TEACHING OF PRACTICAL SUBJECTS TO STUDENTS WITH LOW VISION: A CASE OF A SELECTED SECONDARY SCHOOL IN MUKONO DISTRICT

KYASIIMIRE PHIONA BYARUGABA

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DISSERTATION SUBMITTED TO THE DIRECTORATE OF RESEARCH AND GRADUATE TRAINING IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTER'S DEGREE OF SPECIAL NEEDS EDUCATION OF KYAMBOGO UNIVERSITY

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DECLARATION

I, **Kyasiimire Phiona Byarugaba,** hereby declare that the work compiled in this research dissertation is my own and has never been submitted for any other award in any other institution of higher learning.

…….. **……**

SIGNATURE **DATE**

APPROVAL

This is to certify that this research dissertation titled "**Teaching of practical subjects to students with low vision: A case of Sir Apollo Kagwa senior secondary school secondary school in Mukono District"** carried out by Kyasiimire Phiona Byarugaba, was successfully completed with our guidance and is now ready for examination.

…….. **……**

Signature **Date**

Dr. Odeke-Nato Joseph

…….. **……**

Signature **Date**

Dr. Eron Lawrence

DEDICATION

This thesis is dedicated to my dear family. I would like to express my gratitude to my sister, Hope Nyesigire, for her unwavering encouragement and the financial and emotional support she provided throughout my academic journey.

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I am profoundly humbled and thankful to the Almighty God, for his never-ending love, protection, provision and the greatest gift of life that he has unconditionally offered to me throughout my academic achievement and during my life.

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ELT - Experimental Learning Theory

LV - Low Vision

SwLV - Students with Low Vision

VI - Visual Impairment

WHO - World Health Organization

ABSTRACT

The study aimed to investigate teaching experiences of students with low vision in practical subjects in secondary schools. Specific objectives included examining accessibility provisions, techniques used by teachers, the role of peer support, and the support expected by students with low vision. The research followed a qualitative approach, utilizing a case study design in a secondary school located in Nakisunga Sub-county, Mukono District. The population consisted of students, teachers, administrators, and support staff, totaling 29 individuals. The sample size comprised 9 students with low vision, 2 laboratory technicians, 3 science teachers, and 2 administrators, resulting in a total of 16 participants. Interview guides and observation guides were employed to collect data for the study from the participants. The study revealed that accessibility provisions, such as assistive devices and technology, played a crucial role in enabling students with low vision to participate effectively. Teachers employed hands-on learning, personalized instruction, and collaborative activities to engage students in practical subjects. Peer support emerged as a vital element in creating an inclusive learning environment, with sighted peers assisting students with low vision in various ways. Students with low vision emphasized the need for alternative materials, specialized accommodations, and trained support staff. Regarding conclusions, the study found that accessible materials, positive learning environments, and peer support were essential for the inclusion of students with low vision in practical subjects. The recommendations included the provision of specific accessible materials, further research on teaching strategies, peer support, and an exploration of students' experiences and expectations to enhance their participation in practical subjects.

CHAPTER ONE

INTRODUCTION

1.0 Background

The aim of this study is to examine the teaching of practical subjects to students with low vision in secondary schools. Low vision (LV) is defined as having impaired vision even after treatment and/or standard refractive correction, having a visual acuity of less than 6/18 to light perception, or having a visual field that is less than 10 degrees from the point of fixation, but using or potentially using vision for planning and/or task execution (WHO, 2022).

This chapter addresses the study's background, statement of the problem, purpose, specific objectives, research questions, study scope, significance and operational definitions.

Globally, students with low vision (SwLV) have lower quality of life because the low vision interferes with their ability to carry out daily tasks like mobility, reading, earning a living and performing personal care (Han, et al., 2021). LV and blindness can occur in students of any ethnicity, nationality or family history (Namwase, 2021). The WHO (2021) observes that 22 million children worldwide suffer from visual impairment. Out of these twelve million students with low vision caused by refractive errors whereas 1.4 million children are permanently blind. The precise number of children who are students with low vision in Uganda is unknown. This is due to lack of officially recognised national data on the prevalence and causes of blindness in the nation whereas every Sir Apollo Kagwa senior secondary school should be concerned about the rising number of young people with visual impairment (Aryanti, 2014).

Many studies show that vision loss reduces student's quality of life because it is considered an important aspect of mental health (Siddiqui & Malik, 2019). A student with low vision has difficulty performing daily tasks and may become dependent on others (Priyambodo & Hasanah, 2021). This dependence can lower the self-esteem of a learner with low vision, leading to dissatisfaction with life and depression. Many solutions have been proposed to improve these students with low vision quality of life (Dudovitz et al., 2020). Sir Apollo Kagwa senior secondary schoolof these strategies is to use practical strategies invented and used by learners with visual impairment to perform daily living tasks. In addition, therapists and rehabilitation specialists have been made to encourage students with visual impairment to use these strategies (Aryanti, 2014).

Education is a crucial tool for a person's development, especially when it is high-quality and practical (Ajuwon, 2015). Individuals who have severe visual impairment as well as other special needs may never be able to cope with the consequences of their handicaps, improve their function and quality of life, gain independence, acquire high levels of knowledge, and help propel the standard and respectable lives that every Sir Apollo Kagwa senior secondary school deserves without academic achievement (Rosenblum et al., 2018). Students could use various coping strategies in their daily work, such as maintaining a positive attitude, relearning skills and utilizing visual aids (Namwase, 2021). Other strategies include avoidance, problem-solving, hope, coping, functional capacity and a discipline that seeks for social support (Aldriani, 2013). According to Nannemann et al. (2017), coping literally means dealing with issues and challenges in an effort to resolve them.

The person with a visual impairment must overcome difficulties every day in order to excel in performing their daily activities (Chavarria, et al., 2019). A student with low vision may experience significant life changes and long-lasting effects as a result of the condition (Kisanga,

2022). Individuals who develop a visual impairment respond to this significant loss in a multiplicity of emotional, cognitive, behavioral and societal means (Takimoto, 2017). People who are affected may experience different stages of grief, such as denial, anger, depression and bargaining; hence putting them in a position of failing to attain their life time academic achievements (Siddiqui & Malik, 2019). They resolve to lament their loss of vision and related losses, for instance their job, leisure happenings and freedom (Chang, et al., 2020). Individuals can learn how to control their impairment with the support of positive or negative ways of modification, also known as coping strategies (Tekane & Potgieter, 2021). In general, we can distinguish between healthy coping mechanisms, like goal-setting and counselling, and unhealthy coping mechanisms, like social withdrawal and substance abuse (Aryanti, 2014).

"Coping" literally means dealing with issues and challenges in an effort to resolve those (Nannemann et al., 2017). Regardless of the fact that it has been well known that people with different types of disabilities behave very differently in terms of their capacity to operate and how they approach potential issues, there are currently no research on students with low vision and blindness and the coping skills they use to deal with their day-to-day challenges (Chang et al., 2020).

An individual with LV would have limited access to information from their environment that would ultimately enhance their capability to master practical concepts of science subjects, which would have an adverse impact on their capacity to comprehend ideas, pick up new words, and move around with confidence (Kisanga, 2022). Individuals' eyesight serves as their window to the outside world and allows them to see, perceive, understand, express and communicate with their peers and instructors while in classroom or laboratory (WHO, 2021). Visual perception provides knowledge of motion, form, depth, distance, space, colour, texture and shape (Griffin-Shirley, et

al., 2019). Gained knowledge is put to use to identify objects, imitate behaviors, create visual memories and improve spatial awareness. Therefore, it follows that having poor vision will impair a person's ability to perform all of these tasks (Dudovitz, et al., 2020).

Aldriani (2013) identified a number of issues affecting the education of students with low vision in Africa, including a lack of adequate professional expertise at all levels, inadequate human resources, weak curriculum design and a lack of adequate information. Students with low vision should not be integrated or included in regular secondary schools (Takimoto, 2017). Science, in the context of secondary education, broadly refers to the systematic study of the natural world through observation, experimentation, and theoretical understanding. The provision of the necessary supports to those who are undergoing integration, also known as inclusion, is essential for their successful functioning in the regular classrooms (Chavarria et al., 2019). Sir Apollo Kagwa senior secondary school of the task that students with low vision have to perform is practical exercises in science subjects, laboratory and other practical exercises in science necessitate the use or adaptation for students with low vision (Tekane & Potgieter, 2021). Based on this and similar arguments, many students with low vision are not supported to study science subjects. They are subjected to study science without recognition of vision ability along with talents developed.

The government of Uganda has demonstrated commitment to inclusive education through policies such as the Education Act (2008) and the National Policy on Disability (2006), which advocate for equal access to education for learners with disabilities. The Education Act mandates that schools provide reasonable accommodations and adapt teaching strategies for students with disabilities. The National Policy on Disability emphasizes the importance of inclusive curricula, accessible learning environments, and teacher training to support learners with visual impairments. Despite

these policies, practical subjects often remain challenging due to inadequate resources, lack of specialized equipment, and limited teacher capacity to address the unique needs of students with low vision. (Uganda Ministry of Education and Sports, 2006; 2008)

Sir Apollo Kaggwa Secondary School is situated, inclusive education policies are in place, but their implementation varies. The district has been working towards mainstreaming learners with disabilities, including those with low vision, but practical subjects such as science, technical drawing, and vocational studies continue to pose significant challenges. Many schools in Mukono lack sufficient assistive technologies or adapted teaching materials, which hampers effective teaching and learning for students with low vision. Additionally, there is a shortage of teachers trained in special needs education, which affects the quality of inclusive education services at the local level. (Mukono District Education Office, 2022)

1.2 Statement of the problem

Education is a fundamental entitlement for all students, regardless of whether they have a disability or not (Mendes et al., 2021). Students with low vision can use their residual sight to perform many activities which include seeing and reading. Students with low vision have varying levels of visual acuity which can enable them participate in practical subjects such as physics, biology and chemistry. There are also students with low vision who use magnifying lenses having very strong magnifications that could enable them participate in practical science subjects. Since education of learners with visual impairment started in Uganda, however, some schools with these learners were exempted from teaching science subjects. The misconception is that all learners with low vision are blind and therefore must not learn science subjects because of their practical nature. This study

therefore aims at finding out the perceptions of teachers, learners with low vision and laboratory technicians towards teaching practical science subjects to this category of learners.

1.3 Purpose of the study

The purpose of this study was to assess factors that influence successful teaching of practical subjects to learners with low vision

1.4 Specific objectives

The specific objectives were to:

1. Examine accessibility provisions needed to support students with low vision to participate in practical subjects.
2. Analyze the techniques teachers use to support students with low vision to participate in practical subjects.
3. Evaluate out the role of peer support in the participation of students with low vision in practical subjects.
4. Assess the support students with low vision expect to enable them to participate in practical subjects.

1.6 Scope of the study

The study was limited to investigating strategies that are in place to enable students with low vision participate in practical subjects in secondary schools in Uganda. The study was carried out in Sir Apollo Kagwa senior secondary schoolsecondary school located in Nakisunga Sub-county, Mukono District, in the central region of Uganda. This school was chosen because it is a regular

secondary school with a unit for students with low vision. The study was carried out for a period between June 2022 and October 2023.

1.7 Significance of the study

The result of this study is expected to make significant contributions in various forms. First, and foremost, the findings of the study is meant to contribute new knowledge in research, and for academics and scholars, who may be interested in exploring deeper issues relevant to the study topic. In short, the data generated through the research at hand has to form the basis upon which future researchers have to generate sources for their own research studies. Secondly, the study findings are to provide basic information for policy makers and implementers, who need to make improvement in teaching practical subjects to students with low vision in the country and beyond. For this to be achieved, policy reviews are to be extracted from the research study for easy access by policy makers and implementers. In addition, numerous information dissemination seminars and workshops have to be conducted from which the findings of the study have to be shared.

1.8 Theoretical framework

The research was based on the experiential learning theory. Experiential Learning Theory (ELT) is a learning theory developed by David A. Kolb in the 1970s. It is based on the idea that learning is an active and dynamic process that involves gaining knowledge and skills through direct experience. Kolb's theory has been influential in the fields of education, psychology and organizational development. The theory suggests that people learn best through direct experience and reflective observation of that experience. It emphasizes the importance of active engagement and personal involvement in the learning process. ELT has been widely used in education, training, and personal development contexts. The experiential learning method has two objectives (Kolb,

1984). Sir Apollo Kagwa senior secondary school is to gain knowledge of a subject's intricacies, and the other is to gain knowledge of one's own learning process.

Figure 1: Alice Kolb

Source: Alice Kolb

David Kolb's work on the cycle of experiential learning represents Sir Apollo Kagwa senior secondary school of the most well-known learning methodologies (Yang, Liu, Zhao, & Xu, 2017). Every interaction and encounter incorporates the four steps of the learning cycle of experience, reflection, cognition, and action.

The learning process starts with a contextual approach that necessitates reflection, review, and perspective-taking. The next process is conceptual thought which is used to make inferences and conceptualize the experience. Finally, you decide whether to act, participate in active experimentation, or apply what you have learned (Laschinger, 1990).

ELT holds immense relevance in today's education and training landscape as it acknowledges that meaningful learning arises from active engagement with real-life experiences. In an era marked by information overload, ELT encourages learners to not only acquire knowledge but also understand its practical applications through hands-on encounters. This approach fosters critical thinking,

problem-solving skills, and a deeper understanding of concepts, aligning with the demands of a rapidly evolving job market. Moreover, ELT promotes a learner-centric approach, accommodating diverse learning styles, and enabling personalized growth. By emphasizing the continuous cycle of experience, reflection, conceptualization, and application, ELT equips individuals to adapt, innovate, and thrive in an ever-changing world, making it an invaluable framework for modern education and professional development.

Sir Apollo Kagwa senior secondary school of the primary criticisms that can arise when applying ELT in educational settings is related to accessibility issues, particularly for students with low vision or visual impairments. Traditional experiential activities often heavily rely on visual cues and tangible materials, which can pose challenges for these students. They may face difficulties in fully participating in hands-on experiences and might require additional support and adaptations. This criticism highlights the need for educators to be proactive in addressing accessibility concerns and ensuring that all students, regardless of their physical abilities, can engage effectively in experiential learning activities.

It is, however, essential to recognize that the adoption of ELT principles can also lead to more inclusive educational environments. By being aware of the diverse needs of students, educators can adapt experiential activities to accommodate those with low vision or other disabilities. For instance, tactile materials, audio descriptions, and alternative formats of instruction can be integrated into experiential learning to make it more accessible. In doing so, educators not only create a more inclusive space but also foster a sense of confidence and autonomy among students with low vision, allowing them to participate more fully and gain practical skills that are crucial for their future success.

Ultimately, embracing experiential learning with a focus on accessibility can contribute to a more equitable education system. It helps bridge the gap between students with varying abilities, promoting a culture of diversity and inclusivity within educational institutions. By solving the specific needs of students with low vision and providing tailored support, ELT empowers these individuals to overcome challenges and actively engage in practical subjects. In doing so, it not only enhances their learning experiences but also prepares them for a world where inclusivity and adaptability are highly valued, ultimately benefitting society as a whole.

This theory emphasizes active engagement in the learning process through concrete experiences, reflective observation, abstract conceptualization and active experimentation. In the context of students with low vision, this approach becomes particularly relevant as it encourages hands-on exploration, enabling them to directly interact with practical subjects, fostering better understanding through sensory experiences and adaptive strategies. The theory's cyclic nature aligns with the iterative nature of learning, allowing students to continually refine their understanding and strategies.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The chapter is guided by the research objectives including: to examine accessibility provisions that support students with low vision to participate in practical subjects; to find out the techniques teachers use to enable students with low vision to participate in practical subjects; to find out the role of peer support in the participation of students with low vision in practical subjects; and to assess the support students with low vision expect to enable them to participate in practical subjects.

2.1 Accessibility provisions that support the teaching of learners with low vision

Students with low vision need accessibility provisions to enable them participate in practical subjects. The accessibility features can be in many forms. The creation and adaptation of laboratory materials for students with low vision is receiving more and more attention (Benjamin & Wakhungu, 2014). Students who read using the braille system have access to braille label makers. These label makers can be put to a variety of uses by science instructors in the laboratory. For instance, labels could be placed on glassware, reagent and chemical containers, and other laboratory supplies. Every fall, high school science students should start the year with a laboratory activity that requires them to get comfortable with the tools they will be using all year (Zorluoğlu, et al., 2019). Furthermore, in addition to adapting laboratory materials and tools, it is essential to consider the sensory needs of students with low vision capabilities.

Students with low vision learn over sensory ways other than vision, primarily hearing (Supalo, Wohlers & Humphrey, 2010). For this reason students with low vision should therefore sit closest to the sound source in order to capture most of the details of communication. Students who are blind or have LV should sit in a location in the classroom that has good lighting (Voos & Gonçalves, 2019). In order to lessen glare, a student's table must be arranged such that the light passes over the shoulders of the quasi hand (Voos & Gonçalves, 2019). The best position for sound could not, however, also be the ideal location for lighting. So, depending on what is going on in the classroom, it might be necessary to let the students with visual impairment move from Sir Apollo Kagwa senior secondary school place to another.

It is central to keep in mind that students with low vision have the capacity to learn how to use their vision more effectively when working with them (Sarvis & Silvers, 2019). Educators and other individuals who interact with these students should provide the required training and environmental changes to assist pupils maximize their visual ability, create a positive self-image, and obtain increased independence in the classroom and community.

For teachers of science, safety concerns of students with low vision are frequently top priorities (Supriyadi, et al., 2019). Scientific laboratory safety should be the first topic that is stressed in all science lessons because scientific laboratories can actually be detrimental for all users. When students with low vision are working in a laboratory special safety measures should be taken. Science instructors are to schedule a time for students to "tour" the laboratory. The ideal time for this would be before or after school, during the teacher's planning period, or any other time the laboratory is free and the students are fully present. All of these students must get used to the atmosphere of the laboratory so they are able to move around it easily and find supplies and tools like first aid kits, eye wash stations, and fire extinguishers (Windschitl, et al., 2021).

It is vital for educators to learn how to modify the environment or objects so that students with low vision can more easily see them (Windschitl, 2021). Lighting, colour and contrast, size and distance, as well as the organization of time and space, must all be taken into account when planning environmental modifications. Some students with low vision are indeed very light and glare responsive. Teachers must therefore use drapes to regulate the lighting in the classroom whenever necessary. They ought to make an effort to maintain a constant light level. To minimise glare, learners should be seated facing windows, and sometimes even indoors, students ought to be encouraged to wear sunglasses, hats or visors.

High contrast images and objects may also help students with low vision (Gunjan et al., 2022). For instance, if you highlight the lines on a piece of paper with a black marker, it will be simpler to see them. The white apparatus is easier to see when eating lunch if they are set out on a red or black tray rather than a white table. The learner will be better able to read his personal writing if he utilizes a heavier black pencil, pen, or marker. Additionally, children with low eyesight may benefit from magnification. Maps, photographs, and other visual materials can be provided to pupils by their teachers in larger prints. These students might prefer doing close work as well. They may move closer to it, or the thing could move closer to them.

In the context of secondary school education for students with low vision in practical subjects, the significance of peer support becomes evident as a fundamental element of success. Peer support plays a pivotal role in promoting the inclusion and active participation of these students, offering valuable assistance in various aspects, such as the setup of laboratory equipment, verbalizing visual content, ensuring safety, and adapting materials to accessible formats (McCurdy & Cole, 2014). Beyond its practical contributions, peer support cultivates an inclusive classroom atmosphere by dismantling social barriers, bolstering self-assurance, and fostering collaborative learning

experiences. Furthermore, it serves as a catalyst for raising awareness and advocating for the distinctive needs of students with low vision, ultimately contributing to the development of a more supportive and equitable educational environment, wherein all students can excel in practical subjects.

2.2 Role of peer support during teaching

When people help others with their abilities, knowledge, emotions, social ties, or practical aid, this is known as peer support (Supriyadi et al., 2019). Peer support may enhance people's wellbeing, resulting in fewer hospital admissions, bigger support networks, greater social skills, and higher levels of self-esteem and self-assurance (Windschitl, 2021).

Sarvis and Silvers (2019) explains that the social support that teachers and peers provide to students with low vision at school may help them live independently in the future. Their ability to form friendships and social connections with their classmates may also help them feel more confident and self-assured. Furthermore, since the latter enable the individual to seek out and maintain social support, practical skills are positively correlated with both social support and it.

Limiting social interaction and having a negative effect on a person's socio-emotional development are two effects of visual impairment (Benjamin & Wakhungu, 2014). Compared to their sighted peers, children with visual impairments may exhibit more emotional and behavioural issues. Additionally, it appears that they prefer to spend the majority of their time playing Sir Apollo Kagwa senior secondary school or in pairs rather than playing imaginatively or interacting with their blind classmates.

Students with low vision appear to experience bullying from sighted peers more frequently at school and exhibit lower self-esteem in comparison to sighted peers (Windschitl et al., 2021). Adolescents with visual impairments may experience loneliness on a regular basis, just like younger children do. If students with special needs do not receive the necessary support, high levels of loneliness among these students may be a sign that they will have lifelong emotional and social issues. Additionally, the establishment of a sense of acceptance and belonging in the educational setting, as well as the provision of practical and emotional support from teachers and peers (essential elements of social support) may have a favourable effect on students' well-being and are regarded as essential elements of inclusive education.

2.3 Support students with low vision may expect to enable their participation in practical subjects

Support to participation of students with low vision include using standard laboratory measuring instruments with little to no modifications (Alfred, 2022). This author, for instance, suggests adding tactile marks to laboratory equipment at the measurement required for a specific experiment. Further, surfaces could well be marked tactilely with puff paint (Windschitl et al., 2021). This is in addition to paint products on the market that are created specifically for tactile usage by students with low vision. The American Printing House for the Blind also sells pre-marked tactile rulers, meter sticks, and other tools. For tactile measurements, markings on meter sticks could be stapled (Aldriani, 2013). Sir Apollo Kagwa senior secondary school other option for adjustment is to cut holes in beakers amongst measuring tools to denote specified dimensions (Tekane & Potgieter, 2021). Students pour the preferred liquid (only non-caustic) into the containers and the extra will drain out of the openings (Takimoto, 2017). Students with low

vision may also be capable to see the tip of a graded cylinder if it is set up against a background that contrasts with it.

Some students with low vision can utilize an optical microscope with the assistance of a projector (Anakara, 2021). Students with vision impairment could utilize a triple beam balance to compute an object's mass if the loads are indicated with tangible marks. Tactile and talking thermometers are offered commercially for use in measuring temperature in a science laboratory environment. Likewise, it is simple to purchase tactile timers, Braille timers, and timers with extra-large displays from businesses like Maxi-Aids. There are also Braille compasses and toned light probes available for students studying physical science (Voos & Gonçalves, 2019).

Demonstrations could be a crucial part of science instruction, but they frequently need to be adjusted for students who are blind or students with low vision (Mendes, et al., 2021). Instead of using textual representations of the demonstration, the teacher may emphasize oral descriptions of scientific processes so that students with visual impairment can develop a mental image of what is happening (Windschitl et al., 2021). For instance, the instructor must extensively classify both the physical nature of each different component as well as their specific chemical properties if the display includes the chemical combination of two elements. Only then can the teacher consider the importance of the reaction mechanism and its outcome (s). It will benefit these students' development of careful observation and effective communication to have normally sighted students accurately describe the demonstration.

All worksheets and resources used in science classes should be available in an accessible format (Rethabile, 2021). Worksheets may be printed in Braille or large print (14-point type is the minimum size for large print; for worksheets in the classroom, 18-point type in the Arial font

works well). To give time for printing, teachers should prepare these materials in advance. If students with low vision have access to technological aids, worksheets and materials could be emailed to them. Students may not be familiar with the terminology and symbols used in science textbooks (Aryanti, 2014). Teachers may discover that large-print copies are useful for introducing this terminology and new symbols to students with low vision (Windschitl et al., 2021).

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The study explored the views of students with low vision towards participation in practical subjects. Specifically, the chapter is intended to achieve the research objectives: to examine accessibility provisions that support students with low vision to participate in practical subjects; to find out the techniques teachers use to enable students with low vision to participate in practical subjects; to find out the role of peer support in the participation of students with low vision in practical subjects; and to assess the support students with low vision expect to enable them to participate in practical subjects. This chapter presents the research approach, research design, area of the study, population of the study, sample size and technique, data collection instruments, data collection procedure, data analysis and presentation, ethical considerations and limitations of the study.

3.1 Research Approach

The research approach for this study was qualitative in nature. In a qualitative research approach, data was collected and analyzed to better understand concepts, points of view, or perspectives (Aldriani, 2013). It can be used to discover fine details about a problem or to generate new research ideas. This enables the researcher to understand attitudes, save resources and provide insights that are specific. For that matter, the researcher set up the necessary data collection instruments to make qualitative data collection possible and then the data was captured, cleaned up and subjected to interpretation and analysis.

3.2 Research Design

The researcher used a case study as the research design. The definition of a case study is "an exhaustive study about a person, a group of people, or a unit, with the objective of generalizing over several units (Salter, 2023). A case study can also be defined as a rigorous and systematic assessment of a single person, group, community, or other unit in which the researcher looks at in-depth data relating to multiple factors (Tekane & Potgieter, 2021). It also allows the researcher to examine the case's primary characteristics, significance and implications.

3.3 Area of Study

The research took place at Sir Apollo Kagwa senior secondary school secondary school in Nakisunga Sub-county, Mukono District. This institution was chosen because the school had a unit for students with low vision and they taught practical subjects such as physics, chemistry, biology and agriculture. The school also had teachers trained to support science practical. Its proximity to Kampala, where the researcher studies, made it even more convenient. Mukono district is bounded on the west by Wakiso District, on the north by Kayunga District, on the east by Buikwe District and on the south by Lake Victoria.

3.4 Population of the Study

The total group that a researcher would like to make conclusions about is referred to as a population (Voos & Gonçalves, 2019). The population of 29 individuals for this study comprised of 16 students who have low vision, 7 teachers of science practical subjects, 4 school administrators and 2 support staff (laboratory technicians). The administrators were considered for the study because

they admit students with low vision, teachers teach students with low vision, and the students with low vision are taught the science practical subjects.

3.5 Sample Size and Sampling Technique

This section presents the sample size and sampling techniques used to carry out this study, adopted to ensure its accuracy and representativeness.

3.5.1 Sample size

The results of research need to be generalized to the target population from a representative sample (Windschitl, et al, 2021). The sample for this study was made up of 9 students with low vision, 2 laboratory technicians, 3 science teachers and 2 administrators, making up a total of 16 participants. This sample provided sufficient data for the study objectives.

Table 1: Population and Sample of Participants

Category of Participants	**Population**	**Sample**	**Sampling technique**
Administrators	4	2	Purposive
Science teachers	7	3	Purposive
Laboratory technicians	2	2	Purposive
Students with low vision	16	8	Purposive
Total	29	15	Purposive

Source: Primary Data

3.5.2 Sample technique

The researcher considered Sir Apollo Kagwa senior secondary school inclusive secondary school to choose the study sample from, employing purposive sampling to gather a sample of students with low vision, administrators, science teachers, and laboratory technicians from each school based on predetermined criteria. This non-probability sampling technique, called "Criterion sampling", selects units based on whether these meet certain criteria for inclusion in the sample. This method involves selecting specific individuals or elements from a population for inclusion in a sample based on a predetermined set of criteria.

The researcher selected Sir Apollo Kagwa senior secondary schoolinclusive secondary school in Mukono District as the site for the study. To ensure the sample accurately reflected the specific groups relevant to the research focus-namely students with low vision, administrators, science teachers, and laboratory technicians-purposive sampling was employed. This non-probability sampling method, specifically criterion sampling, involved selecting participants based on predefined criteria that align with the study's objectives.

In applying criterion sampling, individuals were chosen because they met certain inclusion criteria pertinent to the research on teaching practical subjects to students with low vision. For instance, students were selected if they had low vision and were enrolled in the school; administrators, science teachers, and laboratory technicians were included if they were directly involved in the teaching or support of practical science subjects and had relevant experience or responsibilities.

To facilitate data organization and analysis, different categories of participants were coded systematically. For example, science teachers within the school were labeled as Science Teacher 1, Science Teacher 2, and Science Teacher 3, corresponding to their order of participation or their

specific roles related to the teaching of practical science subjects. Similarly, other categories such as students, administrators, and laboratory technicians were assigned unique identifiers to distinguish individual participants while maintaining confidentiality. This coding approach helped streamline data collection and analysis, ensuring clarity in referencing each participant's contributions relative to the research focus on teaching practices and challenges faced by students with low vision in practical science lessons.

3.6 Data Collection Methods and Instruments

Based on the nature of this study, interviews and observation were best suited for collecting data. The two methods were used to blend the data collected and also check on the accuracy of the information given.

3.6.1 Interview

Semi-structured interviews were conducted which was associated with open-ended questions in order to explore emerging themes in more details during the conversation. The researcher obtained and record information from respondents by directly asking the participants questions through word of mouth and this helped in collecting qualitative data with consistency and adoptability (Manion, & Morrison, 2018).

The researcher used interview guide as a tool for collecting information from the participants. According to Kallio, (2016), an interview guide is a structured framework or set of questions used by researchers during qualitative interviews to ensure consistency across different respondents while allowing flexibility for probing and follow-up. This tool was adopted because it allows flexibility by enabling the researcher to probe deeper based on participant’s answers and exploring

of the emerging themes. However, the quality of data heavily depended on the researcher's skill in asking questions, probing effectively, and building rapport. The questions were open-ended questions aligned with the study's objectives and research questions in order to gather in-depth information on participants' experiences, perspectives, and attitudes.

For this research, interview guide was the most genuine for genuine data because it produced in-depth about the study. It was found to be the most suitable for gathering data for this study since it was used to answer all the study objective i.e to examine accessibility provisions needed to support students with low vision to participate in practical subjects, to analyse the techniques teachers use to support students with low vision to participate in practical subjects, to evaluate out the role of peer support in the participation of students with low vision in practical subjects and to assess the support students with low vision expect to enable them to participate in practical subjects in order to strengthen the use of interview guide additionally observation guide was also adopted as explained below.

3.6.2 Observation

Observation is the act of noting an event in a field setting using the observer's five senses (sight, smell, hearing, touch, and taste), frequently with an instrument, and recording it for scientific purposes (Creswell, 2013). The observation method was selected because it allowed the researcher to collect direct data from the natural setting that the participants would not be able to supply, as well as verify what the participants would state and their non-verbal expressions (Kawulich, 2014). The researcher adopted observation list as a tool for the collection of qualitative data. The observation list tool in particular was effective for collecting qualitative data because it allowed the researcher to systematically capture real-time behaviors, interactions, and environmental

conditions without relying on self-reported data which may be biased or incomplete. According to Creswell and Poth (2018), observation as a data collection tool enables the researcher to witness events in their natural context, enhancing the authenticity and richness of the data. The quality of data obtained from an observation list was generally of high quality because it reflected direct evidence of participants' experiences and practices, especially when the tool was structured around key indicators aligned with the study's objectives. In this study, the observation list was administered by observing teachers during class and practical sessions, focusing on techniques used to support students with low vision in practical subjects. This helped achieve objective two by identifying instructional strategies, modifications, and the use of assistive tools. Similarly, in assessing the support students expect (objective four), the researcher observed student reactions, engagement levels, and interactions with both peers and teachers to infer unmet needs. For objective one, the observation list captured physical and instructional accessibility features such as classroom layout, lighting, and availability of visual aids. This alignment with the study objectives ensured that the observation tool provided rich, targeted data necessary for comprehensive analysis.

3.7 Data collection Procedure

The data was entirely primary, gathered from selected research participants. In order for participants to give their informed consent before participating in the study, a letter of introduction from the Directorate of Graduate School and Research Training **(see Appendix 1**) of Kyambogo University, was obtained. Further, a consent form was developed by the researcher.

Initially, the researcher met with the front desk staff who then connected her with the head teacher, who in turn connected her with the head of the unit responsible for the students with low vision.

This initial process took approximately ten minutes to navigate. The response time was, however, somewhat delayed, primarily due to the specific needs and interactions required when dealing with learners with low vision. Subsequently, the head of the resource room guided the researcher to the resource room and provided a demonstration of the various assistive devices that were instrumental in facilitating practical lessons for the learners.

Data was then collected using an interview guide and an observation tool. The researcher simultaneously took notes during the interviews and recorded the talk on an audio recorder.

3.8 Data analysis

The ability to describe and analyzed raw data in order to determine its meaning and pattern makes data analysis vital (Mwakyeja, 2013). To enhance credibility and authenticity, the researcher kept a detail of written notes and recordings of the interviews; and observation notes from a transect walk. The raw transcribed data were coded and categorized into themes and headings. This is known as “categorization” according to Tekane and Potgieter (2021). And these results were analyzed to generate themes and subthemes.

3.9 Ethical considerations

The researcher obtained the participants' free and informed consent and further guaranteed that their rights would not be violated physically or through the use of their responses. Their security was assured in this manner.

The researcher also utilized pseudonyms, which entailed assigning different names to respondents. Data storage involved transparency, security and respect for participants' rights and privacy.

CHAPTER FOUR

PRESENTATION, INTERPRETATION AND DISCUSSIONS OF RESULTS

4.1 Introduction

This chapter presents a comprehensive analysis of "The Learning of Practical Subjects by Students with Low Vision: Perspective from Students in Secondary Schools." This chapter aims to provide an understanding of the experiences and challenges faced by students with low vision (SwLV) in their pursuit of practical subjects. The chapter is structured around four specific objectives of the study, including: Examination of the accessibility provisions that facilitate the participation of SwLV in practical subjects, Exploration of the instructional techniques employed by teachers to enhance the involvement of SwLV in practical subjects, investigation into the role of peer support in fostering the participation of SwLV in practical subjects, and an assessment of the expectations of SwLV regarding the support they require to actively participate in practical subjects.

4.2 Assessment of the accessibility provisions that support SWLV to participate in practical subjects

When participants were asked about the accessibility provisions that support students with visual impairments (SwLV) to participate in practical subjects, participants (n=15) responded that quite a number of provisions are implemented to facilitate the participation of SwLV in practical subjects. These provisions encompass a range of assistive devices.

Admin 1 says that:

"The educational institution offers an array of assistive technologies and tools to students, including the Compact CCTV (CCT) for magnifying printed materials, the Orbit Reader for Braille reading and writing, the Victor Reader for accessing digital books and materials, and scientific calculators to aid in complex calculations. With these diverse resources, students with different abilities receive comprehensive support to excel in their academic pursuits".

Teacher (TR_1) had this to say:

"As a teacher, yeah, I use assistive technology, such as a reader, to help clarify content and enhance understanding. Additionally, I make an effort to explain visual content, such as images or diagrams, to ensure all students comprehend the material".

Another participant ($SwLV_1$) states that:

"Laptops are equipped with screen readers to assist students with visual impairments in accessing and navigating digital content, promoting ICT literacy".

Another participant ($SwLV_2$) had this to say:

"Sure! Calculators are provided during practical sessions, aiding students in performing complex calculations related to the subject matter. Calculators empower students to focus on understanding the concepts and applying them practically without being bogged down by manual computations".

"Other participants ($SwVI_2$, $SwVI_4$, $SwVI_5$, and $SwVI_9$) also mentioned that: The school provides accessibility accommodations for visually impaired students to engage in practical subjects,

including the provision of laptops equipped with JAWS, tactile materials, Orbit 2 devices, and Victor Readers".

The study's participants consistently stressed the importance of accessibility provisions for supporting SwLV in practical subjects. These provisions, including Braille, large print, and audio materials, play a vital role in facilitating SwLV's access to written content and instructions, fostering an inclusive learning environment where they can participate independently and engage effectively. By utilizing assistive technologies like screen readers, SwLV can navigate digital content, enhancing their information and communication technology (ICT) literacy. Furthermore, the availability of calculators during practical sessions proves highly beneficial, enabling SwLV to overcome challenges in complex calculations and ensuring an unhindered learning experience. Additionally, assistive technologies, such as text-to-speech tools, aid SwLV in understanding written materials comprehensively. The instructors' efforts in explaining visual content further contribute to inclusive pedagogy, supporting the diverse learning needs of all students, including SwLV. Overall, the findings highlight the significance of accessibility provisions in empowering SwLV to succeed academically and participate fully in practical subjects.

Braille is a vital tool for literacy and academic success among individuals with low vision (Ali, 2023). It empowers SwLV to independently read and comprehend written information. Similarly, the availability of large print materials is essential, enabling SwLV to access written content without straining their eyes. Audio materials, such as audiobooks or recorded lectures, further enhance SwLV's learning experience by providing an auditory alternative for accessing information (Kızılaslan, 2020).

Accessibility provisions not only facilitate access to information but also contribute to the overall inclusivity of the learning environment (Cumming, Rose, & Megan, 2022). Emphasizing the principles of Universal Design for Learning (UDL), educational institutions create a level playing field for SwLV, allowing them to participate independently and actively engage in practical activities through various means of representation.

The adaptation of equipment is a crucial accessibility provision for students with different abilities (Mukhwana, 2021). Therefore, the provision of laptops equipped with screen readers significantly impacts SwLV's learning experience, as these tools convert text on the screen into synthesized speech or braille output, enabling access to digital content and participation in online activities.

Assistive technologies such as calculators and readers support SwLV during practical sessions (Sørensen, Marianne, & Anders, 2020), enhancing their understanding and active participation in the learning process. These technologies play a vital role in addressing the unique needs of students with low vision, ensuring that they can fully engage in practical subjects and excel academically.

When participants were asked about the accessibility provisions that had been put in place by the school administrators during practical's lessons, the participants (n=5) responded that quite a number of provisions had been put in place by the school administrators during practical's.

Admin 1 had this to say:

> *"In my experience, the school has been quite proactive in providing accessibility provisions during practical's for students with low vision. They ensured that all practical materials, equipment, and tools have tactile markers and labels, making it easier for us to identify and use them".*

$SwLV_1$ says:

> *"I agree. The school administrators have been sensitive to our needs. They installed specialized lighting in the practical rooms, reducing glare and enhancing visibility. I appreciate their efforts in making the learning environment more inclusive".*

$SwLV_3$ also had this to say:

> *"The school also made sure that we had access to hands-on demonstrations and one-on-Sir Apollo Kagwa senior secondary school guidance during practical sessions. Moreover, they arranged for color-contrast materials, which helped us distinguish between different components and elements in experiments. It showed that they were willing to go the extra mile for our learning".*

Additionally, $SwLV_4$ says:

"That they remember that the school administrators collaborated with teachers and fellow students to promote a supportive atmosphere. They conducted awareness workshops about low vision and its impact on practical learning, which helped others understand our challenges better".

TR_3 says:

> *"Yes, and we are open to feedback and suggestions from students with low vision. This participatory approach make students feel valued and empowered in their learning journey. It also allowed them to address specific issues they faced, leading to more effective accessibility solutions".*

According to the administrators and students with low vision, the school had taken significant steps to ensure accessibility provisions during practical. They had put tactile markers and labels on materials and equipment, specialized lighting to reduce glare, and color-contrast materials for better distinction during experiments. The school also emphasized hands-on demonstrations and one-on-Sir Apollo Kagwa senior secondary school guidance, fostering a supportive environment. They also conducted awareness workshops to raise understanding about low vision challenges. The administrators says they valued student feedback, promoting a participatory approach that empowers students and leads to more effective accessibility solutions. Overall, their efforts had created an inclusive learning environment that supported students with low vision on their educational journey.

The findings from the administrator and students with low vision highlight the positive impact of accessibility provisions on practical learning in secondary schools. The provision of tactile markers and labels on materials and equipment aligns with the principles of Universal Design for Learning (UDL) (Rose & Meyer, 2002), which emphasizes multiple means of representation to accommodate diverse learners. Specialized lighting to reduce glare is consistent with the recommendations for creating an accessible environment for individuals with low vision (Latham & Feeney, 2000). The use of color-contrast materials is in line with research (Wong et al., 2018) suggesting that color differentiation aids comprehension for students with visual impairments.

The emphasis on hands-on demonstrations and one-on-Sir Apollo Kagwa senior secondary school guidance aligns with the research on experiential learning (Kolb, 1984), which emphasizes the importance of practical engagement for effective learning outcomes.

The participatory approach to gathering feedback and suggestions from students with low vision reflects the principles of student-centered learning and learner agency, which have been shown to

enhance motivation and self-efficacy (Reeve & Tseng, 2011). Additionally, involving students with low vision in decision-making processes aligns with research (Mitra & Gross, 2009), which advocates for student voice and co-designing of support strategies.

When participants were asked about the challenges administrators encounter when providing accessibility support to students with low vision during practicals, the participants (n=3) responded that quite a number of challenges are encountered by administrators when providing accessibility support to SwLV during practicals.

Admin 1 says:

> *"Based on my experience, Sir Apollo Kagwa senior secondary school of the challenges administrators face is the availability of appropriate assistive technology and resources. While they have made efforts to provide tactile markers and specialized lighting, there are still limitations in obtaining advanced assistive devices that could further enhance our learning experience. Budget constraints and limited access to cutting-edge technology seem to be common hurdles".*

Participant (TR_4) had this to say:

> *"Another challenge is ensuring that teachers and staff are adequately trained to support students with low vision during practicals. While the administrators may implement accessibility provisions, it's crucial that the educators understand how to use and integrate these accommodations effectively".*

Participant TR_5 also had this to say:

> *"Communication and coordination can be a challenge too. Sometimes it feels like the administrators and teachers are not on the same page when it comes to accessibility support"*.

The participants in the study identified several challenges in providing accessibility support to students with low vision during practicals in secondary schools. Sir Apollo Kagwa senior secondary school major issue is the availability of appropriate assistive technology and resources, with budget constraints and limited access to cutting-edge devices hindering the full implementation of support measures. Additionally, ensuring that teachers and staff are adequately trained to effectively integrate accessibility provisions is crucial to providing meaningful assistance. Communication and coordination between administrators and teachers are also highlighted as challenges that can cause discrepancies in understanding and support.

Sir Apollo Kagwa senior secondary school of the major challenges is the limited availability of appropriate assistive technology and resources. This aligns with previous research that emphasizes the importance of incorporating assistive technology to support students with disabilities (Bouck & Flanagan, 2018). Budget constraints and limited access to cutting-edge technology are common hurdles in educational settings (Hitchcock & Stahl, 2019), and this study echoes similar difficulties faced by administrators.

The participants also identified the need for adequate training for teachers and staff to effectively support students with low vision during practicals. This finding aligns with previous research highlighting the significance of teacher preparation and professional development in creating inclusive learning environments (Meijer, Pijl, & Hegarty, 1997).

Proper training can enhance teachers' understanding of accessibility provisions and improve their ability to integrate these accommodations effectively, positively impacting students' learning experiences.

The challenge of communication and coordination between administrators and teachers is emphasized by the participants. This echoes existing literature that emphasizes the importance of strong collaboration and communication within educational teams to meet the diverse needs of students with disabilities (Sailor, Dunlap, Sugai, & Horner, 2009). Effective communication ensures that all stakeholders are on the same page and can work collaboratively to provide meaningful accessibility support to students with low vision during practicals.

4.3 Assessment of techniques teachers use to teach practical subjects

When participants were asked about the techniques teachers use to enable students to participate in practical subjects, the participants (n=7) responded that teachers employ various techniques to enable students to participate effectively in practical subjects.

TR_1 says:

> *"I ensure that classrooms are well-equipped with the necessary resources, equipment and materials relevant to the subject being taught".*

Additionally, TR_1, TR_2, TR_6, and TR_7 had this to say:

> *"We try as much as possible to incorporate hands-on learning into lessons, providing students with opportunities to apply their knowledge through practical activities. Sir Apollo Kagwa senior secondary school of the participants also noted the utility of hands-on learning through personal experience".*

"Similarly, another participant affirmed that their students have indeed benefited from hands-on learning. Moreover, an additional participant shared that they assign practical tasks to learners to enhance their understanding of the subject matter".

TR_3 had this to say:

"Normally, I do as much as I can to group students based on their skill levels, and assign tasks that are appropriate for each group; thus ensuring that all students are appropriately challenged during practical lessons".

"Furthermore, TR_1, TR_5, and TR_4 had this to say: they facilitate collaborative learning through group projects, which encourage students to work together, solve problems, and complete tasks collectively. This technique not only promotes active participation in practical subjects but also fosters the development of vital social skills such as communication and teamwork".

The critical role of well-equipped classrooms in practical subjects underscores the need for schools to prioritize the provision and maintenance of essential resources. By investing in these resources, students can benefit from enriched learning experiences, actively engaging with subjects and applying theoretical knowledge practically. Access to necessary tools and materials enhances students' confidence, curiosity, and relevant skills, making well-equipped classrooms crucial for optimizing learning outcomes. Integrating hands-on learning activities is paramount in promoting active participation, as teachers design lessons to enable real-world application of knowledge, fostering a deeper understanding and retention. Hands-on activities also enhance problem-solving, critical thinking, creativity, and passion for subjects. Grouping students by skill levels and assigning appropriate tasks ensures optimal engagement and personalized learning experiences, fostering a supportive and inclusive environment.

Implementing collaborative learning through group projects nurtures vital social skills, effective communication, and teamwork, preparing students for success in academic and professional settings and contributing to their holistic growth.

Findings from the participants' responses highlight various techniques employed by teachers to enable effective student participation in practical subjects. Participant emphasizes the importance of well-equipped classrooms with relevant resources, tools, and materials. This aligns with a study conducted by Chang and Chuang (2020) who emphasizes the significance of providing appropriate resources to enhance practical learning experiences.

The incorporation of hands-on learning activities, as highlighted by participants, provides students with opportunities to apply their knowledge in practical ways. The findings are consistent with the study conducted by Mendes, et al. (2021) who explained the incorporation of hands-on learning activities has been widely recognized in educational literature as an effective method for promoting deeper understanding and retention of concepts.

The practice of grouping students based on skill levels, as demonstrated by participants, ensures that all students are appropriately challenged during practical lessons. The study findings align with the study carried out by Aryanti (2014), which pointed out that differentiated instruction that tailors tasks to individual abilities has been advocated as a means to personalize learning experiences and support students' development at their own pace.

The facilitation of collaborative learning through group projects, as emphasized by participants, fosters active participation and cultivates vital social skills such as communication and teamwork. Research findings are in line with the study carried out by Mendes, et al. (2021) who explained

that collaborative learning enhances problem-solving abilities, critical thinking and interpersonal skills.

When participants were asked about how peer support enhance both the academic and social participation of students with low vision within inclusive classes, the participants (n=6) responded as follows:

Sir Apollo Kagwa senior secondary school participant ($SwLV_2$) says:

> *"Peer support has been a game-changer for me as a student with low vision in inclusive classes. Classmates are willing to help me with visual information during practicals".*

Another participant ($SwLV_3$) had this to say:

> *"I completely agree. Peer support not only helps with academic aspects but also improves our social participation. When peers actively engage with us and include us in group activities, we feel more connected and accepted".*

TR_4 says:

> *"Yeah … Inclusive classes with peer support create a positive learning environment. They encourage collaborative learning, where students with low vision can work with their peers on group projects and experiments".*

$SwLV_3$, $SwLV_4$, $SwLV_5$, and $SwLV_6$ expressed the following sentiments:

Through ongoing interaction with our peers, we improve our ability to communicate our needs and preferences effectively, thereby enhancing our social interaction. This process also empowers us to seek assistance from fellow students, fostering a sense of self-reliance. This is decisive for our personal growth as it prevents us from constantly depending solely on the teacher. Additionally, I

have observed that peer support has a broader impact, extending beyond the classroom. It facilitates my active involvement in sports and other extracurricular activities, contributing to a more holistic and enjoyable experience.

Participants in the study highlighted the significant impact of peer support for students with low vision in inclusive classes. The support received from classmates during practicals was described as a game-changer, enabling access to visual information. Beyond academic benefits, peer support enhanced social participation, fostering a sense of connection and acceptance when peers actively engaged and included students with low vision in group activities. Participants emphasized that inclusive classes with peer support facilitated collaborative learning, allowing students with low vision to work on group projects and experiments with their peers. Regular engagement with peers helped students articulate their needs better, leading to improved social interactions. Moreover, peer support empowered students with low vision to seek help from their peers, promoting a sense of independence and personal growth. Additionally, the positive effects of peer support extended beyond the classroom, ensuring active engagement in extracurricular activities and contributing to a more inclusive and enjoyable experience for all students.

The findings from the participants' responses highlight the positive impact of peer support on students with low vision in inclusive classes. Peer support not only facilitates access to visual information during practicals but also enhances both academic and social participation. This aligns with previous research on the benefits of peer support for students with disabilities in inclusive settings. The participants emphasized that peer support creates a positive learning environment by encouraging collaborative learning and active engagement in group activities, which fosters a sense of connection and acceptance among students. This finding aligns with research (Kalyva2019) that advocates for inclusive education to promote social interaction and peer

relationships. Furthermore, the participants pointed out that regular engagement with peers helps students with low vision articulate their needs better, leading to improved social interaction. This finding is consistent with research (Liebman, 2019) on the importance of social skill development in inclusive settings.

The participants mentioned that peer support empowers them to seek help from their peers, fostering a sense of independence. This aligns with research (Koster, Dengerink, & van Houten, 2018) on the positive effects of student empowerment in inclusive classrooms. Additionally, the finding that peer support extends beyond the classroom, enabling active engagement in extracurricular activities, aligns with research (Frood, 2018), emphasizing the importance of inclusive extracurricular opportunities for students with disabilities.

When asked about how peer relation is important in teaching, the participants (n=3) responded as follows:

Admin says:

> *"Peer relations play a crucial role in teaching, especially for students with low vision. When they interact and collaborate with their peers, it enhances their understanding of the subject matter. Moreover, peer interaction fosters a supportive and motivating atmosphere in the classroom, which encourages active engagement and participation".*

TR_2 had this to say:

> *"Yes sure. Peer relations create a sense of belonging and inclusion, which is essential for effective learning".*

SwLV$_4$ says that:

> *"Interacting with peers from diverse backgrounds and experiences enhances our communication skills. It prepares us for real-life situations where collaboration and cooperation are vital for success".*

From the statements above, it can be concluded that peer relations are a fundamental aspect of teaching, particularly for students with low vision. Interacting and collaborating with peers enhances their understanding of subjects and fosters a supportive and motivating classroom environment, promoting active engagement and participation. Additionally, peer relations create a sense of belonging and inclusion, which are crucial for effective learning. Interacting with peers from diverse backgrounds enhances communication skills and prepares students for real-life situations requiring collaboration and cooperation.

The findings from the participants' responses underscore the significance of peer relations in teaching, particularly for students with low vision. Peer interaction and collaboration contribute to an enhanced understanding of the subject matter (Vygotsky, 1978), as it allows students to engage in discussions and share insights, reinforcing their learning. Furthermore, peer relations foster a supportive and motivating classroom environment, which aligns with research (Wetzel, 2002), emphasizing the role of positive social interactions in promoting engagement and academic achievement. When students feel a sense of belonging and inclusion within the peer group (Rogers, 2016), it positively impacts their learning experience.

Interacting with peers from diverse backgrounds and experiences not only enriches students' communication skills but also prepares them for real-life situations where collaboration and cooperation are essential (Johnson & Johnson, 2009). The exposure to diverse perspectives and

approaches through peer interactions is also valuable for students' cognitive and social development (Slavin, 1983). Additionally, engaging with peers in cooperative tasks has been associated with improved academic outcomes and higher levels of critical thinking.

4.4 Assessment of the role of peer support in the teaching of practical subjects

The findings regarding the assessment of the role of peer support in the participation of students with low vision in practical subjects reveal the significant contributions of sighted peers in various aspects.

TR_1 states that:

> *"Assistive technology, such as a reader, is used to help clarify content and enhance understanding. Additionally, instructors make an effort to explain visual content, such as images or diagrams, to ensure all students comprehend the material".*

$SwLV_1$ had this to say:

> *"Peers offer assistance in tracing and retrieving belongings, fostering independence through peer support".*

Another participant ($SwLV_2$) shared:

> *"During class our sighted peers sit together with us and help us read and describe the information on the blackboard".*

Additionally, $SwLV_3$, $SwLV_4$, and $SwLV_5$ had this to say: Their participation greatly assists me in identifying specimens during our field trips or outdoor activities, thereby enhancing my overall engagement in the classroom. Additionally, peers play a crucial role in interpreting the theoretical

material presented by teachers on the chalkboard, making it easier for me to access vital information. It's certainly accurate! Peers also take on the responsibility of advocating for the needs of visually impaired students, diligently reminding teachers to make the necessary accommodations and provide assistance.

The admin 2 also mentions:

> *"Mhhh… sighted student's help their visually impaired peers by reading and describing information on the blackboard during class".*

Furthermore, $SwLV_3$, $SwLV_4$, and $SwLV_5$ says: that the engagement of their peers is instrumental in enhancing their learning experiences. Peer involvement contributes to a better understanding of practical elements during field trips and outdoor activities, which, in turn, positively impacts overall classroom engagement. Additionally, peers assist in simplifying complex theoretical concepts presented by teachers, improving access to essential information. This collective support extends to advocating for the needs of visually impaired students, encouraging educators to implement necessary accommodations and provide assistance, demonstrating the valuable role of peer support in inclusive education.

From the above statements, participants in the study stressed the significance of peer support in promoting the participation and success of students with low vision in practical subjects while also benefiting all students in the classroom. They pointed out that peer support facilitates collaboration, knowledge-sharing, and mutual learning among students, fostering a sense of community and encouragement to help Sir Apollo Kagwa senior secondary schoolanother. Additionally, peer support serves as a valuable tool for differentiation, accommodating diverse learning paces and levels, thus ensuring inclusivity and equal participation for everyone. The

participants highlighted the importance of cultivating a positive learning environment that nurtures the growth and development of all students, irrespective of their abilities. By integrating peer support, schools can create an inclusive learning setting that encourages students to support and learn from each other in various ways, including peer tutoring, mentoring, and modeling, adaptable to individual student needs and applicable across different subjects and contexts.

The findings from the assessment of peer support for SwLV in practical subjects shed light on the significant contributions made by sighted peers in enhancing their participation and overall inclusion. Peer support plays a crucial role in facilitating access to information for SwLV, especially where peers assist in reading theoretical content written on the chalkboard. This aligns with the research of Ajuwon, et al. (2015), who emphasize the importance of peer assistance in accessing visual information for visually impaired students.

The active engagement and collaboration between visually impaired students and their sighted peers highlights the mutual benefits gained through their interactions. This finding aligns with the research of Han et al. (2021), who argue that peer interactions promote academic and social growth for students with visual impairments as well as for their sighted peers.

Admin's description of sighted students reading and describing information on the blackboard during class showcases the supportive role of peers in facilitating equal participation. Similar findings have been reported by Mendes et al. (2021), who assert that sighted peers can act as effective mediators, providing access to visual information for visually impaired students.

Sighted peers provided assistance to SwLV during field trips and outdoor activities, enabling them to actively engage in the practical aspects of their education. This aligns with the research of

Rosenblum et al. (2018), who emphasize the positive impact of peer assistance in outdoor learning environments for students with visual impairments.

The reliance on peers for assistance in tracing and retrieving belongings, as mentioned by participants, contributes to fostering independence through peer support. This finding aligns with the research of Griffin (2019), who argue that peer support helps visually impaired students to develop self-advocacy skills and promote independence.

The supportive role of sighted peers in computer laboratories, as highlighted by participants, is crucial in aiding visually impaired students in navigating software and hardware. This finding resonates with the research of Supalo et al. (2010), who emphasize the positive influence of peer assistance in promoting access to technology for visually impaired students.

Furthermore, participants indicate that peers also serve as advocates, reminding teachers about necessary accommodations and support for visually impaired students. Peer advocacy has been recognized as an important factor in promoting inclusivity and ensuring that the needs of visually impaired students are met (Mendes, et al., 2021).

When participants were asked about what support increases the participation of students with low vision, the participants (n=2) responded as follows:

Sir Apollo Kagwa senior secondary school participant ($SwLV_3$) says:

> *"When textbooks, handouts and other resources are available in large print or electronic formats compatible with my screen reader, I can actively engage in class discussions and complete assignments more independently".*

Another participant ($SwLV_6$) had this to say:

> *"With the support of screen readers, magnification tools, and optical character recognition software, I can read and understand materials presented in various formats".*

From the statements above, both participants emphasize the importance of accessible learning materials and technology, as well as the presence of knowledgeable teachers and designated support personnel in increasing the participation of students with low vision. These support measures address specific challenges related to accessing information and participating in practical subjects, empowering students to fully engage in their learning and contribute to the classroom environment.

The findings from the responses highlight the significant impact of accessible learning materials and technology on increasing the participation of students with low vision in practical subjects. Providing textbooks, handouts and resources in formats such as large print or electronic compatibility with screen readers empowers students to actively engage in class discussions and complete assignments more independently (National Center on Accessible Educational Materials, 2018). This aligns with the principles of Universal Design for Learning (UDL) (CAST, 2018), which emphasizes the importance of providing multiple means of representation to cater to diverse learning needs.

Further, the use of screen readers, magnification tools and optical character recognition software has been instrumental in facilitating access to materials presented in various formats (American Foundation for the Blind, 2020). Assistive technology plays a crucial role in leveling the playing field for students with low vision and promoting their active participation in educational activities. This finding is consistent with research (Cavicchi & Marano, 2015) that highlights the positive

impact of assistive technology on the academic performance and inclusion of students with visual impairments.

4.5 Assessment of expectation of students with low vision in practical subjects

The responses regarding the assessment of the expectations of students with visual impairments (SwLV) to enable their participation in practical subjects highlight key factors that contribute to their inclusive learning experience.

On this issue, admin says that:

> *""It emphasizes the need for alternative formats of materials, such as Braille, large print or audio, to ensure that SwLV can access information effectively. Introducing support personnel who are trained in working with students with disabilities would be beneficial".*

Another participant (TR_2) had this to say:

> *"Ahh… To ensure that students have equal access to information, it is essential to provide them with specialized equipment or technology like screen readers or magnification software, which will enable them to access these materials".*

Additionally, participants TR_3, TR_4, $SwLV_2$, $SwLV_4$ had this to say:

They (SwLV) engage in peer-to-peer discussions and participate in hands-on activities that allow for exploration. When it comes to my educational approach, they find value in engaging in peer-to-peer discussions and participating in hands-on activities that encourage exploration and experimentation. Additionally, they recognize the significance of tailored course materials for students with visual impairments, encompassing resources like textbooks, lab manuals, and other

materials provided in alternative formats like Braille, large print, or electronic text. To further enhance my ICT literacy, they utilize laptops equipped with screen readers like JAWS.

From the statements above, the participants highlighted several challenges faced by SwLV when engaging in practical subjects. Sir Apollo Kagwa senior secondary schoolmajor obstacle is the necessity for specialized accommodations and support to ensure their full inclusion in the learning process. These accommodations can vary from Sir Apollo Kagwa senior secondary schoolindividual to another, including adjustments to the learning environment, materials and equipment, as well as instructional approaches. Some SwLV may need alternative formats for materials like Braille, large print or audio, to access information effectively. Others might require adaptive equipment, such as screen readers or speech-to-text software, to interact with learning materials and communicate with peers and teachers. Additionally, tactile diagrams or models could be necessary for comprehending complex concepts in subjects like biology and physics. Furthermore, SwLV may benefit from the assistance of trained teachers or aides who can offer guidance, clarification, and reinforcement, as well as help navigate the practical elements of the subject. Teachers can employ diverse strategies, like hands-on learning, group work, and differentiated instruction, to ensure the active participation of all students, including those with visual or learning impairments, in practical subjects.

The findings regarding the expectations of SwLV in enabling their participation in practical subjects shed light on key factors crucial for fostering an inclusive learning experience. Admin underscores the significance of alternative formats of materials, such as Braille, large print, or audio, to ensure effective access to information by SwLV. This aligns with the research of D'agostino (2022), who emphasizes the importance of providing accessible materials for students with visual impairments.

Participant highlights the necessity for specialized accommodations and support to fully include SwLV in the learning process. This finding resonates with the research of Griffin (2019), who emphasize the importance of individualized support and accommodations for students with visual impairments to ensure their active participation and engagement.

"*Sir Apollo Kagwa senior secondary school participant mentions the provision of laptops with screen readers, such as JAWS, to enhance ICT literacy among SwLV. This finding aligns with the research of Chen and Griffin (2019), who advocate for the use of assistive technologies, including screen readers, to facilitate access to digital resources and promote independent learning for students with visual impairments".*

Another participant highlights the need for support from trained teachers or assistants with experience working with students with different abilities. This finding emphasizes the importance of knowledgeable and skilled support staff in facilitating the participation of SwLV in practical subjects. Trained professionals can provide guidance, assistance, and personalized instruction to SwLV (Han et al., 2021), promoting their active engagement and learning outcomes.

Overall, these findings underscore the critical role of alternative formats of materials, specialized accommodations, assistive technologies, and trained support staff in enabling the participation and inclusion of SwLV in practical subjects (Ajuwon, et al., 2015). Implementing these factors can create a supportive and accessible learning environment that empowers SwLV to fully engage in their educational journey.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents a complete overview of the investigation into how students with low vision experience practical subjects in secondary schools. The chapter summarizes key findings derived from preceding sections, culminating in a significant conclusion that emphasizes the research's implications for education and inclusivity. It also provides thoughtful recommendations for educators, policymakers, and stakeholders to create an inclusive learning environment. Additionally, the chapter identifies potential areas for future research, contributing to the ongoing discourse on the learning journey of students with low vision in practical subjects within secondary education.

5.1 Summary

5.1.1 Assessment of the accessibility provisions that support participation in practical subjects

The findings revealed that a variety of assistive devices are implemented to facilitate SwLV's participation. Educational institutions have recognized the importance of inclusivity and have thus adopted a comprehensive toolkit to cater to the unique needs of SwLV. These tools encompass a Compact CCTV, which allows for magnification of printed materials, the Orbit Reader, an essential tool for Braille reading and writing, the Victor Reader, which enables access to digital materials, and scientific calculators that are indispensable for intricate mathematical calculations. Teachers have incorporated assistive technology into their teaching strategies, utilizing screen

readers on laptops to articulate content and elucidate visual material, thereby augmenting the overall comprehension of the subjects being taught. To enhance tactile learning experiences, educators have also introduced methods that enable SwLV to interact with physical materials and gain a deeper understanding of the subject matter. The participants of this study overwhelmingly underscored the vital importance of these provisions in fostering an inclusive and equitable learning environment, Sir Apollo Kagwa senior secondary school where SwLV can actively participate and excel academically on par with their sighted peers. In essence, this research underscores the paramount significance of accessibility provisions in empowering SwLV to succeed and fully engage in practical subjects, ultimately reinforcing the notion that education should be an equitable opportunity for all, regardless of visual impairment.

5.1.2 Assessment of the techniques teachers use to enable participation in practical subjects

The research findings unveil a multitude of effective strategies employed by educators to stimulate active engagement in practical learning. Within well-equipped classrooms adorned with relevant resources, the foundation for enriching learning experiences is laid, nurturing students' confidence and sparking their innate curiosity. Among these strategies, the widespread adoption of hands-on learning activities emerges as a standout, allowing students to transcend theory and delve into real-world application of their acquired knowledge. This immersive approach not only hones their problem-solving and critical thinking skills but also instills a profound sense of relevance and enthusiasm for the subject matter. Teachers further tailor their pedagogy by adeptly grouping students according to their skill levels and assigning tasks that align with individual abilities, ensuring that all learners are both appropriately challenged and supported during practical lessons, thereby facilitating personalized learning experiences. The cultivation of collaborative learning through group projects takes center stage as a technique that not only deepens subject

comprehension but also nurtures essential social skills such as effective communication and teamwork. This holistic approach to education, as revealed in the study, underscores its pivotal role in optimizing student participation and achievement in practical subjects, ultimately equipping them with the skills and knowledge needed for success in the real world.

5.1.3 Assessment of the role of peer support in the participation in practical subjects

The findings highlighted the significant contributions of sighted peers in various aspects. Peer support emerged as a corners Sir Apollo Kagwa senior secondary school in the development of a harmonious learning environment, characterized by cooperation, knowledge-sharing, and mutual learning among students. This sense of community and encouragement to assist Sir Apollo Kagwa senior secondary school another not only enriched the overall classroom experience but also contributed significantly to the academic journey of students with Severe visual impairments (SwLV). Sighted peers played pivotal roles in bridging the accessibility gap for SwLV by reading aloud and vividly describing information displayed on the blackboard, aiding in the identification of specimens during field trips, and offering invaluable assistance in computer laboratories. These actions not only heightened SwLV's engagement with the curriculum but also improved their access to vital information. Beyond these practical aspects, peer support extended to promoting independence among SwLV, as they received aid in tasks like tracing and retrieving their belongings. What became evident was that the active engagement and collaboration between SwLV and their sighted peers were mutually beneficial, with the latter acting as effective mediators, facilitating access to visual information and advocating for the necessary accommodations and support. In essence, this study underscored the paramount importance of cultivating a positive and inclusive learning environment that nurtures the growth and development of all students, regardless of their abilities, through the seamless integration of peer support. The

findings resoundingly emphasized the pivotal role of peer support in the creation of an inclusive learning setting that not only encourages students to support and learn from each other but also champions equal participation and success for all students, including those with visual impairments.

5.1.4 Assessment of expectation to enable participation in practical subjects

According to the study findings, SwLV highlighted challenges such as the need for alternative formats of materials, specialized accommodations, and assistive technologies like screen readers to access information effectively. SwLV emphasized the necessity for alternative formats of learning materials, ranging from accessible textbooks to digital resources, to level the playing field and facilitate their access to information effectively. Additionally, they highlighted the indispensability of specialized accommodations tailored to their unique needs, such as ergonomic seating arrangements, tactile graphics and Braille displays. The integration of assistive technologies, including screen readers and speech synthesis software, was deemed essential for enabling independent navigation through digital content. Furthermore, SwLV expressed a genuine desire for support from educators and assistants who possess the requisite training and understanding of the specific challenges faced by students with disabilities. This comprehensive approach to creating an inclusive learning environment, characterized by personalized accommodations, accessible materials, and a cadre of skilled support staff, is not just pivotal but fundamental in promoting active engagement and success for SwLV, particularly in practical subjects where visual information is abundant. By embracing these factors, educational institutions can empower SwLV to fully participate in their educational journey, break down barriers to learning, and ensure their active inclusion in the broader educational process thus reaffirming the principles of equity and access in education.

5.2 Data Dissemination

Data dissemination is a critical phase of research that involves the process of sharing findings with relevant stakeholders and wider audiences. In the study titled "Teaching of Practical Subjects to Students with Low Vision, a case of a Selected Secondary School in Mukono District," the results will be disseminated through several channels to maximize their impact and reach. These included creating policy briefs to communicate key findings to policymakers and educators, organizing stakeholder workshops to facilitate discussions on best practices based on the study's insights, and conducting academic seminars to present the research to the education community. Furthermore, the results will be also published in scholarly journals, contributing to the academic literature on inclusive education and providing a resource for future researchers in the field. By utilizing multiple dissemination methods, the study aimed to ensure that the findings effectively informed practice and policy in supporting students with low vision in practical subjects, thereby enhancing their educational experiences and outcomes.

5.3 Conclusions

From the findings of the study, it can be concluded that:

Providing accessible materials and equipment in alternative formats is crucial for enabling students with visual impairments to participate in practical subjects like biology and physics. Tactile diagrams, models, and 3D printing are particularly useful tools for helping these students to visualize and comprehend abstract concepts that they may not be able to see or visualize otherwise.

Practical subjects are important in developing transferable skills that are essential for daily life, but acknowledged that some students may struggle to participate. Effective strategies include creating a positive learning environment, differentiating instruction, using collaborative learning,

and providing hands-on learning opportunities. These methods help all students, including those with disabilities, to participate effectively in practical lessons and develop important social skills.

Peer support is a crucial factor in promoting students' participation and success in practical subjects, as well as enhancing learning for all students in the classroom. Creating a positive learning environment that fosters the growth and development of all students was highlighted as crucial. Peer support provides an opportunity for students to work together, share knowledge, and learn from Sir Apollo Kagwa senior secondary school another. These approaches can be tailored to meet the individual needs of each student, and can be used in a variety of subjects and contexts. Students with visual impairments, however, face challenges when participating in practical subjects that require specialized accommodations and support to ensure their full inclusion in the learning process. Accommodations can range from adaptations to the learning environment, materials and equipment used, to instructional approaches. Some students may require alternative formats of materials or adaptive equipment, while others may need support from trained teachers or assistants who can provide guidance, clarification, and reinforcement to help them navigate the practical elements of the subject. Teachers can use various strategies, such as hands-on learning, group work, and differentiated instruction to ensure that all students, including those with visual impairments, are able to participate effectively.

5.4 Recommendations

Basing on the conclusions and findings made for the study, the following valid recommendations were made here as follows;

1. The Ministry of Education and Sports, in collaboration with other stakeholders such as Non-Governmental Organization, should identify and supply specific types of accessible

materials and equipment that are most effective for supporting students with visual impairments in practical subjects.

2. The Research Officers at the Ministry of Education and Sports should examine the effectiveness of specific teaching strategies for enabling students with visual impairments to participate in practical subjects, such as differentiated instruction, collaborative learning techniques, and creating positive learning environments.
3. Investigate the role of peer support in enabling students with visual impairments to participate in practical subjects, including exploring different types of peer support and tailoring them to meet individual needs.
4. Study the experiences and expectations of students with visual impairments in practical subjects, including identifying the challenges they face and the supports and accommodations that are most effective for them.

Overall, these recommendations can help to improve the inclusion and participation of students with low vision in practical subjects, leading to better outcomes and experiences for these students. All recommendations are directed to the Ministry of Education because it is the central authority responsible for setting policies, allocating resources and implementing strategies related to the education sector, ensuring that initiatives effectively improve educational outcomes nationwide.

5.5 Areas for further studies

Based on the research findings presented, several areas for future studies can be suggested as follows:

Firstly, future studies can focus on identifying specific types of accessible materials and equipment that are most effective for supporting students with visual impairments in practical subjects. This

can include investigating the effectiveness of different types of tactile diagrams, models, and 3D printing in helping students to understand abstract concepts. Furthermore, studies can explore the potential of new technologies and tools, such as virtual reality, to enhance the learning experience for students with visual impairments in practical subjects.

Future studies can examine the effectiveness of specific teaching strategies for enabling students with visual impairments to participate in practical subjects. This can include exploring the use of differentiated instruction and collaborative learning techniques in practical subjects, as well as investigating how positive learning environments can be created to promote the participation and success of all students. Additionally, studies can explore the effectiveness of specific accommodations, such as adapted materials and instructional approaches, in supporting students with visual impairments in practical subjects.

Further, future studies can investigate the role of peer support in enabling students with visual impairments to participate in practical subjects. This can include examining the effectiveness of different types of peer support, such as peer tutoring and peer mentoring, in promoting a sense of community, differentiation, and inclusivity in the classroom. Furthermore, studies can explore how peer support can be tailored to meet the individual needs of students with visual impairments in practical subjects.

Finally, studies can investigate the experiences and expectations of students with visual impairments in practical subjects. This can include exploring the challenges they face, as well as identifying the supports and accommodations that they find most effective in enabling them to participate fully in practical subjects. Studies can also explore the perspectives of teachers and

other stakeholders in supporting the participation and success of students with visual impairments in practical subjects.

Overall, the findings of the research highlight the importance of providing accessible materials and equipment, creating positive learning environments, using effective teaching strategies, and providing peer support to enable students with visual impairments to participate fully in practical subjects. Future studies can build upon these findings by identifying specific types of supports and accommodations that are most effective, and by exploring the experiences and expectations of students with visual impairments in practical subjects.

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APPENDICES

APPENDIX I: INTRODUCTORY LETTER

KYAMBOGO UNIVERSITY
P. O. BOX 1 KYAMBOGO
Tel: 041 - 4286792 Fax: 256-41-220464
Website :www.kyu.ac.ug Email: drgt@kyu.ac.ug
Directorate of Research and Graduate Training
Office of the Director

Date: 27th/03/2023

TO WHOM IT MAY CONCERN

RE: KYASIIMIRE PHIONAH BYARUGABA

Dear Sir/Madam,

This is to introduce to you the above-named student Reg: No **20/U/GMSN/14320/WKD** Pursuing Master of Special Needs Education, Department of Hearing Impairment and Sign Language Interpretation Studies, Kyambogo University.

She intends to carry out research on **"Teaching and Learning of Practical Subjects by Students with Low Vision: A Case of One Secondary School in Mukono District, Uganda."** in partial fulfillment of the requirements of the award of Master of Special Needs Education.

The purpose of this letter therefore is to request you to grant her permission to carry out her study in your institution.

Any assistance rendered to her will be highly appreciated.

Yours sincerely,

Prof. Bosco Bua
AG. DIRECTOR

KYAMBOGO UNIVERSITY
★ 27 MAR 2023 ★
DIRECTOR
DIRECTORATE OF RESEARCH AND GRADUATE TRAINING

APPENDIX II: LETTER TO THE SCHOOL ADMINISTRATION

KYAMBOGO UNIVERSITY

FACULTY OF SPECIAL NEEDS AND REHABILITATION

DEPARTMENT OF SPECIAL NEEDS STUDIES

P.O.BOX 1, KYAMBOGO

Tel 0414-286237/285584, 222935, Fax 0414-222961

Letter to the school Administration

THE HEAD TEACHER
SIR APOLLO KAGWA SENIOR SECONDARY SCHOOL – NAKISUNGA

Dear Sir/Madam,

RE: REQUEST TO CARRY OUT DATA COLLECTION FROM YOUR SCHOOL

I hereby submit my request to your office as indicated in the reference above. I am student of Kyambogo University pursuing a master's degree in special needs education tenable in the department of special needs studies. Currently I am conducting a study on '***Teaching of practical subjects to students with low vision: a case of a selected secondary school in Mukono district'*** and I have embarked on data collection exercise as a requirement for the award of that degree. My study is targeting Secondary Schools in central Uganda and in particular Mukono District. This school has been chosen because it has students with low vision. Thus, your institution is expected to have relevant information to answer the research questions for the study.

My study is purely qualitative and I am using interviews to collect data but I also request to be allowed to observe the unit with the devices used to facilitate learning for students with low vision. The purpose of this letter therefore is to request your office to grant me permission to get information for my study.

I will be grateful if my request meets your kind consideration. Attached are copies of my university admission, identity card, and introductory letter from Kyambogo University.

Thank you.

Yours sincerely

Kyasiimire Phiona Byarugaba

+256772363803

20/U/GMSN/14320/WKD

APPENDIX III: CONSENT FORM

KYAMBOGO UNIVERSITY

FACULTY OF SPECIAL NEEDS AND REHABILITATION

DEPARTMENT OF SPECIAL NEEDS STUDIES

P.O.BOX 1, KYAMBOGO

Tel 0414-286237/285584, 222935, Fax 0414-222961

CONSENT FORM

Dear participant,

I am a student of Kyambogo University pursuing a Master's Degree in Special Needs Education. I am carrying out a research study on '***teaching of practical subjects to students with low vision: a case of a selected secondary school in Mukono district'.*** It's hoped that the findings of the study will help to enlighten the educators, policy makers and implementers who need to make improvement in teaching practical subjects to students with low vision in the country and beyond.

You have been identified as one of the participants who can inform the study through an interview. The interview will focus on study objectives. The interview is likely to last 25-30 minutes. The purpose of this letter is to request you to participate in the study. Whatever information you provide will be used for the purpose of the study and academics only and will be kept confidential. You will also be free to withdraw from the study in case you feel uncomfortable to proceed with the participation.

Thank you very much for your support and cooperation in advance.

Yours sincerely

KYASIIMIRE PHIONA BYARUGABA

Confirmation of acceptance

I have read and understood the purpose of the study and I hereby consent to participate.

Signature…….. Date…….

APPENDIX IV: INTERVIEW GUIDE FOR PARTICIPANTS

I am Kyasiimire Phiona.B, a student pursuing a Master's degree in Special Needs Education of Kymbogo University. I am conducting a research study on ***"The learning of practical subjects by students with low vision: perspective from students in secondary schools".*** *I assure you safety and confidentiality.*

1. **a) Background information** consisting of gender, class and age bracket

   b) Accessibility provisions that support students with low vision to participate in science practical subjects.

   1. What are the accessibility provisions that support students with low vision during practicals?
   2. What accessibility provisions have been put in place by the school administrators during practicals?
   3. What challenges do administrators encounter when providing accessibility support to students with low vision during practicals?

   c) Role of peer support during the teaching of practical subjects

   1. What is the role of peers in the learning process?
   2. How does peer support enhance both the academic and social participation of students with low vision within inclusive classes?
   3. How is peer relation important in teaching?

   d) Support students with low vision would expect to enable them participate in practical subjects

   1. Which supports are useful for students with low vision?
   2. What support is increasing the participation of students with low vision?

3. What activities would you recommend for someSir Apollo Kagwa senior secondary schoolwith low vision?

e) What is the availability of accessibility provisions such as magnifiers, screen recorders, braille keyboard stickers, braille printers, low vision talking calculators, laboratory safety needs, fire extinguishers among others and in what state are they?

a) Major theme

Sub-theme	**Available**	**Comment**
1. Accessibility provisions that support students with low vision during practical	Yes, enough provisions are in place to support students during practical activities.	❖ The existing accommodations, such as tactile materials and audio descriptions, generally meet students' needs. ❖ While provisions are sufficient in many cases, some practical sessions still lack tailored support, especially in new or complex activities. ❖ Continuous assessment and updates are necessary

		to ensure provisions remain adequate as student needs evolve
2. Accessibility provisions that have been put in place by the school administrators during practical	Varies; some schools have implemented comprehensive measures, while others have minimal provisions.	❖ School administrators have introduced tools like enlarged visual aids and assistive technology in certain practical classes. ❖ There is inconsistency in the implementation of accessibility measures across different departments or classes.
3. Challenges administrators encounter when providing accessibility support to students with low vision during practical	Challenges exist; administrators encounter several obstacles	❖ There is limited funding and resources hinder the deployment of specialized support tools. ❖ There is lack of training or awareness about specific needs

		of students with low vision can impede effective support
Major theme		
Sub-theme 2	**Available**	**Comment**
1. The role of peers in the learning process	Yes, peer support is actively present in many settings	❖ Peers often assist students with low vision in navigating materials and participating in group work. ❖ Social interactions facilitated by peers help reduce feelings of isolation among students with low vision. ❖ Peer mentoring programs have been effective in fostering inclusive learning environments.

2. Peer support enhance both the academic and social participation of students with low vision within inclusive classes	Generally, positive peer relations are fostered within schools.	❖ Strong peer relationships contribute to increased confidence and independence for students with low vision. ❖ Teachers often encourage peer collaboration to promote understanding and empathy. ❖ Training students on inclusivity can further strengthen peer relations and support mechanisms.
3. Peer relation important in teaching	Supports are available and generally useful	❖ Assistive technologies like magnifiers and screen readers significantly enhance learning

		❖ Customized support plans help address individual needs more effectively. ❖ Regular feedback from students helps improve the relevance and utility of support measures
Major theme		
1. Supports are useful for students with low vision	Yes, support systems are linked to increased participation	❖ With adequate support, students are more engaged in practical activities and discussions. ❖ Support measures facilitate independence, enabling students to take more active role. ❖ When support is withdrawn or insufficient,

		participation declines, emphasizing the need for consistent support
2. Support is increasing the participation of students with low vision	Yes, support systems are linked to increased participation	❖ With adequate support, students are more engaged in practical activities and discussions. ❖ Support measures facilitate independence, enabling students to take more active roles. ❖ When support is withdrawn or insufficient, participation declines, emphasizing the need for consistent support.
3. Activities that you would recommend for someSir Apollo Kagwa senior	Several activities are recommended, tailored to their needs.	❖ Tactile and auditory-based activities help reinforce learning.

secondary schoolwith low vision		❖ Collaborative projects encourage peer interaction and support. ❖ Use of technology-based exercises, such as voice-activated tools, can be beneficial.

Appendix V: Observation guide

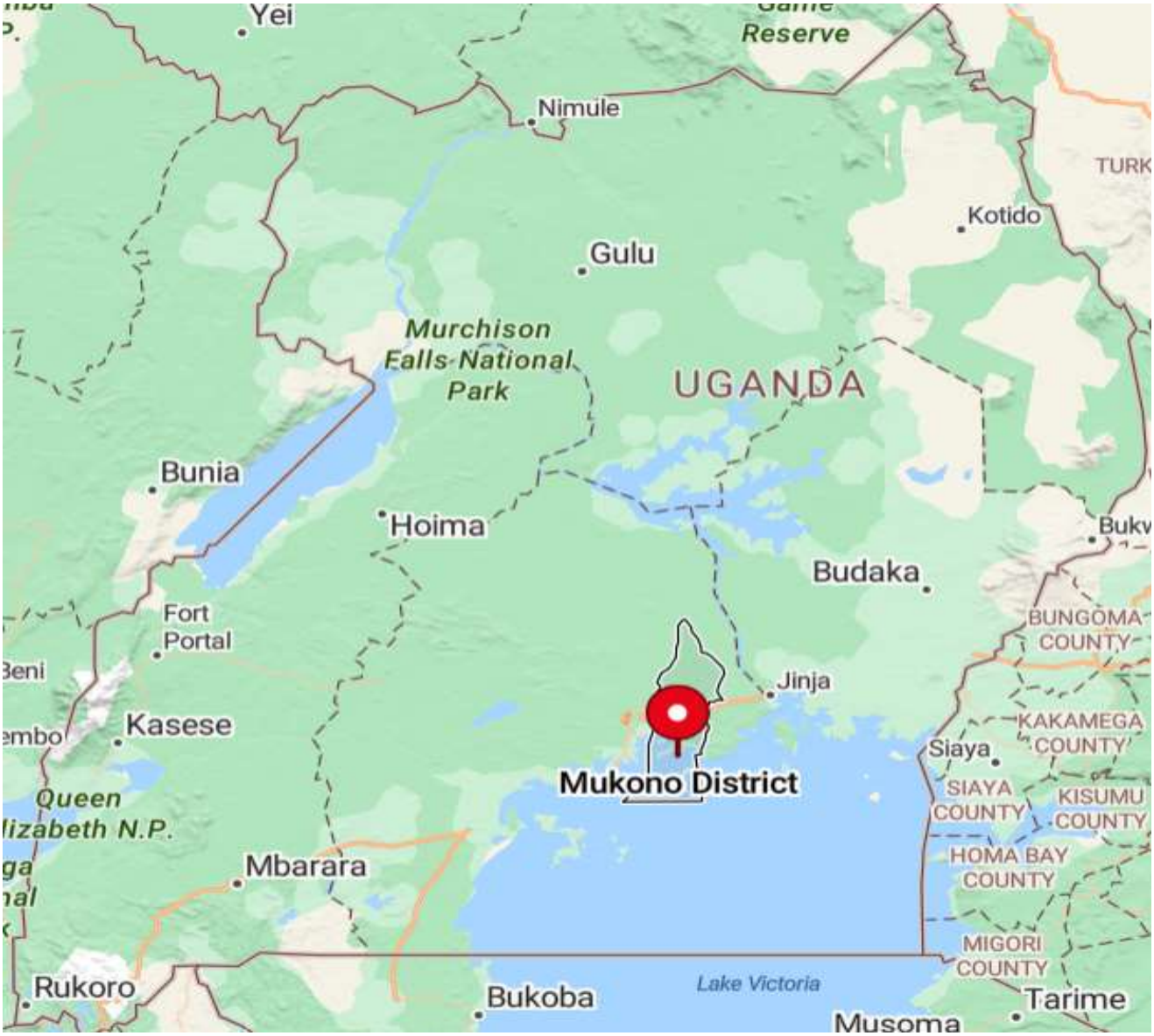
Aspect to observe	**Items expected**	**Available**	**Comments**
Theme	**Sub-theme**		
Accessibility provisions	Magnifiers	❖ Confirm presence and operational status of each item	❖ Note any shortages or deficiencies
	Screen recorders	❖ Check quantity against requirements	❖ Highlight items needing maintenance or replacement
	Braille keyboard stickers	❖ Ensure accessibility features are integrated	❖ Record user feedback on accessibility and usability
	Braille printers	❖ Yes	❖ Incorporate braille or raised symbols for visually impaired users
	Low vision talking calculators	❖ Widely available in assistive technology stores and online retailers. ❖ Often included in special education and rehabilitation programs.	❖ They greatly enhance independence for individuals with visual impairments. ❖ Cost can be a barrier; subsidies

		❖ Availability may vary in resource-limited settings, but they are increasingly accessible through government aid programs.	or grants improve access.
	Portable recorders	❖ Commonly available at electronics and specialty stores. ❖ Widely used in educational, medical, and professional settings.	❖ Useful for note-taking, recording lectures, and interviews. ❖ Battery life and storage capacity are important factors to consider.
	Laboratory safety needs	❖ Generally available through laboratory suppliers and safety equipment providers. ❖ Can be customized based on specific lab requirements. ❖ Availability may be limited in smaller or underfunded institutions.	❖ Proper safety equipment is crucial to prevent accidents. ❖ Regular training and audits are necessary to ensure compliance and safety.

	First aid kits	❖ Readily available at pharmacies, medical supply stores, and online. ❖ Standard kits are widely stocked; specialized kits may require custom orders. ❖ Some workplaces are mandated to have them accessible by law.	❖ Essential for immediate response to injuries. ❖ Maintenance and regular replenishment are necessary to ensure readiness.
	Fire extinguishers	❖ Commonly available at hardware stores and safety equipment suppliers. ❖ Different types (ABC, CO2, etc.) are available for various fire hazards. ❖ Regular inspections and servicing are mandated for safety compliance.	❖ Critical for controlling small fires before they escalate. ❖ Proper placement and staff training are vital for effective use.
	Eye wash stations	❖ Available through safety equipment	❖ Immediate use can prevent serious eye injuries.

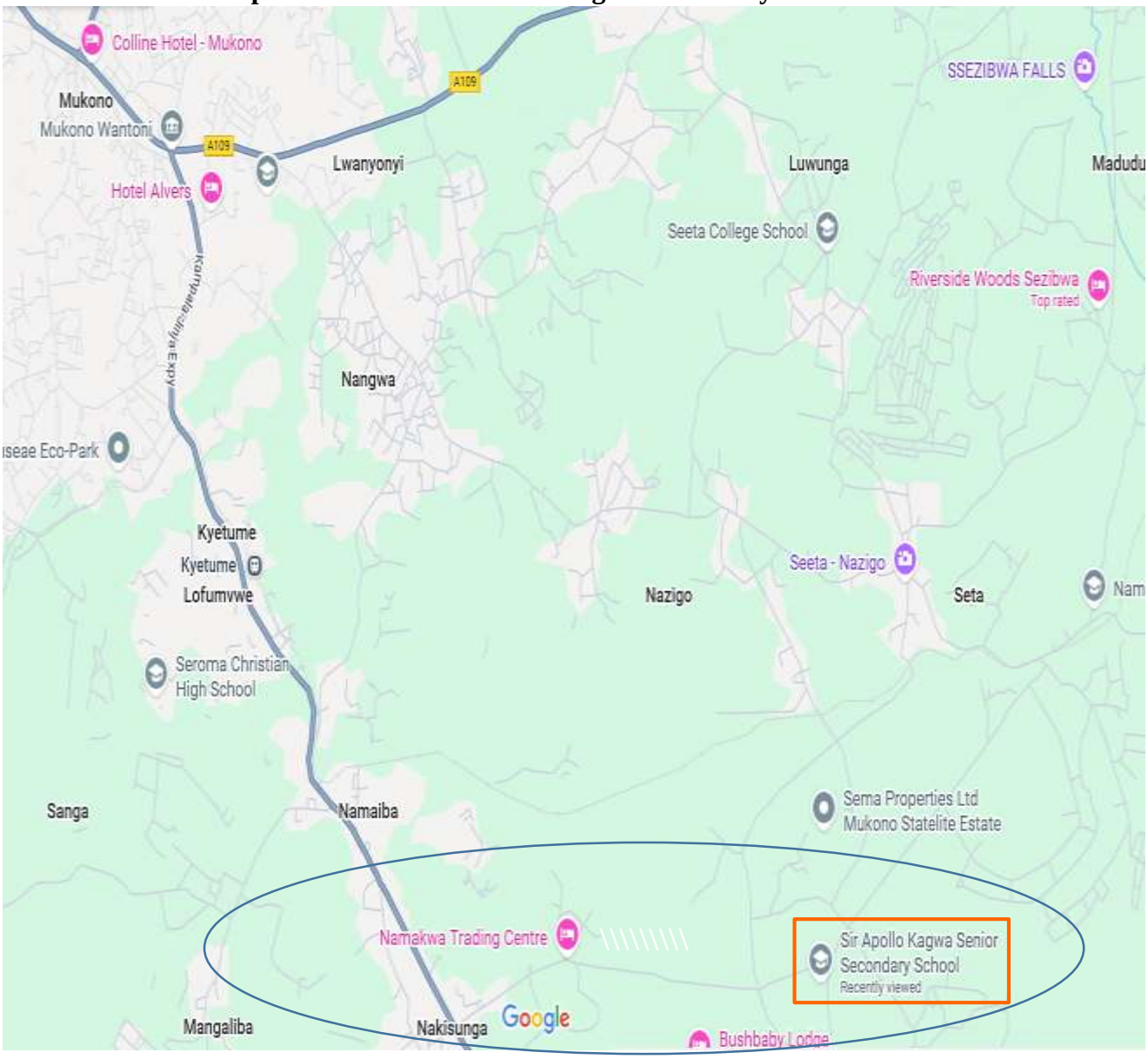
		providers and laboratory suppliers. ❖ Fixed and portable models are accessible depending on needs.	❖ Regular testing and maintenance are essential to ensure functionality.
	Labels on reagent, chemical containers and other lab supplies	❖ Standard labels are available from lab supply companies. ❖ Custom labeling options are often offered for specific safety or identification needs. ❖ Availability can depend on the laboratory's procurement processes.	❖ Proper labeling is critical for safety and inventory management. ❖ Labels should be clear, durable, and compliant with safety standards.

APPENDIX VI: Map of Uganda showing Mukono District



Source: Uganda Bureau of Statistics (UBOS). Retrieved 7 November 2016.

APPENDIX VII: Map of Mukono District showing Area of study



Area of Study

Source: Google maps