FACTORS INFLUENCING STUDENTS' ENROLMENT AND RETENTION IN SCIENCES AT ADVANCED LEVEL IN SECONDARY SCHOOLS IN UGANDA: A CASE OF KABALE MUNICIPALITY SECONDARY SCHOOLS

BY

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DECLARATION

I, Akatuhurira Frank Bindeba, hereby declare that the research entitled, "Factors Influencing Students' Enrolment and Retention in Sciences at Advanced Level in Secondary Schools in Kabale Municipality", is original in nature and has never been submitted to any institution for any award.

Signature   Date

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APPROVAL

This is to certify that the dissertation entitled, "Factors Influencing Students' Enrolment and Retention in Sciences at Advanced Level of Secondary Schools in Kabale Municipality", has been conducted under our supervision and is now ready for submission to the Directorate of Postgraduate Training, with our approval.

Signature Date:

______________________________ ______________________

ASSOC. PROF. DENIS SEKIWU

Supervisor

Signature Date

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DR. ALEX RONALD MWANGU

Supervisor

DEDICATION

This research is dedicated to my wife, Lady Olivia Kemigisha, and my children who missed my care and support during the study period.

May God bless you!

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

ADB	African Development Bank
AMS	Average Mean Score
CVI	Content Validity Index
DQC	Data Quality Control
EFA	Education For All
ERS	Environmental Rating Scale
KESSP	Kenya Education Sector Support Programme
MDGs	Millennium Development Goals
MoES	Ministry of Education and Sports
NGSS	Next Generation Science Standards
NSMT	Non-Science-Math-Technology
NSSME	National Survey of Science and Mathematics Education
NSTA	National Science Teachers' Association
PERS	Physical Environment Rating Scale
PISA	Programme for International Students' Assessment
SAPs	Structural Adjustment Programmes
SASS	Schools And Staffing Survey
SESEMAT	Secondary Science and Mathematics Teachers
SPSS	Statistical Package for Social Sciences
SWAP	Sector Wide Approach Programme
UACE	Uganda Advanced Certificate of Education
UCE	Uganda Certificate of Education
UNEB	Uganda National Examinations Board

ABSTRACT

A correlational study was carried out on the factors influencing students' enrolment and retention in sciences at the advanced level in secondary schools in Kabale Municipality, Uganda. The study adopted both quantitative and qualitative approaches, with questionnaires and interview guides as the primary tools for data collection. The study focused on the physical learning environment, students' attitudes towards sciences, and the quality of science teachers, and how these factors influenced students' enrolment and retention in sciences at the ‘A’ level. The findings of the study indicated that the availability of enough apparatus in the laboratories, a cool temperature to encourage learning, and students' social status defined their attitudes towards sciences. Additionally, inadequate professional training affected science teaching. Based on the study's conclusions, the enrolment and retention of students in sciences at the advanced level of secondary schools in Kabale Municipality were influenced by a conducive physical learning environment, students' attitudes towards sciences, and the quality of science teachers. The study recommends addressing acoustic conditions in classrooms, encouraging a cool temperature for learning, providing government aid to secondary schools for infrastructure development, and employing professional science teachers.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

Science is not only an essential element in society but also an integral part of life due to the innovations demanded by the world. In Uganda, science subjects are highlighted as the main focal areas in schools at the Advanced level of Secondary Education and have a direct relationship with performance at the Ordinary level of Secondary Education. The aim of emphasizing science and technological advancements is a worldwide element as contributory factors towards economic growth and a scientific basis for problem-solving (Balyejjusa, 2015). A science combination involves mainly Chemistry, Biology, Physics, Agriculture, and Mathematics.

During the e-registration at the Advanced level of Secondary Education by the Uganda National Examinations Board (UNEB) manual 2019, the entry registration requirements demanded that candidates with a science combination with Principal Mathematics automatically register for Subsidiary Information Communications Technology alongside compulsory General Paper. Additionally, a candidate had to pass the Uganda Certificate of Education with Divisions 1, 2, 3, and 4 obtained at Uganda Certificate of Education or an equivalent qualification and pursue an Advanced level course of at least 2 years.

The Uganda Education and Sports sector provides education for all, with the mission to support, guide, coordinate, and regulate education activities for all persons for national integration (Education Sector Strategic Plan, 2004). Therefore, a study was carried out to tackle the factors influencing Students' Enrolment and Retention in Sciences at the Advanced Level in secondary schools in Kabale Municipality. This chapter details the background of the study, statement of the problem, justification, purpose of the study, study objectives, scope, and significance of the study.

1.1 Back ground to the Study

The background of the study encompassed historical, theoretical, conceptual, and contextual perspectives, which provided a better understanding of the relevance of the topic at hand, "The Factors Influencing Students' Enrolment and Retention in Sciences at Advanced Level in Secondary Schools in Uganda: A Case of Kabale Municipality".

1.1.1 Historical Perspective

The teaching and learning of scientific knowledge in secondary schools aims to share knowledge with society for sustainable development. Science subjects are crucial as they serve as the foundation for science-based courses taught at universities and tertiary levels. Some of these courses include Engineering, Medicine and Surgery, Environmental Science, Health Sciences, Agriculture, Architecture, and more. These courses emanate from the advanced science subjects taught at the secondary education level, which include Biology, Chemistry, Physics, Agriculture, and Mathematics (Akanbi, 2003).

Enrolment and persistence in higher education institutions in the United States have been key priorities since the 1970s (Morrison & Silverman, 2012). The primary focus was on enhancing enrolment and retention through financing programmes for teaching science subjects to achieve sustainability levels by increasing enrolment. Understanding retention and enrolment of more learners is crucial since it is through sciences that development can be assured (UNESCO, 2013).

Calderon (2012) argues that retention and enrolment issues in sciences outside the US provide contemporary perspectives where participation to guard against controlling the two phenomena to completion, at times become futile despite the provision of all the requirements for learners in institutions of higher learning. In the United States, significant goals for higher education were set to have community colleges strive for 5 million graduates by 2020 (The White House, 2013).

In Latin America, children began learning about colour, energy, growth, living, and non-living things at home. Science at this stage was in the career awareness stage, and learners continue until the primary level. The next stage was the career exploration stage, where learners deepened their knowledge in science learning (Crowley, 2009). At both levels, learners developed an interest in learning and were curious about it. Parents were also eager to enrol their children in science classes. Unfortunately, as students moved to the next level, which was the career orientation stage, students' interest and attention started to change due to many problems (Hackling & Sherriff, 2011). Finally, at the last stage (career specialization), the challenges to the students' learning became pronounced, as interest and enrolment in science classes at all school levels became a national debate (Genç, 2015).

De Voogd (2007) contends that in secondary schools in India, students were meant to pursue science subjects, though they were not initially handled. The students were therefore supposed to be fully oriented to explore their potential (Tytler & Osborn, 2012). The key priority of involving learners in science subjects was to train learners in junior secondary schools that would continue advancing to higher education levels (VanStock et al., 2007). Sciences were included in the syllabus for secondary education levels, but the primary challenge of this programme was low enrolment, which factored among many others (Calderon, 2012).

In Kenya, the significant challenge confronting sciences in secondary schools is the declining student enrolment (Harry, 2011). Enrolment in sciences is poor and reduces year after year, especially in Agriculture, which is not compulsory, unlike other science subjects. Many reasons contribute to this, but research studies indicate that secondary school science enrolment is poor. Akanbi (2003) observed this problem in secondary schools many decades ago. Similarly, Altman (2015) concurred with the fact that science students in secondary schools, particularly female students, were not encouraged.

According to Gucluer and Keserciogh (2012), the proliferation of education was one of the factors affecting sciences in post-primary institutions. Recently, individuals and religious bodies have been in the business of establishing private secondary schools. The proprietors of these schools lowered the admission standards to attract students. There were some secondary schools in Uganda that did not admit weak students for ‘A’ level in science combinations on the pretext that they would not perform better in such science combinations (Fives et al., 2014).

Ovona (2019) contended that Uganda had revitalized efforts to employ Science, Technology, and Innovation (STI) as catalysts of profound economic and social transformations. This was evidenced in the National Development Plan (NDP III 2020/21-2024/25) under program 14 (Innovation, Technology Development, and Transfer). Masinde (2014) asserted that the aim of this programme was to increase development, adoption, transfer, and commercialization of Technologies and Innovations.

Similarly, Uganda's Science, Technology, and Innovation Sector Development Plan 2019/2020-2024/2025 identified a number of challenges, among which were weak STI sector coordination and the need to invest in STI infrastructure (Mwesigwa, 2016). The aim of the sector over the period of the Sector Development Plan was "to strengthen the National Science Technology and Innovation system for Uganda". The main pillars of the innovation system were proposed to be: a) access to business incubation, including access to scientific equipment and qualified technical supervision; b) functional science and technology parks for innovative technological firms; c) skilled human capital; and d) a legal-regulatory environment that fostered innovation (Birungi, 2016).

According to Geithner and Pollastro (2016), poor quality teachers influenced the teaching of science subjects at the post-primary level. The sandwich programme was started to help the in-service teachers who had no time to attend direct universities so as to catch up with other scholars whose time to do so was available (Molenbroek, 2003). Most of these teachers in their sandwich training gained confidence through their resilience to handle sciences, though not to the required standard with regard to the learners' achievement in sciences (Farook et al., 2011). However, the sandwich programme saw good work done, where the enrolment levels were maintained in schools they went to teach in (Bird, 2013).

Given this background on enrolment and retention, it was a yardstick that to base on to see the foundation for science subjects at the advanced level of secondary school education. The variations seen showed a lot about the engagement of students in science subjects, irrespective of other factors that had to cling to the situations prevailing in such schools set to train students in science subjects, especially the girl-child. It is through this noble background that the study was set to establish the effects of student enrolment and retention at the advanced level of education in selected secondary schools in Kabale Municipality.

1.1.2 Theoretical Perspective

This study was guided by constructivism theory by Vygotsky (1978), which states that learning is an active, contextualized process of constructing knowledge rather than acquiring it. The learner brings past experiences and cultural factors to the current situation, which translates into each person having a different interpretation and construction of the knowledge process.

The relevance of Vygotsky’s (1978) theory to the study in question was actually based on the notion that the theory clarified both individual and collaborative, involving experience and uncertainty. It comprised identifying questions and key elements of a matter that had emerged as significant, then taking the teachers' thought into dialogue with himself and with others (Lengkanawati & Sukyadi, 2017; Nurfaidah, 2018).

They evaluated insights gained from that process concerning additional perspectives into science-based initiatives in schools, their own values, experiences, and beliefs, and the larger context within which the questions were raised. Their presence thus incorporated the physical learning environment that influenced retention and enrolment, as well as the sharpening of the attitude of learners towards sciences, all of which were determined by the quality of teachers. Through the theory in context, they reached newfound clarity, on which they based changes in their action or disposition (Klatte, 2010).

To ascertain the relevance further, the study incorporated the following assumptions based on Vygotsky's theory:

1. Physical learning environments should be orderly and enhance specific interests in how individual students relate to one another in a learning situation, emphasizing the importance of activity to learning to make work highly relevant during class attendance in science learning environments (Rovegno & Dolly, 2006).

2. Children's social circle influences their attitude towards learning and enables them to actively engage within learning environments, continuously analysing the reactions of others and modifying their responses as they adopt or reject accepted standards as their own, thereby enhancing students' retention and enrolment in sciences (Korres, 2007).

3. Good quality teachers are more knowledgeable personnel than other professionals because of their prominent constructive role in the learners' development by providing the needed social instruction within the classroom context (Wilson, 2009).

1.1.3 Conceptual Perspective

The study was based on two variables: enrolment and retention of students in secondary schools at the 'A' level. According to Hicks and Tingley (2011), enrolment refers to the total number of registered students for a particular course of study or any course unit at any given institution of learning where services and concepts are offered.

Retention literally describes the act of continued possession, use, or control of something, including students in class, students in school, people in a cooperative society, members of the board of directors, and many more. In a related development, Kadir (2014) mentioned that retention was actually the only way that students in sciences were encompassed for a noble cause to study certain concepts as fully registered members legitimately known by the school of their study.

Enrolment refers to the actual number of students the teacher has in class or school who are fully dedicated to taking up school studies in a given period of the course or courses. Retention of students is simply an indicator of the continuity in the journey with the same number of corporate class students registered to pursue and dedicate time towards fulfilling their ultimate goals and objectives.

1.1.4 Contextual Perspective

Despite the pursuit of sciences in Kabale Municipality, the schools themselves could not afford to provide all the necessary logistical appliances to boost the science sector at ‘A' level across the board without the intervention of beneficial policies. In order to benefit science students, The Government White Paper on Education (1992) was put in place, which highlighted the potential role that science and technology play in enhancing development.

The policy advocated for the waiver of taxes by the business community on the sale of equipment for science laboratories, such as chemicals and other apparatuses used by students pursuing sciences like Physics, Biology, Agriculture, Chemistry and more. The government also embarked on building the necessary infrastructure to absorb large numbers of students pursuing sciences, including building laboratories, expanding more classes, and providing employment opportunities for laboratory technicians and attendants. Quality teachers were employed to teach sciences to masses of students taking science combinations. Secondary schools implementing Universal Secondary Education were given free equipment to use in laboratories to enhance the science subjects, aiming at retaining enrolment levels (Barret & Zhang, 2009).

The performance in science subjects in Kabale Municipality, where the study was conducted, had 116 As and 151 Bs in 2019 (Grapevine News, 2019). This was simply a sample of the performance of the five consecutive years from 2015 up to 2019. The numbers shown in the text indicate the students who scored Principal Pass A and B only. This was an indication that many students did not offer science subjects in Kabale Municipality. Therefore, this contextual background was set to investigate "Factors Influencing Students' Enrollment and

Retention in Sciences at Advanced Level of Education in Uganda, a Case of Kabale Municipality Secondary Schools".

1.2 Problem Statement

Uganda's education system offers both Arts and Sciences in secondary schools. The government policy advocated for the exemption of taxes on the sale of science laboratory equipment like chemicals and other apparatuses used by students pursuing Physics, Biology, Chemistry, and other science subjects (Barret and Zhang, 2009). According to Muzaale (2020), 53% of students attempted to perform well in science subjects, while 47% still struggled with average performance nationwide. The performance in Kabale Municipality was not exceptional, as it stood at 37% in 2019. The number of students enrolling for sciences at A'Level kept decreasing in secondary schools, and those who pursued science subjects did not perform well. Therefore, the researcher investigated the factors that influenced students' enrolment and retention in science subjects at the Advanced Level in Secondary Schools in Kabale Municipality.

1.3 General Objective

The general objective of the study was to examine the factors influencing students' enrolment and retention in sciences at Advanced level in secondary schools of Kabale Municipality.

1.3.1 The Specific Objectives of the Study

The study's specific objectives were as follows:

1. To examine how physical learning environment influences enrolment and retention of students in sciences at 'A' level.
2. To determine how students' attitude towards sciences influences enrolment and retention of students in sciences at 'A' level.
3. To determine how the quality of science teachers influences students in sciences at 'A' level.

1.3.2 Hypotheses

The following hypotheses were adopted to fulfill the demands of this study.

1) There is a significant difference between physical learning environment, enrolment and retention of students in sciences at 'A' level.
2) There is a significant difference between students' attitude towards sciences, their enrolment and retention in sciences at 'A' level.

3) There is a significant difference between the quality of science teachers, students' enrolment and retention in sciences at 'A' level.

1.4 Scope of the Study

The study was based on the geographical, content and time scope respectively to harness quality of its own. The details pertinent to each stance of the varieties of scope were indicated as per the subsequent sub headings.

1.4.1 Geographical Scope

The study was conducted in Kabale Municipality, which is located in the South-Western part of Uganda, approximately 420 km (260 miles) by road south-west of Kampala, Uganda's capital and largest city. The town sits at an elevation of 6,600 feet above sea level, with coordinates of 01°15'00"S, 29°59'24"E (latitude: -1.2500, longitude: 29.9900). The study was carried out in all seven secondary schools in the area, including private and government-aided institutions. Kabale Municipality was selected for investigation due to its accessibility in terms of transport costs, feeding, and other amenities. The area is composed of three divisions: Northern, Southern, and Central, with each division having four wards, resulting in a total of twelve wards. The municipality is further subdivided into seventy-four villages, with several informal settlements spanning across all divisions. These informal settlements include Katojo, Rwakalaba B, and Kakabano in the Northern Division, Kabahangara and Kirigime in the Southern Division, while the Central Division has the largest number of informal settlements, including Konyo, Kigongi A, Kigongi B, Rwakaraba A, Rutenga, and Nyakahita.

1.4.2 Content Scope

The study titled "Examining the Factors Influencing Students' Enrolment and Retention in Sciences at Advanced Level of Secondary Schools in Uganda: A case of Kabale Municipality" focused on three main areas: the physical learning environment, students' attitudes towards science, and the quality of science teachers. The aim was to investigate how these factors influenced the enrolment and retention of students in science subjects at 'A' level in Kabale Municipality's secondary schools.

1.4.3 Time Scope

The study focused on the years from 2015 to 2019 to analyse the enrolment levels of science subjects at Advanced Level of Secondary Education in Kabale Municipality. This period was chosen to examine the trends in retention and enrolment over time and to provide a strong foundation for the study's conclusions. The researcher found this period sufficient to gather the necessary information, as academic performance data was readily available for this timeframe.

1.5 Study Significance

The study would help the Ministry of Education and Sports in their bid to harmonize inspection programmes, under which the teaching of sciences at an advanced level in secondary schools would be key. This would enable teachers to receive recommendations from Ministry officials on acquiring the required laboratory equipment and instituting ultimate allowances for extra work done on science students.

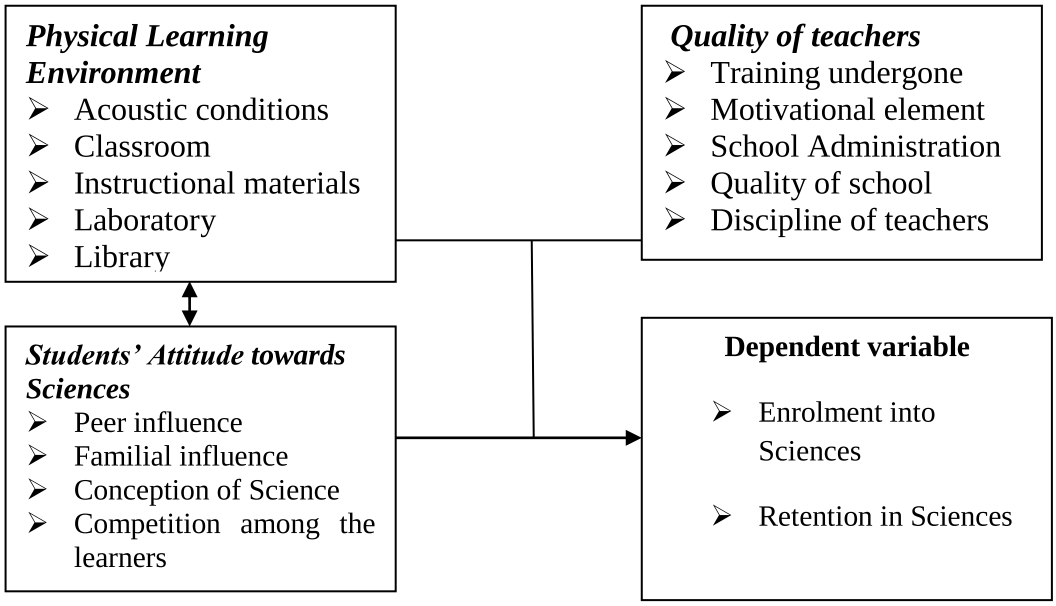
The findings and recommendations of this study would help secondary schools learn how to solicit bigger numbers of students advocating for sciences, rather than other subjects, enrolling at Form Five. This would give impetus to bargain with government officials for more classroom blocks and laboratory equipment to uplift academic standards and improve the physical learning environment of students and teachers, aiming for quality teaching and learning.

The findings and recommendations of this study would assist students by providing dedicated teachers who diligently observe any ill-feeling that may disrupt the science study programme in schools, adding value to their career and determining their quality there and then.

Research students would be helped by the findings of this study as they get to know the factors responsible for influencing the enrolment and retention of students in sciences. This would enable them to devise means of retaining students in their science class for future positive outcomes.

1.6 Conceptual Framework

The illustration below shows the conceptual framework for the factors influencing the students' enrolment and retention in sciences at Advanced level in secondary schools in Kabale Municipality with reference to the study objectives and the subsequent operational variables. The details are presented beneath the illustration in Fig.1.1.



Adopted from O'Leary, 2014

Fig 1.1: Conceptual Framework for Factors Affecting Students' Enrolment and Retention in Sciences.

The study's conceptual framework was a synthesis of ideas that formed a basis for understanding the problem. The foundation of the study was based on the constructivist theory, which explains how learning occurs. However, studies by Kolb (2014) and Knowles et al. (2005) criticized the theory for not curbing the conceptualization effect of facts acquired during teaching and learning processes. This resulted in learners losing interest in science subjects taught at the Advanced level of education. Vygotsky (1978) countered this by arguing that the theory focuses on social interaction that plays a fundamental role in the process of cognitive development, which fosters the study of sciences.

The factors affecting students' retention in science were the physical learning environment, including acoustic conditions, classroom, instructional materials, laboratory, and library. These factors combined affected enrolment and retention in science, in agreement with Matheson, Clark, Martin et al. (2010), who argued that poor physical learning environments negatively affected student learning and achievement. Learners with hearing impairments or other additional learning needs were particularly at risk of the negative effects of poor school acoustics. Therefore, a calm learning environment with the availability of classroom, instructional materials, laboratory, and libraries was necessary to help learners take advantage of learning.

Students' attitudes toward science were another independent variable that described peer influence, familial influence, conception of science, and competition among learners. These operational variables directly or indirectly affected both the retention and enrolment of science students. This coincides with Osborn, Simon, and Collins (2003) and Tytler and Osborn (2012) who argued that building and sustaining students' attitudes toward science was a consistent goal in science education and a topic of significant research. Attitudes were an important aspect of students' persistence in school science and interest in pursuing science careers. Students' attitudes toward science generally declined over the middle and high school years (George, 2000; Potvin & Hasni, 2014). Therefore, finding ways to support middle-school students' attitudes toward science could help contribute to efforts to teach and retain students in school science.

The quality of teachers was defined as the training they received, their motivational element, school administration, quality of school, and teacher discipline. It was hypothesized that these factors in combination would affect the standards of the school in terms of retention and enrolment of students in science. All of these factors influenced the state of the teachers, which affected their readiness to teach the students in class. For example, if teachers were inadequately motivated, they would not teach well, which would lead to a high rate of student dropouts. Conversely, the training undergone by teachers let them persist with the school and teaching conditions. School administration also played a role in maintaining or relaxing teacher quality, as well as teachers' discipline during and after teaching (Boyd & Landoford, 2008).

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter presents the viewpoints of educationists related to the topic of "Examining the Factors Influencing Students' Enrolment and Retention in Sciences at Advanced Level of public Secondary Schools in Kabale Municipality". Their contributions are in line with the study objectives and are presented in chronological order. First, the chapter examines how the physical learning environment affects the enrolment and retention of students. Second, it explores how students' attitudes towards sciences impact their enrolment and retention. Finally, the chapter investigates how the quality of science teachers affects the enrolment and retention of students in sciences at the advanced level.

2.1 Physical Learning Environment and Enrolment and Retention of Students into Sciences

According to Bautista and Borges (2013), the secondary school concept includes an administration centre, classrooms, halls, libraries, laboratories, workshops, canteens, car parks, staff quarters, and sanitation facilities. The class size should be limited to 40 students from form five to six, and the facilities should be co-educational with an equal number of boys and girls. A circulation space of 6 m^2 per student and playfields should also be provided. The required area for a single stream is 3.4 hectares. The spatial requirements for a double and triple stream are 3.5 and 4.5 hectares, respectively. When agriculture is taught, an additional 10% of the above minimum area should be added.

The dimensions captured in the citation are appropriate to enhance the physical learning environment that promotes both retention and enrolment of students into sciences at 'A' level. The adequacy of libraries, laboratories, and other equipment should be provided to enhance good performance. However, students should utilize the facilities sustainably so that others can also use them in the future.

Griffin (2006) points out that the acoustic conditions in the classroom do not meet the needs of listeners, implying a negative impact on the perception of science students and on the space and its occupants as well as their social relationships, which increase the level of stress and arousal that flows into aggressive behaviour among students. This behaviour limits the number of scholars in science class. On the effects of sound as a factor in designing the environment, there is a look at music in the nearby community of science students' class.

However, the proper use of background music on behaviour and the work done in class has promoted cooperative behaviour and encouraged good humour (Hallam, 2002).

To observe a good physical learning environment, it is imperative to have a calm place where learning takes place, as noisy places inhibit the conceptualization process. Sciences need at least calm places of learning, as the students require thinking hard about what is being taught. Thus, it is important to observe silent places if sciences are to retain their learners' enrolments. However, silence is not a solution to good learning since brains will be idle in some instances, leading to reduced reasoning in some students. So, some students will need noisy places to stimulate their mental faculties. In the same view, dosing will be revoked from students while in a noisy place as the physical learning environment should enable them to grasp concepts and build their capability to understand what is taught to them.

To understand the space as an environment, it is necessary to understand the relationships between humans and the environment in which they participate, as well as the ability to project them into it. The learning environment becomes swap space, stimulating and thoughtful, both for learners and for teachers (Atman, 2015). A learning space is always generated and organized by an educational agent for one or more students. This educational agent intentionally plans a set of activities, actions, and forms of intervention aimed at achieving the objective of learning by students. Definitely, education is the generic agent to designate "who heads the educational activity," and trainees are "those who learn and develop." The educational agent is not always a teacher, and learners are not always children from a school (Clabaugh, 2000).

Küller and Wetterberg (2013) mention that a part of the learning environment is based on sensory stimulation. Therefore, they have played with lighting and color variations of the surface materials in the classroom to stimulate the senses of science students. In addition, one of the fundamental objectives of lighting is to provide visual support. Therefore, it is necessary to strike a balance between natural and artificial lighting. Prolonged exposure to artificial light increases the excitation of the nervous system, causing stress in students and leading to irritability. Through changes in lighting, improvements can be made in various areas related to the students within the learning space. Among these are interpersonal relationships, where adequate lighting helps improve social relations by providing a clear vision, both of oneself and of others, so that students can communicate and cooperate properly (Juslén & Tenner, 2005).

In their critique, the researchers find that a good physical learning environment should incorporate adequate lighting to help students learn better. They should be able to clearly see what is written on the chalkboard or observe the apparatus in the laboratory. Lighting helps other senses of the students to master and grasp concepts well. However, where lighting is inadequate, students are likely to leave the science class for arts where there is adequate light and observation of other physical learning environment factors or attributes.

Molenbroek (2003) comments that the arrangement of furniture also conditions behaviour. However, despite the number of hours spent presenting the different components of classroom furniture such as chairs, in addition to the postural habits acquired with their use, there has not been enough time dedicated to them in the field of research. Furniture can promote various social gatherings. Since the arrangement of the teacher-centred classroom that seeks control of students and promotes individualistic behaviour was put in place, there have not been layouts designed to promote cooperation among students. The main function of furniture is to support students during classroom activities. Therefore, many of the designs of active learning conceive the teacher's desk as mobile and placed in the centre, while the tables of students are designed precisely to achieve positive social behaviours of interaction and cooperation with round, rectangular, or octagonal shapes (Painter, Senkosi, and Balyejjusa, 2012).

The critique here is that in order to observe the physical learning environment, teachers need to foster classroom control. This encourages real learning and students are encouraged to observe a proper sitting posture that is key to learning because cognitive development works better when sitting upright is enhanced. Thus, students will be retained, and enrolment levels will be realized. However, it is imperative to note that classroom control disturbs students' ability to share ideas with their peers in the same classroom, who may be useful in providing them with other learning experiences. Thus, teachers need to shape their classes well to allow physical students' interaction to advance understanding of the entire class in what is being taught.

Moraes and Ismail (2007) contend that another environmental factor is temperature, which is connected with ventilation. Thermal comfort is achieved by maintaining the temperature in response to the movement of air and moisture (Anderson, Deuser, & DeNeve, 2015). High temperatures alter well-being, social relationships, and performance. In turn, physiological changes that cause irritability, fatigue, and confusion also occur. However, when temperatures are low, the physiological effects represent a major distraction in students and also a heightened state of alert, increasing the levels of nerve activity and therefore preparing the mind for action. Moreover, exposure to poor air quality is related to a decrease in attendance by the students and the existence of passive social behaviour (Cheryan & Marzano, 2014).

The observation, as per researchers' critique, is that sciences, like other subjects, require well-ventilated rooms and learning places. Where the temperature is not regulated accordingly, students find it rough because they end up dozing in class and may not be able to grasp what is taught. Thus, there is a need to regulate temperatures during the learning processes to ensure retention and enrolment rates are maintained in sciences in schools that encourage them. However, in some cold weather, there is no need for temperature regulation because students find themselves shivering, which is a predicament for their stable learning.

The physical learning environment should entail efforts to build excellent facilities in educational institutions to enable science students' enrolment and retention. It should contain ergonomically designed buildings with centrally located courtyards. Landscaped gardens where science students can interact with nature are provided (Cheryan, 2014). The facilities should also include alternative and environmentally clean power resources to provide a number of lighting and heating options. Well-ventilated and cheerfully coloured classrooms accommodate the learning activities related to sciences. The school must have playgrounds and indoor sporting facilities to facilitate the fitness of the learners, which stimulates the brain to think rationally (Altman, 2015).

It is prudent to have a number of facilities to develop the academic field, and the promotion of students should also be tackled. In addition to science laboratories and good lighting systems in classes and other places in the learning environment of students, there is a need for playgrounds, for example, to enable students to become physically fit. Learning without playing is detrimental to students' health. Therefore, the school should provide everything that stimulates students' thinking to perform well in science subjects and keep them interested in the subjects as well. In disagreement with this, some students may develop a habit of playing instead of concentrating on education to master certain issues to make them useful in the future.

2.2 Students' Attitude towards Sciences and Enrolment and Retention in Sciences

According to McCall, Evahn, & Kratzer (2012), many learners who perform poorly tend to exhibit problems with learning and school personnel, and they display hostility toward learning (Mandel & Marcus, 2018). Positive attitudes toward school are not only important for preventing adverse events such as dropping out of school but are also positively associated with good performance. Learners must acquire the right types of attitudes toward learning and other people to improve their performance (Gottfredson, 2009).

To develop positive attitudes toward science, school administrators should demonstrate the advantages of studying science during school assemblies and invite key speakers to talk to students about the subject. This encourages students to pursue their dreams by looking at successful people who have studied science. However, some invited speakers sometimes mislead students by telling them about the impossibilities of life, which can discourage them as they already feel that science is hard. Thus, speakers need to be restricted in what they say to which group.

According to Waters and Marzano (2006), several factors affect the enrolment and retention of students in science subjects, which can lower the quality of performance. These factors include learners' attitudes toward teachers, the socioeconomic status of learners, the educational background of parents, types of schools, poor teaching methods, lack of instructional materials, lack of functional laboratories, poor students' morale, and lack of qualified teachers. These factors are grouped into student factors, family factors, school factors, and peer factors (Crosnoe, Johnson & Elder, 2004). This section, however, is concerned with learners' attitudes toward learning, whose empirical data are scarce in relation to performance, especially in the Ugandan context (Nkonge, 2010).

It is believed that the attitudes of teachers in science, parents, and students themselves contribute a lot toward liking science at the secondary school, especially at 'A' level. It is abnormal that some parents have never encouraged their children to study science at all because of their educational background. They feel they have nothing to tell their children regarding their education, which is an embarrassment and does not encourage their children to learn science. Some teachers who did not excel in science at 'A' level also put students down in terms of advice, which calls for relaxation of their courage. This lowers enrolment and retention in science subjects, which is unfortunate. However, it should be done in such a way that the attitude of students is uplifted by their parents as it is pronounced; but in instances where the parents' educational background is not realized, encouraging their children becomes rather futile.

Barret and Zhang (2009) comment that in 2005, the Government of Uganda made science subjects compulsory for secondary school students at 'O' level and preferentially funded University students taking science courses. This new policy made science subjects compulsory for all secondary school students, and almost 75% of science students received the majority of government scholarships to universities and other tertiary education institutions. It was made that way to entice students to join science combinations at 'A' level as their attitudes had already been positive. Nevertheless, the number of students taking science-related subjects in Uganda at 'A' level and universities and colleges is low. In fact, the number of students taking science-related subjects in universities is too small, representing only 22%. If this general trend is not changed, Uganda may not attain Vision 2030, as it will lack the critical mass of people needed to manage the society envisaged in that dream. Some of the reasons for this trend lie in the students' attitude toward science (Uganda National Academy of Sciences, 2010).

Despite sciences being made compulsory at Ordinary level, students do not have the attitude to pursue them at 'A' level because they have no one to give them courage. Another thing is that those who take them at 'A' level find it rough at University level when they fail to get well paying jobs. The regrets they develop put them at a level that they even discourage other students who are their brothers and sisters never to pursue sciences. It is a matter of fact that the students, after successfully taking sciences, are in a position to create their own jobs rather than look for poorly-paying government jobs.

McEneaney and Radeloff (2000) comment that typically, students enrol in science combinations at Uganda Advanced Certificate of Education (UACE) to meet a science requirement set by the school or institution. Despite the compromised attitude developed, research shows that those students who finally decide to pursue sciences end up convincing others to follow their trend. This increases the enrolment levels as well as the retention component. For this reason, therefore, three-quarters of the students find themselves raising their hands when asked on the first day of class to meet a science requirement, and about 80% of the students enrolled in different streams ignore Non-Science-Math-Technology (NSMT). Specifically, gender is one of the most studied variables in attitude toward learning science, and it has been shown in many studies that male students tend to have a more positive attitude toward science than female students.

Despite the fact that students of science subject combinations convince others to pursue sciences, it is found that a good number of students, after being convinced, meet hardships in following what is taught by teachers because at times their capacity to take them becomes unrealistic. This causes an imbalance in both enrolment and students' retention in science classes at school, and hence, such students may end up visiting arts classes. However, schools should not force attitudes to work; instead, they should talk to students generally so that whoever wants to take the sciences does so. This is a self-esteem venture developed among students to pursue sciences.

Schneider and Coleman (2013) comment that the attitude survey conducted by expert researchers consisting of a pre-test (26 questions) and a post-test (31 questions) had the post-test phenomenon that included five additional questions on peer and familial influences, which shows that the ability of a student to cope with the different demands of post-secondary science classes may factor into their attitude toward science, and this ability to cope may have developed in high school. For this reason, a question was added on the post-test asking how many science classes the respondent took during high school. The results indicated that most of the students dropped sciences at high school due to negatively-based notions (Farooq, Chaundhry & Berhanu, 2011).

It is imperative to develop a positive attitude regarding studying sciences, even if one did not take sciences during their high school time. Parents can teach their children better based on their learning experience, especially when they were tortured by employment they got that was not science-based. This should be an eye-opener to guide their children so that they do not fall into the trap that they saw. However, this does not mean that if parents met hardships, their children would also meet them. The days of long ago are not associated with the current trends of education and employment. Students may succeed and get jobs related to sciences they study at 'A' level today. Therefore, the attitude should be directed towards science the manipulation of science subjects.

The attitude towards sciences at the Uganda Advanced Certificate of Education level, according to Steinberg and Brown (2016), is a combination of various factors such as self-image, peer influence, parental influence, and classroom environment. Attitudes are developed over time and tend to change based on cognitive states. This highlights the importance of assessing attitudes in the science classroom, particularly when there is a desire for improvement and an established teaching style. The most convenient way to assess attitude change is through pre/post-tests, where a survey is administered at the beginning and end of the instruction period (Considine & Zappala, 2002).

The researcher emphasizes the importance of students being able to pass tests for subject combinations before selecting their options. It is observed that some students have positive attitudes towards pursuing sciences, despite not having the necessary skills to excel in these subjects. However, students should not give up on science based solely on their poor attitude, as perseverance can help overcome the difficulties associated with science education, and things may change in the future.

Kyoshaba (2009) states that the Ugandan government has implemented several initiatives to promote science education including: the construction and rehabilitation of science laboratories; the provision of science textbooks and resource materials; and, in-service training for science teachers. The government has constructed over 54 laboratories in secondary schools under the African Development Bank III (ADB) support and has built 405 multi-purpose rooms with the support of the World Bank. Additionally, the Secondary Science and Mathematics Teacher programme (SESEMAT) has trained over 4,287 science and mathematics teachers all aimed at improving students' attitudes towards studying sciences. The Ministry of Education and Sports has also provided at least 5,000 science kits to 1,341 schools across the country to enhance science teaching.

The researcher's observation focuses on the science teachers' ability to teach sciences and the schools' capacity to accommodate a large number of science students. Students' attitudes towards sciences depend entirely on the effectiveness of science teachers. If teachers lack experience in teaching sciences, students may find it difficult to concentrate, leading to negative attitudes towards science. However, all teachers are trained in the same institutions nationwide, and the distinction between them is derived from the welfare provided to them in the different schools where they teach. Encouraging and supporting well-paid science teachers can contribute to creating a positive attitude towards science education among students.

2.3 Science Teachers' Quality and Students' Enrolment and Retention in Sciences

According to Hill and Stearns (2015), a recent analysis of representative national data compared science teachers' fields of qualification with the fields they are assigned to teach. This analysis, together with other analyses of state-level data, shows that some teachers are teaching outside their fields, while others are fully qualified to teach in secondary schools. At the high school level, about one-fifth to one-quarter of teachers assigned to teach Biology are not qualified for this subject. The fraction of high school teachers not qualified in their subjects rises to 30-40 per cent in chemistry and from 40 to more than 50 per cent in physics (Bird, 2013).

The researcher's observation is significant in the field of qualification, and they have the opinion that it is detrimental to allow unqualified staff to handle children in secondary schools, especially at 'A' level that determines the course to be pursued after that level. The researcher agrees with the fact that some schools employ unqualified persons to teach candidate classes. This is exemplified in major schools that call back students who excel at UACE to help candidates when actually they are still on vacation. However, irrespective of low skills and experience, some students treasure them much more than qualified teachers. They get a lot from them since they take students as their brothers and sisters, which is not common in qualified teachers. Therefore, qualifications are mere papers acquired from universities and other institutions of learning.

The role of human factors can be associated with the observation that the perceptions of teachers teaching physics raise students' performance, but lack adequate professional training, as a major problem militating against the effective use of local resources for science teaching. In case of adverse effects perpetrated by such a strategy or method, then it is evident that enrolment lowers as students advocate for other subject combinations available (Bird, 2013).

Enrolment and retention are two things that should be maintained in sciences. These can only be done when there is a tendency of having qualified teachers for the subjects taught at 'A' level for students in preparation for fine-tuning future scientists. It is not good to let students learn in doubt because at times they are aware that they are being handled by persons not qualified to do so. Therefore, the school administration should ensure that they employ only qualified personnel to handle not only science students but also other subjects. Thus, that is why the Education Service Commission advertises for teaching vacancies, holds interviews for the applicants so that only qualified persons are employed to steer the teaching career in the secondary schools.

An emerging body of research suggests that highly qualified teachers and those with certification in school subjects positively affect student learning. Mathematics teachers who had standard state certification had a statistically significant positive impact on student test scores relative to teachers who either held private school certification or were uncertified in their subject area. This boosted the students' enrolment levels and retention to greater heights. Student achievement gains as measured by different sciences and mathematics tests over a 6-year period found that qualified teachers (including those recruited through Teach for America) consistently produced stronger student achievement gains relative to unqualified teachers (Goldhaber & Brewer, 2000).

The researcher agrees with the statement of certification of teachers in Uganda, vis-a-vis being allowed to teach in secondary school and elsewhere in other levels of teaching. Uganda has managed to do this by asking teachers already in the profession and those advocating to join teaching to have certification of their documents before they do electronic registration. This shows teachers who are qualified to teach not only sciences but also other subjects. For this matter, therefore, only qualified teachers are allowed to teach.

Awang et al. (2013) comment that because of complicated conditions in the teaching profession, encouraging teachers to stay in the profession is ongoing due to attrition that is rampant. Some good teachers feel they should look for other professions that do not have stringent conditions like teaching. Some are well aligned with school policies on teaching and learning, curriculum and assessment, and teacher evaluation. The data and research on teacher attrition suggest that the level of experience in science is the lowest in schools that most need teachers with deep expertise in teaching science to diverse students in challenging circumstances (Aikman & Unterhalter, 2005).

The data also suggest that many science teachers are not staying in the profession long enough to develop expertise in science teaching, a situation that requires rethinking how to support early-career teachers so that they develop as much expertise as possible, as quickly as possible. Not only will this benefit students, but if some teachers leave the profession because they feel unprepared, increasing their ability may also stem some of the observed attrition (Adesokan, 2002).

The researchers critique the teaching profession in regard to qualification, stands on the principle that the government's failure to pay well the teachers of good quality qualification has created avenues for them to go elsewhere to look for greener pastures that they regard as salient for development. This has created a vacuum in the country's secondary schools, leaving unqualified or less qualified teachers to do the job. However, if payment becomes more generous, there will be a likelihood of teachers opening shops and even dodging classes as they look after their businesses. The quality of teachers is still a mystery phenomenon to most of the populace countrywide.

Banilower (2013) contends that nearly a half of all high school and middle school science teachers should have more than 10 years of science teaching experience to show quality teaching. As is the case with teachers generally, however, schools with greater proportions of students who are eligible for free and reduced-price lunches are less likely than schools with fewer poor students to have an experienced science teacher. In schools in the highest poverty quartile, 45 per cent of science teachers have 5 or fewer years of science teaching experience, compared with just 25 per cent of those in the lowest poverty quartile.

The researcher looks at teaching experience and teacher quality as different phenomena that do not qualify someone to be of quality. Actually, sometimes teachers with no experience, even of one year, have proven to work better than those with vast experience. The answer here is clear: more experienced teachers do not concentrate on one school. They keep on visiting many schools for part-time teaching and end up serving no interest for an individual school. However, newly recruited teachers sometimes concentrate on their newly acquired job leading to the delivery of quality service based on the notion. However, skills in teacher education are vital. Despite the fact that one can teach well, at times there is a requirement for professionalism in guidance upon certain issues in educational scenarios. Thus, quality teachers help a lot, and it is the only way to advance the education sector.

Chech (2012) opines that currently, many states are adopting the Next Generation Science Standards (NGSS) or revising their own state standards to reflect the NGSS. For students and schools, the implementation of science standards rests with teachers. For those teachers, an evolving understanding of how best to teach science represents a significant transition in the way science is taught in most classrooms. It will require most science teachers to change how they teach, which will lead to an elevation in enrolment and retention levels because students gain confidence in teachers due to their expertise. This change requires learning opportunities for teachers that reinforce and expand their knowledge of major ideas and concepts in science, their familiarity with a range of instructional strategies, and the skills to implement those strategies in the classroom. Providing these kinds of learning opportunities, in turn, requires profound changes to current approaches to supporting teachers' learning across their careers, from initial training to continuing professional development (Considire & Zappala, 2002).

With changes in the teaching career, teachers who adjust to changes in terms of strategies, approaches, and other viable methods let the enrolment of students, as well as their retention, prevail. Old teaching methods that are traditional in nature no longer apply, but rather modern methods of teaching that encompass student-centred approaches and practical experience are relevant to learning and mastery of the content as well as concepts in sciences. Therefore, qualified teachers are ready to handle that very well, leading to performance advancement across secondary schools that advocate for sciences. However, though teachers may be qualified, they need some refresher courses to replenish their teaching methods and other techniques for the better in regard to pursuing sciences.

Lankford, Loeb & Wyckoff (2002) opine that even when teachers have completed one course in a topic, they are underprepared for teaching to the new standards reflected in the Framework and NGSS. These data do not reveal whether science teachers have deep knowledge of or experience with the core concepts of a science field and its scientific practices. Although most high school science teachers have completed a science major, fewer than half of middle school science teachers and only 5 per cent of elementary science teachers have done so. Elementary and middle school teachers without science majors likely have had limited opportunities to engage in scientific investigations and thus are unprepared to engage their students in science practices in ways that build conceptual understanding. However, even high school teachers who have majored in science are unlikely to have experienced authentic investigations that were closely integrated with core science ideas and crosscutting concepts as envisioned in the NGSS (National Research Council, 2012).

It is observed that only prepared teachers should be allowed to teach sciences at ‘A’ level. It is a big shame for students to be taught by someone who has, for example, only one or two years at the university, though in a teaching professional course. Such staff are not skilled and cannot understand the dynamics in the education sector. However, most schools use such teachers, especially those who come for school practice. Such teacher-students should be closely monitored by an experienced teacher and administration. Short of that, the retention of students in science classes may be jeopardized somewhat.

The teacher is the facilitator who is to impart concepts expected to be learned by the students. Research studies reveal that most teachers teaching Physics are ignorant of the curriculum content of the subject because they forget to consult their schemes of work extracted from the syllabus and curriculum-based books. The students taught by these rather incompetent teachers would be invariably shallow in Physics concepts and principles. Thus, looking for suitable methods would be helpful, not only in physics but also in other science subjects (Nwagbo, 2015).

The qualifications that teachers have sometimes deceive them into thinking that they can teach without any point of reference. Sciences are factual and should not be assumed, as learning is taking place. When teachers teach using only their expertise, the enrolment and retention of students in science classes can be compromised and eventually reduced. The teachers find themselves ignorant of what they teach and may end up teaching outside of the curriculum, which does not match the standards of the Uganda National Examinations Board (UNEB). This is dangerous because by the time students sit for examinations, they may get frustrated when they realize that what they learned in class does not align with the exam's content.

However, when teachers use their expertise correctly, students may master the content very well and base their understanding on experience, which is helpful in certain situations. Expressing knowledge and understanding towards the provision of certain services is alright.

In conclusion, all three objectives embedded in the literature review have been fully tackled. The third objective, which is teachers' quality in regard to enhancing students' enrolment and retention levels in sciences at ‘A’ level, is seen in the forefront at the expense of the other objectives because it has straightforward viewpoints. The critiques generated are more positive and clear than in the other two objectives. However, objective one is more elaborative in the sense that students require a conducive physical learning environment to capture their requirements. It is also observed in the second objective that the learners' attitudes depend on the views of the first and third objectives.

Conversely, the researcher observed that if all the facts mentioned were positively met, there would be nothing to stop the pursuit of sciences at ‘A’ level with flying colours.

2.4 Research Gap

The teaching of sciences at the advanced secondary school level of education has faced numerous challenges over time. The gaps in the literature review are evident in terms of methodology, content, and theoretical tendencies.

In previous research, the methodological perspective was found to have gaps as the designs adopted did not comply with the enrolment and retention levels of science students, which did not meet the requirements. Other studies conducted on the enrolment and retention of science students in post-secondary institutions failed to capture the involvement of teachers but focused on other stakeholders, which could have had a significant impact on the results.

The projected analysis did not use the latest data from other studies, and the observation of the relationships was not articulated, leading to bias in the data treatment. Furthermore, the content of previous studies did not meet the required standards as they lacked critiques from researchers, which resulted in a loss of value and made the content unreliable and untrustworthy.

Some studies deviated from their objectives and did not meet them, leading to a need to ensure the proper flow of content following the set objectives.

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes how the study was carried out; that is, how the data was collected and analysed. Therefore, it presents the research design, study population, sample size, sampling procedure, data collection methods and procedures, and data management for data analysis and processing as core phenomena to drive the forces behind the chapter in context.

3.1 Research Design

According to Bhandari (2022), Correlational research design investigates relationships between variables without the researcher controlling or manipulating any of them. A correlation reflects the strength and/or direction of the relationship between two (or more) variables. The direction of a correlation can be either positive or negative. Therefore, the study adopted a correlational design that was considered alongside quantitative and qualitative paradigms. The quantitative approach was adopted to enhance mathematical representations for empirical phenomena. These mathematical representations formed the relationships between a set of variables. Correlational design helped in data collection through designed tools such as questionnaires that allowed for comparisons of the findings collected to make meaningful deliberations.

Correlational design was adopted for this research because it allowed for the investigation of naturally occurring variables that were unethical or impractical to test experimentally. It was also used to examine how variables related to one another. It also tended to understand a particular social condition/pattern and meaning of a social experience, especially in a qualitative study (Kothari, 2004). This design was guided by constructivism theory, in which learning was presumed to be an active, contextualized process of constructing knowledge rather than acquiring it, where the learner brought past experiences and cultural factors to the current situation that translated into each person having a different interpretation and construction of the knowledge process. Thus, the tools for data collection were designed to harness the contents of the theory that were key to the study.

3.2 Study Area

The study took place in Kabale Municipality, which is located in the southwestern part of Uganda, approximately 420 km (260 miles) from Kampala, Uganda's capital and largest city. The study was conducted in all seven secondary schools in the area. Kabale Municipality was selected for investigation because it was easily accessible to the researcher, who was familiar with the respondents and could obtain information from them easily.

3.3 Study Population

According to Creswell (2008), the study population is the number of people in a particular area where the research is conducted. It refers to a group of people with specific characteristics. In statistics, a population is a group of individuals, as well as other characteristics such as height, weight, haemoglobin levels, events, and outcomes, provided that the population is clearly defined with specific inclusion and exclusion criteria (Kothari, 2004).

McGregor and Kearton (2010) argue that in epidemiological research, the term "population" does not always correspond to its demographic meaning of an entire group of people living within a specific geographic or political boundary. Instead, it includes groups of people defined in many different ways, such as coal mine workers in Dhanbad, children exposed to German measles during intrauterine life, or pilgrims traveling to Kumbh Mela at Allahabad.

Since the study focused on science, the population in Kabale Municipality was considered. There were four public secondary schools with at least 20 students per school, totalling 80, and three private secondary schools with an average of 20 students per school, totalling 60 students. This made a total of 140 students studying science at ‘A’ Level, taught by 14 teachers and managed by 7 head teachers. The total target population was 161 from whom the sample size was generated.

The population was selected because the teachers played a crucial role in implementing the curriculum for which the students were being assessed. The school head teachers were selected for their administrative role in promoting the teaching and learning of science to achieve learning objectives. Finally, students were included in the study population because they were responsible for the enrolment and retention maintenance at ‘A’ level for the completion of their study programmes.

Table 3.1: Study Population

No.	Respondent	Population	Sample Size	Sampling Technique
1	Science Students	140	100	Simple Random Sampling
2	Science Teachers	14	10	Simple Random Sampling
3	Head teachers	7	5	Simple Random Sampling
	Total	161	115	

Source: Field Data, 2020

3.4 Sample Size

Yamane (1967) formula for sample size determination was applied in finding out the sample size reflected in Table 3.1.

$$n = \frac{N}{1+N(e)^2}$$

Where:

n was the sample size in the study

N was the Population

e was marginal error set as 0.05

Thus, the population= 161

Therefore, the sample size is as follows:

$$n = \frac{161}{1+161 \times (0.05)^2}$$

$$n = \frac{161}{1+161 \times 0.0025}$$

$$n = \frac{161}{1+0.4025}$$

$$n = \frac{161}{1.4025}$$

Sample Size (n) = 115

Thus given the sample size (115), different cohorts of respondents were determined.

Cohort of Respondents ÷ Total Population x Sample Size = Sample size for each Cohort.

Science Students in the sample size = 140 ÷ 161 × 115 = 100

Science Teachers in the sample size = 14 ÷ 161 × 115 = 10

Head teachers in sample size = 7 ÷ 161 × 115 = 5

3.5 Sampling Techniques

The study employed Simple Random Sampling technique to select all the respondents of the study. The details were duly explained as indicated in the subsequent headings.

3.5.1 Simple Random Sampling

Creswell (2008) argued that simple random sampling is a method used to select a smaller sample size from a larger population, which is then used to conduct research and make generalizations about the larger group. It is one of several methods that statisticians and researchers use to extract a sample from a larger population. To create a sample, there are six steps: (a) defining the population; (b) choosing the sample size; (c) listing the population; (d) assigning numbers to the units; (e) finding random numbers; and (f) selecting a sample.

In step one, the population was defined as 161, expressed as N. The interest was in students, teachers, and head teachers of secondary schools in Kabale Municipality. The sampling frame included 140 science students, 14 teachers, and 7 head teachers, totaling to 161 respondents.

Step two involved choosing the samples, which were the above-mentioned students, teachers, and head teachers. The sample sizes were expressed as n and were chosen based on the budget and time available to distribute the questionnaire to students.

Step three was to list the population, which included identifying all 161 respondents, including 140 science students, 14 science teachers, and 7 head teachers from the secondary schools (government-aided and private) in Kabale Municipality. The researcher required permission from the head teachers to obtain a list of all science students and their teachers.

Step four was about assigning numbers to the units. The researcher assigned consecutive numbers from 1 to N to each of the respondents' categories, meaning assigning numbers from 1 to 140 for science students, 1 to 14 for science teachers, and 1 to 7 for head teachers.

Step five involved finding random numbers, which were listed before selecting the sample of the said number of science students, science teachers, and head teachers from the total population list of 161 respondents. The researcher used random number tables to find the random numbers.

Step six included selecting a sample, which involved choosing which of the 161 total population, in this case, 140 science students, 14 science teachers, and 7 head teachers intending to take part in the research. The researcher selected these samples from the numbers generated from the random number table. The researcher followed the sample as follows:

005 (The 5th from the numbered list of 140 science students).

002 (The 2nd Science teacher from the list of 14 Science teachers).

001 (The 1st head teacher from the list of 7 head teachers).

The researcher selected the 5th, 2nd, and 1st science student, teacher, and head teacher respectively from the list to be part of the sample. He repeated this process until all the respondents in their respective samples were obtained.

Simple Random Sampling was chosen because it ensured that each member of the larger population had an equal chance of being selected. Additionally, it was convenient for the researcher as it did not require much time or energy. The respondents did not have to worry about who would be selected as it was a game of chance.

3.5.2 Levels of Analysis

According to Manasseh (2010), the term "level of analysis" is used in social sciences to refer to the location, size, or scale of a research target. This concept was distinct from the term "unit of observation," which referred to the specific unit from which data would be collected. The combination of the unit of observation and the level of analysis helped to define the population of a research study. In general, a meso-level analysis was used to describe the population size falling between the micro and macro levels, since the study focused on formal organizations (institutions).

3.6 Data Collection Instruments

The research collection tools included questionnaires and interview guides in order to come up with the quality work.

3.6.1 Questionnaire

The study used both open-ended and close-ended questionnaires, which were distributed to 10 science teachers and 5 head teachers who were selected from the sample size. Questionnaires were chosen for their ability to gather a large amount of information in a short time. They were also easy to handle and formulated in simple language, which made them easy to understand. Additionally, questionnaires were helpful in generating reliable information as they were left with the respondents to fill out in the absence of the researcher.

3.6.2 Interview Guide

The interviews were conducted using an Interview Guide to obtain information from science students. The researcher formulated questions arranged according to the research objectives and used his time to meet with the science students individually, according to the number selected in the sample size. The researcher acted as the interviewer while the students (respondents) were the interviewees. The responses generated were kept well for the analysis phase in the next chapter. The interview guide was used because the researcher had the ability to modify the questioning on the spot in case it became challenging. It enabled the researcher to obtain detailed information, and the respondent was free to interact with the researcher, providing the researcher with the hope of obtaining the appropriate information.

3.7 Data Analysis

The analysis of quantitative and qualitative findings were done at the same time according to the individual objectives.

Objective One: The Influence of Physical Learning Environment on the Enrolment and Retention of Students in Sciences at ‘A’ level was analysed using linear regression, a statistical technique that uses several explanatory variables to predict the outcome of a response variable. This model aimed to show the linear relationship between the explanatory (independent) variables and the response (dependent) variable. Linear regression is an extension of ordinary least-squares (OLS) regression that involves more than one explanatory variable. As there were two independent variables (retention and enrolment), their relationship would be related to the physical learning environment of students studying sciences at ‘A’ level. The researcher therefore used the Statistical Package for Social Scientists (SPSS) Version 16.0.

For this objective, the analyst analysed how the physical learning environment could be affected by both the retention and enrolment of students into sciences. In this case, the linear equation had the value of the retention and enrolment as the independent variables (predictors), and the physical learning environment of science students studying sciences at 'A' level as the dependent variable. This equation would be used to determine the relationship existing between variables.

- y_i = dependent variable (Students in A'level)
- x_{i1} = Physical learning environment
- x_{i2} = Science subjects
- x_{i3} = Physical learning environment
- x_{i4}= Retention and Enrolment
- B_0 = y-intercept at time zero
- B_1 = regression coefficient that measures a unit change in the dependent variable when x_{i1} changes - the change in retention and enrolment of students.
- B_2 = coefficient value that measures a unit change in the dependent variable when x_{i2} changes-the change in retention and enrolment of students into sciences changes.

Least-squares estimates, B_0, B_1, $B_2 \ldots B_p$, were computed by statistical software (Statistical Package for Social Sciences). Many variables were included in the regression model in which each independent variable was differentiated with a number: 1, 2, 3, 4...p. The multiple regression models allowed the analyst to predict an outcome based on information provided on multiple explanatory variables.

Objective Two: The influence of students' attitudes towards sciences on the enrolment and retention of students into sciences at 'A' level was analysed by comparing the means of the variables involved. This involved comparing the retention and enrolment of students with the dependent variable of students into sciences at 'A' level. The analysis was done using the Statistical Package for Social Scientists (SPSS) Version 16.0. In this case, the researcher used the "One Sample Test" that involved t-values and the degree of freedom (df) of 114, since the total number of subjects subjected to both quantitative and qualitative analyses was 115. The Sig (2-tailed) and Mean Difference were displayed, and finally, there was a 95% Confidence Interval of Differences. The Mean Difference determined the fate of the findings, guided by the margin of error obtained from the findings in relation to the Mean Difference.

Objective Three: The quality of science teachers in influencing students into sciences at 'A' level was determined using the Statistical Package for Social Scientists (SPSS) Version 16.0 through Descriptive Statistics. The main components were the "Mean and Standard Deviation," aimed at determining the extent to which the quality of teachers would be the key influencing variable in relation to the enrolment and retention of students into sciences at 'A' level. The higher score from the Mean values determined the conclusive remark that the quality of teachers was important to students' learning in science classes at 'A' level.

3.8 Ethical Considerations

The researcher ensured confidentiality by communicating to all respondents that he would not disclose any piece of information obtained from them. Therefore, the researcher signed the informed consent or assent form with the respondents, vowing never to disclose any information regarding the research study.

To ensure ethical credibility, the researcher gave key respondents a copy of his research so that they could benefit from the concepts for future reference related to the topic.

Anonymity was considered in the research, whereby the researcher ensured that all participants had the right to remain anonymous and that their individual identities were not salient features in the study.

3.9 Limitations of the Study

The researcher anticipated attrition from respondents and made provision for unanswered questions, which he could use in case of data mortality. Some respondents may have been suspicious of the researcher, believing that he might not have had their best interests at heart, leading them to decline to participate in the study. However, the researcher overcame these limitations by making it clear that the research was solely academic and necessary for his studies.

Conducting this investigation required a significant amount of resources, including stationery, transportation, meals, telephone and internet fees, typing and secretarial assistance, printing, binding, photocopying, and other costs that demanded a strong financial position. The researcher used a portion of his salary to successfully conduct his research.

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.0 Introduction

Chapter Four of the research report provides data presentation, analysis, and discussion of findings. The chapter is based on two main aspects: the socio-demographic characteristics of the respondents and the study objectives, which covered the physical learning environment and its impact on students' enrolment and retention in sciences; students' attitudes towards sciences and their impact on enrolment and retention; and the quality of science teachers and their influence on enrolment and retention of students in sciences at ‘A' Level in secondary schools.

To ensure uniformity in the analysis of qualitative data, it was coded before being analysed quantitatively.

4.1 Respondents’ Socio-demographic Characteristics

These included among the many: gender, age and respondents’ education qualification levels. This section was realized by “One Sample t-Test” a method that was computer generated using the Statistical Package for Social Sciences (SPSS) Version 16.0. The key players were the t, degree of freedom (df), Sig. (2-tailed), Mean Difference and, above all, the 95% Confidence Interval of the Difference as shown in Table 4.1.

Table 4.1: One-Sample Test For Respondents’ Demographic Characteristics

Variable	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	Df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Gender	32.968	114	.000	1.539	1.45	1.63
Age	26.413	114	.000	1.878	1.74	2.02
Qualification	17.480	114	.000	1.635	1.45	1.82

(Source: Primary Data, 2022.)

Table 4.1 presents information on the socio-demographic characteristics of the respondents. The results indicate that the Sig. (2-tailed) value was uniform throughout, with a degree of freedom (df) of 114. Gender was found to be significant, with t = 32.968 and a Mean

Difference of 1.539. The 95% Confidence Interval of the Difference was calculated as Upper (1.63) – Lower (1.45) = 0.18 alpha. Since the alpha was less than the recommended 5% margin of error, it was concluded that the respondents' gender was appropriate for the study.

Age was also found to be significant, with t = 26.413 and a Mean Difference of 1.878. The 95% Confidence Interval of the Difference was calculated as Upper (2.02) – Lower (1.74) = 0.28 alpha. Since the alpha was below the recommended 5% margin of error, the respondents' age-brackets were suitable for the study.

The results further indicated that education qualification was significant, with t = 17.480 and a Mean Difference of 1.635. The 95% Confidence Interval of the Difference was calculated as Upper (1.82) – Lower (1.45) = 0.37 alpha. Since the alpha was less than the recommended 5% margin of error, the education levels of the respondents were appropriate for the study.

Overall, the analysis showed that education qualification was the most important socio-demographic characteristic of the respondents, while gender was the least important. This is because the study required understanding from respondents to answer difficult questions, which was facilitated by education. In contrast, gender was less important because some respondents may have been compromised in their responses based on their perception of the study's focus.

In summary, education played a critical role in the study's success, as it was the most significant socio-demographic characteristic of the respondents. This underscores the importance of education in understanding and addressing the issues studied in this research.

Table 4.2: Distribution of Respondents by School Category

Variable		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Private	5	25.0	25.0	25.0
	Government	15	75.0	75.0	100.0
	Total	20	100.0	100.0	

Source: Primary Data, 2022

From Table 4.2, it can be observed that out of the 20 schools in the study area, 15 (75.0%) were government-aided secondary schools, while 5 (25.0%) were private schools. The reason for the greater representation of government-aided secondary schools compared to private schools was that the researcher had access to a list of government-aided schools from the education department of Kabale Municipality, making it easier to allocate them for the study.

4.2 Response Rate

The study was vigilant on the response rate to ascertain whether the participation turn-up was fully realized. Table 4.3 shows how the response rate of the respondents and the details are elucidated underneath the Table in context.

Table 4.3: Response Rate

Variable		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Science Students	100	87.0	87.0	87.0
	Science Teachers	10	8.7	8.7	95.7
	Headteachers	5	4.3	4.3	100.0
	Total	115	100.0	100.0	

Source: Field Data, 2022

From Table 4.3, it was observed that science students accounted for 100 (87.0%) of the respondents, while science teachers and head teachers constituted 10 (8.7%) and 5 (4.3%) of the total respondents respectively, out of 115 (100.0%) participants. Therefore, it was evident that all intended respondents participated in the study, achieving a 100% response rate.

4.3 Presentation

As mentioned earlier in the introduction of this chapter, the main objectives presented their findings ranging from the physical learning environment, students' attitudes, as well as the quality of science teachers and the enrollment and retention of students in sciences at the advanced level. Different methods were used to address the different objectives mentioned, as observed in the subsequent sections.

4.3.1Physical Learning Environment and Students' Enrolment and Retention in Sciences

The objective in question was analysed using Linear Regression analysis through the Statistical Package for Social Sciences (SPSS) Version 16.0. Relevant features used for the analysis included the "Unstandardized Coefficients" represented by the B-value and Standard Error, and the "Standardized Coefficients" marked by the Beta. Other significant features included t and Sig.

Table 4.4: Physical Learning Environment and Students' Enrolment and Retention in Sciences

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	-.154	.235		-.654	.514
	Acoustic conditions in classrooms.	.107	.062	.090	1.720	.088
	Cool temperature to encourage learning.	.396	.073	.444	5.434	.000
	Developed infrastructure like administration offices, halls, libraries.	.168	.082	.178	2.060	.042
	Enough space for teachers and students.	-.174	.117	-.118	-1.491	.139
	Ergonomically designed buildings with centrally located courtyard.	-.225	.127	-.126	-1.764	.081
	Lighting and colour variations of classrooms to stimulate senses of students.	-.267	.099	-.197	-2.705	.008
	Presence of furniture with good sitting arrangement.	.244	.087	.270	2.806	.006
	Laboratories for Physics, Chemistry, Biology and Agriculture.	.131	.121	.118	1.083	.281
	Enough Apparatus in the Laboratories.	.518	.094	.263	5.496	.000
	Well stocked library.	.165	.092	.125	1.791	.076
	Professional Teachers for sciences.	-.032	.081	-.016	-.397	.693

a. Dependent Variable: Access to appropriate learning life-skills' program

Table 4.4 displays the results of Linear Regression analysis using the Statistical Package for Social Sciences (SPSS) Version 16.0. The table shows Unstandardized Coefficients and Standardized Coefficients with their respective B-Value, Standard Error, Beta, t, and Sig. Model 1 Constant had a B-Value of -.154 and a Standard Error of .235 under Unstandardized Coefficients, translating into t(-.654) and Sig. .514. No values were shown on the side of Standardized Coefficients.

The analysis revealed that acoustic conditions in classrooms had a B-Value of .107 and a Standard Error of .062 under Unstandardized Coefficients, while the Beta was .090 on the Standardized Coefficients side, translating into t(1.720) and Sig. .088. This finding suggests that the physical learning environment for science students was not conducive due to noise from instruments and other sources that easily distracted students' attention. This conclusion is supported by Griffin's (2006) claim that acoustic conditions in the classroom did not meet listeners' needs, leading to negative impacts on students' perception, social relationships, and stress levels, which resulted in aggressive behaviour and limited the number of scholars in science classes.

Cool temperature had a B-Value of .396 and a Standard Error of .073 on Unstandardized Coefficients' side, while the Beta was .444 on the Standardized Coefficients side, translating into t(5.434) with a Sig. value of .0000. The study found that the physical learning environment for science students should be cool because high temperatures change students' well-being, social relationships, and performance, leading to irritability and fatigue due to physiological changes. This statement is consistent with Moraes and Ismail's (2007) argument that temperature is an environmental factor connected to ventilation and that thermal comfort is achieved by maintaining the temperature in response to the movement of air and moisture (Anderson, Deuser, and DeNeve, 2015). High temperatures alter well-being, social relationships, and performance, causing irritability, fatigue, and confusion (Cheryan and Marzano, 2014).

Developed infrastructure such as administrative offices, halls, and libraries had a B-Value of .168 and a Standard Error of .082 on the Unstandardized Coefficients side, while the Beta was .178 on the Standardized Coefficients side, translating into t(2.060) with a Sig. value of .042. The study found that infrastructure such as administrative offices, libraries, laboratories, and classrooms, among others, needed to be in place to accommodate all science students. This conclusion is supported by Bautista and Borges's (2013) assertion that the secondary school concept includes several facilities such as administration centres/offices, classrooms, halls, libraries, laboratories, workshops, canteens, car parks, staff quarters, and sanitation facilities. The number of students to be accommodated in each class was 40, from form five to six, with co-educational facilities having an equal number of boys and girls.

Table 4.5 summarizes the presentation made in Table 4.4 to determine the gist and performance of the physical learning environment in relation to students' enrolment and retention in sciences at the advanced level of education in secondary schools. The verdict was determined thereafter regarding the relevance of the objective in question.

Table 4.5: Residuals Statistics[a]

Variable	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.09	5.01	3.86	.963	115
Residual	-.580	.495	.000	.191	115
Std. Predicted Value	-2.875	1.193	.000	1.000	115
Std. Residual	-2.891	2.466	.000	.951	115

a. Dependent Variable: Access to appropriate learning life-skills' programme

The variables presented in Table 4.5 were obtained through a detailed analysis of the findings in Table 4.4. The Predicted Value had a minimum of 1.09 and a maximum of 5.01, resulting in a mean score of 3.86 and a standard deviation of .963 based on the number of respondents (115).

The Residual had a minimum value of -.580 and a maximum of .495, with a mean score of .000 and a standard deviation of .191. The Standard Predicted Value had a minimum of -2875 and a maximum of 1.193, with a mean score of .0000 and a standard deviation of 1.000.

The Standard Residual had a minimum of -2.891 and a maximum of 2.466, with a mean score of .000 and a standard deviation of .951. Therefore, based on the Predicted Value with a mean score of 3.86, it can be concluded that a conducive physical learning environment for students in sciences was significant in attracting and retaining them for academic purposes.

This conclusion was drawn from the Residuals Statistics presented in Table 4.5, which were derived from the findings in Table 4.4.

4.3.2 Students' Attitude and Enrolment and Retention in Sciences

The findings of Objective two were analysed using the "Comparing Means" function in the Statistical Package for Social Sciences (SPSS) Version 16.0. The relevant features analysed in Table 4.6 included t, df, Sig. (2-tailed), Mean Difference, and the 95% Confidence Interval of the Difference.

Table 4.6: Students' Attitude and Enrolment and Retention in Sciences

Variable	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Performance shows hostility towards sciences.	55.008	114	.000	4.296	4.14	4.45
Government policy forces sciences on students.	53.258	114	.000	4.174	4.02	4.33
Government supports science students' attitude.	85.377	114	.000	4.226	4.13	4.32
Parents determine children's attitude to sciences.	46.479	114	.000	4.287	4.10	4.47
Parents' influence fixes attitude change of a child.	87.648	114	.000	4.104	4.01	4.20
Peer influence affects the study of sciences.	37.993	114	.000	4.122	3.91	4.34
Students' status defines their attitude on sciences.	33.730	114	.000	3.774	3.55	4.00
Students' performance inspires study of sciences.	51.039	114	.000	3.957	3.80	4.11
Students' positive attitude towards sciences.	30.469	114	.000	3.791	3.54	4.04
Teachers' pay relates boosts students' attitude.	44.803	114	.000	4.043	3.86	4.22
Career guidance encourages students' sciences.	58.777	114	.000	4.548	4.39	4.70
Laboratory equipment inspires students' sciences.	105.522	114	.000	3.904	3.83	3.98

Source: Field Data, 2022

The information presented in Table 4.6 indicates that there is hostility towards sciences, with a t-value of 55.008, degree of freedom (df) of 114, and a significance level (Sig.) of .000. The Mean Difference is 4.296, with a 95% Confidence Interval of the Difference of 0.31 less than the recommended Alpha Value of 5% for the margin of error. This finding is significant because it greatly impacts the attitude towards students' pursuit of sciences. This perspective is based on the practical observation that students who perform poorly in sciences often drop out of school, compromising their enrolment and retention. McCall, Evahn, and Kratzer (2012) analysed this statement further and contended that many learners who perform poorly exhibit problems with learning and school personnel and demonstrate hostility toward learning (Mandel & Marcus, 2018). Positive school attitudes not only prevent adverse events such as dropping out of school but are also positively associated with good performance (Gottfredson, 2009).

Another finding captured is that the government's policy forces students to take science subjects, represented by a t-value of 53.258 and a df of 114 with a Sig. (2-tailed) of .000. The Mean Difference is 4.174, with a 95% Confidence Interval of the Difference of 0.31 less than the recommended Alpha Value of 5% for the margin of error. This finding indicates that the government's effort to make science compulsory at the Ordinary Level has translated into positive attitudes towards enrolment and retention in sciences at the Advanced Level of secondary education. Barrett and Zhang (2009) comment that in 2005, the Government of Uganda made science subjects compulsory for secondary school students at the 'O' level and preferentially funded university students taking science courses. This policy was made to entice students to pursue science combinations at ‘A' level as their attitudes towards science were already positive. Almost 75% of science students received the majority of government scholarships to universities and other tertiary education institutions.

The third finding captured is that the government supports science students' attitude with a t-value of 85.377 and a df of 114 with a Sig. (2-tailed) of .000. The Mean Difference is 4.226, with a 95% Confidence Interval of the Difference of 0.19 less than the recommended Alpha Value of 5% for the margin of error. This finding suggests that the government's support towards science is strong and significant in fostering positive attitudes towards science among students, leading to increased enrolment and retention rates. The support provided by the government includes instructional materials such as laboratory equipment, textbooks, and other resources intended to train science teachers in schools. Kyoshaba (2009) affirms this statement, stating that the government of Uganda supported and implemented various aspects to promote science education, including the construction of new and rehabilitation of science laboratories, supply of science textbooks and resource materials, and in-service training of science teachers using funding from the African Development Bank III (ADB) support to education in Uganda.

In conclusion, the three representative findings highlighted in the paragraphs above relate fully to students' attitudes towards science at the Advanced Level of secondary education and show significant support for the subject matter in question. While there were numerous findings that were not analysed or discussed, these three findings shed light on the objectives of the study.

4.3.3 Science Teachers' Quality and Students' Enrolment and Retention in Sciences

The researcher utilized the Statistical Package for Social Sciences (SPSS) Version 16.0 to compute the results of the findings. The significant components utilized in the analysis were "Mean" and "Standard Deviation", and the "Standard Error Mean" column was also noted. These values were interpreted using the "Mean Range Guide", which helped to determine the score obtained in each setting. All these analyses were conducted under the Descriptive Statistics tool, which was generated by the computer.

Mean range	**Response mode**	**Interpretation**
>4.00	Strongly agree	Very Significant
3.26-4.00	Agree	Significant
2.51-3.25	Undecided	Reasonable
1.76-2.50	Disagree	Fair
1.00-1.75	Strongly disagree	Inadequate

Table 4.7: Science Teachers' Quality and Students' Enrolment and Retention in Sciences

Variable	N	Mean	Std.Dev	Std. Error Mean
Highly qualified teachers teach sciences very well than novices.	115	3.77	1.172	.109
Highly qualified teachers positively affect student learning.	115	3.90	1.155	.108
Recruitment on experience leaves inexperienced teachers behind.	115	3.83	1.008	.094
Some teachers are not conversant with what they teach.	115	3.94	.729	.068
Some teachers teach outside their field qualifying to teach sciences.	115	4.37	.614	.057
Teachers' attrition is high and compromises teachers' quality.	115	4.22	.770	.072
Unpreparedness to teach sciences by some teachers.	115	3.83	1.293	.121
Teachers are not aware of new innovations in teaching sciences.	115	3.88	.564	.053
Hardworking teachers retain more learners in sciences.	115	4.13	.755	.070
Inadequate professional training affects science teaching.	115	4.70	.565	.053
Knowledgeable of science concepts makes teacher of good quality.	115	3.93	1.168	.109
Rampant attrition of science teachers affects their quality.	115	4.26	1.018	.095

Source: Field Data, 2022 AMS = 4.06

The results from Table 4.7 showed that the total number of respondents was 115, with 12 responses for the objective. The viewpoint that "Inadequate professional training affects science teaching" registered a Mean Score of 4.70 and a Standard Deviation of 0.565, resulting in a Standard Error Mean of 0.053. This finding was the first and had the highest score because if teachers were not fully trained, it meant that they did not have a strong foundation to teach sciences, as they did not understand what was trending in that field. This statement was somewhat associated with Bird (2013), who mentioned that the role of human factors could be linked to the observation that the perceptions of teachers teaching physics raised students' performance, but the lack of adequate professional training was a significant problem affecting the effective use of local resources for science teaching. In case of adverse effects perpetrated by such a strategy or method, it was evident that enrolment lowered as students advocated for other subject combinations available.

The fact that "Some teachers teach outside their field qualifying to teach sciences" had a Mean Score of 4.37 and a Standard Deviation of 0.614, as well as a Standard Error Mean of 0.057. It was believed that the observation made was factual since teachers simply looked for survival to teach what they did not qualify in depending on the available slots in schools they visited seeking employment. This drew back the performance, enrolment, and retention of students in sciences because the students themselves never understood the concepts taught. This same statement was aligned with Hill & Stearns (2015) who asserted that an analysis of representative national data compared science teachers' fields of qualification with the fields they were assigned to teach. Some teachers taught outside their fields, while others were fully qualified to teach in secondary schools. At the high school level, about one-fifth to one-quarter of teachers assigned to teach biology were not qualified for it.

The fact that "Rampant attrition of science teachers affects their quality" had a Mean Score of 4.26 and a Standard Deviation of 1.018, translating into a Standard Error Mean of 0.095. This was ranked third but had a bearing on the quality of teaching, especially in science-based subjects. Students used to a teacher found it hard to cope with the newly employed teacher to replace such an experienced teacher. This statement was further explicated by Awang et al. (2013) who commented that because of complicated conditions in the teaching profession, encouraging teachers to stay in the profession was ongoing due to rampant attrition. Some good teachers felt that looking for other professions that did not have stringent conditions like teaching. Some were well-aligned with school policies on teaching and learning, curriculum, and assessment, and teacher evaluation.

In summary, the Average Mean Score (AMS) of 4.06 was obtained for this objective, falling in the Mean Range of > 4.00 read as "Strongly agree" and interpreted as "Very Significant". Thus the respondents strongly agreed that the quality of teachers in handling science subjects mattered a lot.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

Chapter Five provides a summary of the research findings, conclusions, and recommendations. The conclusions and recommendations are based on the results presented in the previous chapter, which were analysed separately for each research objective. The chapter also highlights the need for further research in the area.

5.1 Summary of Findings

As each objective's findings were presented or tabulated in the previous chapter, this study considered each objective's strengths in terms of the performance of each finding. Therefore, this chapter presents the most highly ranked and the least performed finding for each objective.

Regarding Physical Learning Environment and Students' Enrolment and Retention in Sciences at 'A' Level in Secondary Schools, the verdict was based on the Sig. Value obtained. The lower the Sig.Value, the more highly ranked the finding was, and vice versa. Thus, the "Enough Apparatus in the Laboratories" viewpoint had a Sig.Value worth .000, as well as "Cool temperature to encourage learning", while the lowest Sig.Value was for "Professional teachers for sciences", which had .693.

For Students' Attitude and Enrolment and Retention in Sciences at Advanced Level, the consideration was based on the achievement from the margin of error obtained after thorough computation. The lower the margin of error (Alpha) obtained, the higher the performance, and vice versa. Thus, the most leading finding was the "Students' status defines their attitude on sciences" viewpoint, which had a margin of error (Alpha) of 0.15 from the Upper (3.98) – Lower (3.83), while the least scored finding was "Laboratory equipment inspires students' sciences," whose margin of error was Upper (4.00) – Lower (3.55) = 0.45.

For Science Teachers' Quality and Students' Enrolment and Retention in Sciences, the higher the Mean Score, the higher the performance of the finding, and vice versa. Thus, the "Inadequate professional training affects science teaching" viewpoint had the leading Mean Score of 4.70 compared to "Highly qualified teachers teach sciences very well than novices", which had a Mean Score of 3.77.

5.2 Conclusions

The findings presented demonstrate the significant impact of the physical learning environment on students' enrolment and retention in science. The Mean Score of 3.86 obtained from the Predicted Value indicates that this objective was achieved to its full potential without bias.

Similarly, the students' attitude towards science at the advanced level of secondary education showed strong support for the subject matter. This objective was based on the premise that students' attitude towards science influences their enrolment and retention in science.

The overall performance of the objective, as reflected by the Average Mean Score (AMS) of 4.06, shows that the quality of teachers is a crucial factor in motivating students to pursue science. In particular, the inadequate professional training of science teachers was found to negatively affect their teaching effectiveness.

In conclusion, the study found that conducive physical learning environments; positive attitudes towards science among students; and the quality of science teachers are all significant factors in influencing students' enrolment and retention in science at the advanced level in Kabale Municipality's secondary schools.

5.3 Recommendations

The following are recommendations based on the findings of the study:

Improve the acoustic conditions in classrooms to create a calm learning environment during science lessons, which can help students to better understand the concepts being taught.

Maintain cool temperature in classrooms to encourage learning, as students learn better when they are refreshed. This can lead to increased enrolment and retention in science classes.

The government should provide aid to secondary schools to develop their infrastructure, including administration offices, halls, libraries, laboratories, and classrooms, to enable better learning experiences for students.

Employ professional teachers for science subjects to elevate students’ enrolment and retention levels.

Supply secondary school laboratories with adequate equipment to inspire students' interest in science subjects.

Increase teachers' pay to motivate them to provide excellent teaching, which can positively impact students' attitudes towards pursuing sciences.

Encourage teachers to upgrade their skills through workshops on teaching methods and new innovations in science teaching.

School administrators should encourage a culture of hard work among teachers to improve students' enrolment and retention in science subjects.

5.4 Suggestions for Further Research

There is need to investigate the impact of teacher remuneration on academic performance in Uganda's western region.

Examine the effect of education tuition hikes and teacher upgrading on secondary school education in Kabale Municipality, Uganda.

Examine the relationship between physical learning environment and academic performance of secondary school students in a specific sub-county in western Uganda.

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APPENDICES

APPENDIX A: QUESTIONNAIRE TO TEACHERS

Dear Respondent,

I am Akatuhurira Frank Bindeeba, a master's student at Kabale University, and I am conducting a research project on the factors influencing students' enrollment and retention in secondary schools in Uganda, specifically focusing on Kabale Municipality. I kindly request your assistance in providing any necessary information for this study. Please be assured that any data generated from you will be kept anonymous. Thank you for your cooperation in this noble cause.

Thank you for your cooperation.

Section A: Respondents' Socio-demography

Age:

a). <30 years ☐

b). 31 years plus ☐

Gender: ___________________________________

Education Qualification

a). Below UCE ☐

b). UCE ☐

c). UACE ☐

d). Diploma ☐

e). Degree ☐

f). Postgraduate ☐

Section B: Physical Learning Environment and Students' Enrolment and Retention in Sciences in Secondary Schools at A'level

Instructions: Use the rating options given and tick under the suitable option of your choice.

5 Strongly agree; 4 Agree; 3 undecided; 2 Disagree; 1 Strongly agree.

No.	**What is your take on the following features of physical learning environment that influence students' Enrolment and Retention in Sciences in Secondary Schools at A'level?**	**1**	**2**	**3**	**4**	**5**
1	Access to appropriate learning life-skills' program.					
2	Acoustic conditions in classrooms.					
3	Cool temperature to encourage learning.					
4	Developed school infrastructure like administration centres, halls, libraries, laboratories, classrooms, and more.					
5	Enough space for teachers and students.					
6	Ergonomically designed buildings with centrally located courtyard.					
7	Lighting and colour variations of classrooms to stimulate senses of students.					
8	Presence of furniture with good sitting arrangement.					

Section C: Students' Attitude towards Sciences and Enrolment and Retention of Students into Sciences in Secondary Schools at A'level.

No.	**Rate the facts about the students' attitude towards sciences and enrolment and retention of students into sciences in secondary schools at A'level.**	**1**	**2**	**3**	**4**	**5**
1	Dismally performance exhibits hostility towards learning.					
2	Government policy to make sciences compulsory affects science students.					
3	Government support positively steers up students' attitude on sciences.					
4	Parents' educational background determines children's attitude to sciences.					
5	Parents' influence has a bearing on the attitude change of a child in sciences.					
6	Peer influence affects the study of sciences at A'level.					
7	Socio-economic status of students determines the attitude towards sciences.					
8	The performance of students affects their attitude towards sciences' learning.					

Section D: The Quality of Teachers and Enrolment and Retention of Students into Sciences in Secondary Schools at A'level.

No.	Rate the facts about teachers' quality and the enrolment and retention of students into sciences in secondary schools at A'level.	1	2	3	4
1	Highly qualified teachers teach sciences very while than the novices				
2	Lack of teachers' professional training militates effective resources' use				
3	Recruitment based on experience leaves inexperienced good teachers behind				
4	Some teachers are not conversant with what they teach				
5	Some teachers teach outside their field while others qualify to teach sciences				
6	Teachers' attrition is high and so exhibit compromised teachers' quality				
7	Teachers are not conversant with new innovations in teaching sciences				
8	Unpreparedness to teach sciences by some teachers				

APPENDIX B: QUESTIONNAIRE FOR HEAD TEACHERS

Dear Respondent,

I am Akatuhurira Frank Bindeba, a master's student at Kabale University, and my research project focuses on examining the factors that influence students' enrollment and retention in secondary schools in Uganda, specifically in Kabale Municipality. I kindly request your assistance in providing the necessary information for this important study. Rest assured that any data generated from you will remain anonymous.

Thank you for your cooperation.

Section A: Respondents' Socio-demography

Age:

a). <30 years ☐

b). 31 years plus ☐

Gender: ___________________________________

Education Qualification

a). Below UCE ☐

b). UCE ☐

c). UACE ☐

d). Diploma ☐

e). Degree ☐

f). Postgraduate ☐

Section B: Questions about Physical Learning Environment and Students' Enrolment and Retention in Sciences at Advanced Level of Secondary Schools.

1. Give me light on physical learning environment.
   ………………………………………………………………………………………
   ………………………………………………………………………………………
2. What features make a good physical learning environment?
   ………………………………………………………………………………………
   ………………………………………………………………………………………
3. How do the mentioned physical learning environment attribute to the study of sciences?
   ………………………………………………………………………………………
   ………………………………………………………………………………………
4. Vividly comment on the levels to which physical learning environment influences the study of sciences at A'level.
   Tick the right alternative put in the box in front of each response
   Very important ☐
   Important ☐
   Averagely Important ☐
   Weak ☐
   Poor ☐

Section C: Questions on Students' Attitude and Enrolment and Retention in Sciences at Advanced Level of Secondary Schools

5. Students sometimes develop ill-feelings as they prepare to pursue sciences. What is your take on that?
   ………………………………………………………………………………………
   ………………………………………………………………………………………
6. What causes ill-feelings among the students in pursuit of sciences in your school?
   ………………………………………………………………………………………
   ………………………………………………………………………………………

7. What boosts the positive attitude to students that they reason highly to pursue sciences at A'level?

   ………………………………………………………………………………………………

   ………………………………………………………………………………………………

8. At times equipment in the library and laboratory put the anxiety of students down who may wish to pursue sciences. What is your comment about that?

   ………………………………………………………………………………………………

   ………………………………………………………………………………………………

Section D: Questions about the Quality of Science Teachers and the Enrolment and Retention of Students into Sciences at Advanced Level of Secondary Schools.

9. For any institution to succeed there should be the quality staff to steer up the move towards its good performance. What is the quality of your teachers in an attempt to enhance the teaching of sciences at A'level?

   ………………………………………………………………………………………………

   ………………………………………………………………………………………………

10. It is believed that the highly qualified teachers teach well because of their expertise. What do you comment on that?

    ………………………………………………………………………………………………

    What factors make a good science teacher?

    ………………………………………………………………………………………………

    ………………………………………………………………………………………………

11. What are the qualities of a good science teacher?

    ………………………………………………………………………………………………

    ………………………………………………………………………………………………

12. Give your general comment on the qualities of science teachers visa viz students' enrolment and retention.

    ………………………………………………………………………………………………

    ………………………………………………………………………………………………

APPENDIX C: INTERVIEW GUIDE FOR STUDENTS

Section A: Respondents' Socio-demography

Age:

a). 1- 20 years ☐

b). 21 years and above ☐

Gender:_____________________

School Category

a). Private School ☐

b). Government aided ☐

Class

Form 5 ☐ Form 6 ☐

Section B: Topical Questions

1. For how long have you been here in this school as a student?
2. Which subjects do you study in your class?
3. In order to understand the concepts taught to you, there has to a conducive physical learning environment. What makes a good physical learning environment?
4. How does a good physical learning environment contribute to sure learning of sciences?
5. What is your attitude towards sciences at A'level?
6. What is behind the attitude type mentioned in regard to sciences?
7. How do you rate "attitude" to realize the enrolment and retention of students into sciences at A'level of secondary schools?
8. Some students believe too much in their science teachers. What is your take on that as in connection with the teaching and learning of sciences?
9. What quality of teachers would you cherish in science lessons and why?
10. Give your general comment on the factors influencing students' enrolment and retention in sciences at advanced level of secondary schools?

APPENDIX D: ACTIVITY CHART

ACTIVITY	MONTH	YEAR	COMMENT
Topic Formulation	December	2019	Done
Proposal Writing	January – July	2020	Done
Designing & Testing Tools for Data Collection	August to December	2021	Done
Administration of Tools for Data	January & Feb	2022	Done
Data Collection	March	2021	Done
Compilation of Dissertation	April	2022	Done
Submission of Final Dissertation	May	2022	Done
Submission of Final collections	April	2023	Done

APPENDIX E: BUDGET FRAMEWORK

ITEM	**UNIT COST**	**AMOUNT**
Paper	2 Ream x 20,000/=	40,000/=
Pen	3 Pens x 500/=	1,500/=
Airtime	100,000/=	100,000/=
Typing	150 Pages x 500/=	75,000/=
Printing	150 Pages x 500/= x 3 copies	225,000/=
Binding	3 Copies x 10,000/=	30,000/=
Fuel to the Field for a week	300,000/=	300,000/=
Miscellaneous	450,000/=	450,000/=
Grand total		**1,221,500/=**

APPENDIX F: COPY OF INTRODUCTORY LETTER

KABALE UNIVERSITY

P.O Box 317
Kabale - Uganda
Email: info@kab.ac.ug
admissions@kab.ac.ug

Tel: 256-392-848355/04864-26463
Mob: 256-782860259
Fax: 256-4864-22803
Website: www.kab.ac.ug

DIRECTORATE OF POSTGRADUATE TRAINING

March 25th , 2022

To whom it may concern

This is to certify that Mr. Akatuhurira Frank Bindeba Reg. No: 2018/A/MAED/1560/W is a postgraduate student of Kabale University studying for a Masters of Arts in Educational Management in the department of Foundations of Education.

He has successfully defended his Research Proposal for a study entitled,

"Factors influencing students' enrolment and retention into sciences at Advanced level in secondary schools in Uganda. A case of Kabale Municipality Secondary Schools."

The student is now ready for field work to collect data for his study. Please give the student any assistance you can to enable him accomplish the task.

Thanking you for your assistance.

Yours sincerely

KABALE UNIVERSITY DIRECTORATE
25 MAR 2022
OF POSTGRADUATE TRAINING
P.O. BOX 317, KABALE

Dr. Sekiwu Denis
DIRECTOR, POSTGRADUATE TRAINING