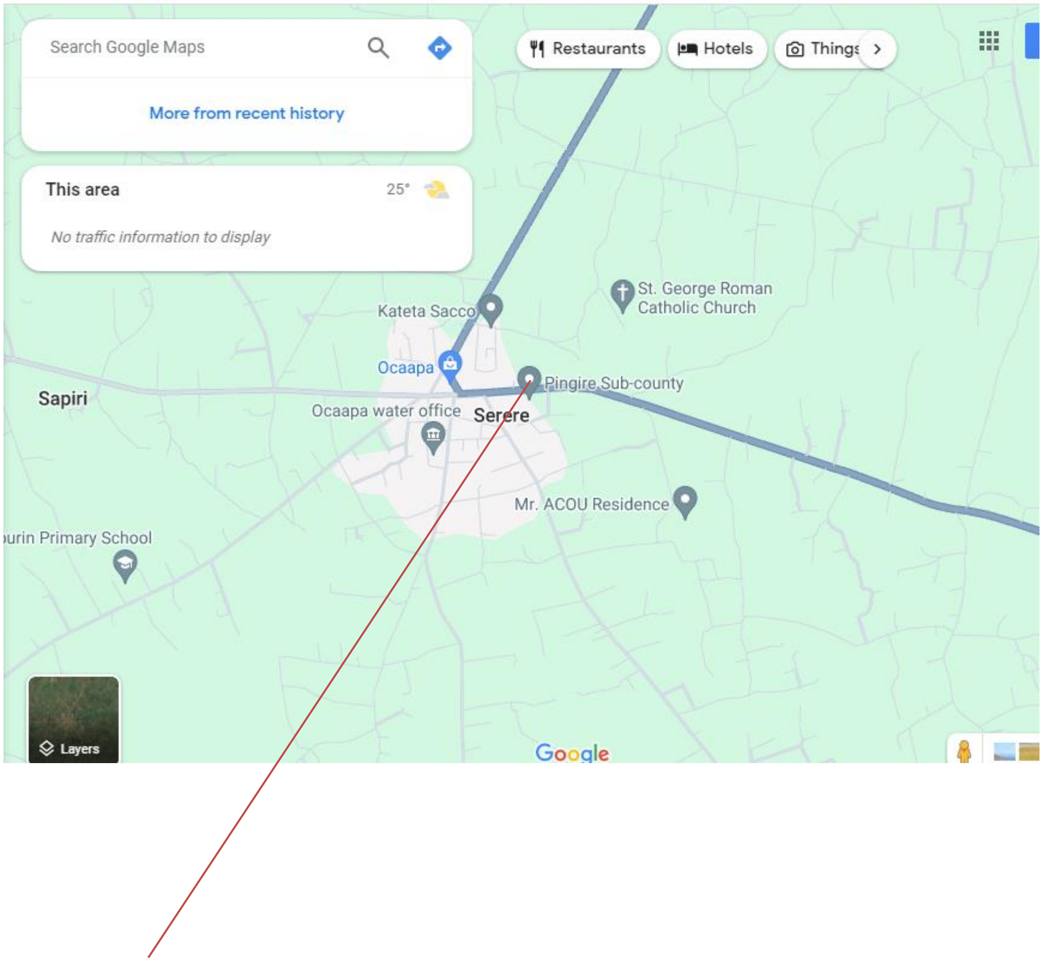
APPENDIX IV: ESTIMATED BUDGET

ITEM	QTY	UNITCOST	AMOUNT
Plain papers	1REAMS	20,000/=	20,000/=
Pens	5PC	500/=	2500/=
Pencils	2PCS	200/=	4000/=
Rubbers	1PCS	500/=	500/=
Printing			50,000
Spiral binding	7pcs	3,000/=	21,000/=
Break fast	4	2,000/=	8,000/=
Lunch	4	5,000/=	20,000/=
Transport			30,000/=
Miscellaneous			20,000/=
			170,000

APPENDIX V: MAP OF UGANDA SHOWING THE LOCATION OF SERERE DISTRICT

Serere District

APPENDIX VI: MAP OF SERERE DISTRICT SHOWING THE LOCATION OF PINGIRE SUB COUNTY



Pingire sub county