Project-Based Learning and Learners' Academic Achievement in Physics at Ordinary level in Government Aided Secondary Schools In Ibanda Municipality

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DECLARATION

I, Arthur Tukakira hereby declare that this research dissertation is a result of my original research work and I present it to Bishop Stuart University for approval without any reservations for the award. I further declare that this research has never been presented to any other university or institution for any award.

Signature…… Date…21/06/2024

Arthur Tukakira

(Candidate)

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APPROVAL

This dissertation's research by Arthur Tukakira has been carried out under my supervisors, and is now ready for submission.

Signed ..... Date 24/6/24

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Signed ..... Date 02/07/2024

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(Supervisor)

DEDICATION

This Dissertation is dedicated to my wife Nabasa Enid and my two sons; Agaba Collins and Mutatina Shepherd who sacrificed all the family pleasures for the sake of supporting my studies.

ACKNOWLEDGEMENT

I am very grateful to God for blessing me with all the resources that I needed for this course. May his name be glorified.

I thank my beloved wife Nabasa Enid and my two sons; Agaba Collins and Mutatina Shepherd who sacrificed all the family pleasures for the sake of supporting my studies.

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Furthermore, I thank my respondents from Ibanda Municipality from whom primary data was collected from. Thank you very much for your responses and genuine cooperation.

Finally, I would also wish to extend my sincere thanks to my fellow students /course mates for the contribution towards this achievement. May the lord reward you abundantly.

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LIST OF ACRONYMS

MIS:	Municipal Inspector of Schools
PBL:	Project Based Learning
PEO:	Principal Education Officer
SESEMAT:	Secondary Science and Mathematics Teacher's Program
SPSS:	Statistical Package for Social Scientists
SS:	Secondary School
UCE:	Uganda Certificate of Education
UNEB:	Uganda National Examinations Board

ABSTRACT

The study focused on examining the relationship between project-based learning and academic achievement in physics among ordinary level students in government aided secondary schools in Ibanda Municipality. The study was guided by the following objectives; to examine the indicators of project-based learning in physics at ordinary level in government aided secondary schools, to assess academic achievement in physics at ordinary level in government aided secondary schools and to determine the relationship between project-based learning and academic achievement in physics at ordinary level in government aided secondary schools in Ibanda Municipality. A descriptive research design was employed using both quantitative and qualitative approaches to allow triangulation. Both stratified, systematic and purposive sampling techniques were applied to select the 467 respondents with responses of 432. Data collection methods such as questionnaire survey and interview methods were used. Data was analyzed with descriptive statistics, Pearson correlation coefficient and multi-linear regression analysis. The findings of the study were; Students are grouped and given supervisors for project learning; class timetable has a provision for project work; Students conduct research and hands on during the project implementation. However, it was disagreed that students identify the critical project problem and students present findings from project research. The study also concluded that progress assessment scores determine physics academic achievement; end of term scores manifests physics performance in schools; grades at Uganda Certificate of Education (UCE) is an indicator of physics academic achievement and collaboration between teachers and students can improve their performance in physics. The study also concluded that there is a positive significant but weak relationship between project-based Learning and Academic learners' achievement. The study recommends that evaluation in the project-based learning should be authentic. It also recommends that the teaching materials which are prepared basing on the project-based learning method should be obtained from a learning environment, students develop better performance skills in science and technology teaching and have more increased self-efficiency beliefs as compared with students instructed by using the traditional method. The study also recommends that project based learning (PBL) should highly be emphasized in the new current curriculum so that learners can perform very well especially in science subjects that's chemistry, biology and physics as well. Projects should be identified basing on the existing problem in the society and research should be made by the learner when addressing all the procedures of the project. The study also recommends that enough resources in form of scholastic materials should be provided so as to promote project-based learning and learner's academic achievement in physics at ordinary level in government aided secondary schools especially in Ibanda Municipality.

CHAPTER ONE

Background of the Study

Introduction

This chapter consists of background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, research hypothesis, and scope of the study, conceptual framework and significance of the study.

Historical Background

According to students studying natural science across the world, physics is one of the most popular and challenging subjects (Chala, Kedir, & Wami, 2020). Academic underperformance in physics as a subject in the United Kingdom dates back to the 1870s with the establishment of the first London School Board in the 1870s that dealt with school curriculum discussion and launched courses to prepare science teachers for the country in order to improve students' performance in the subject (Gillard, 2018). The board's major aim was to prepare all students to do well in physics and contribute to their well-being and the good of society. In the United States of America (USA), concern over academic low achievement in physics subject at secondary school level started in the 1890s. Physics was the first program endorsed by the American Association of Physics Teachers, where 9th grade students take an introductory physics course, overwhelmingly underperformed (Qazi, 2019). Physics education in high schools of United States had registered low academic achievements because many states only required three science subjects, that is physical science, chemistry, and biology (Dwight & Hugh 2017). In the project-based learning approach, students build up and direct their own learning, develop their creativity, prefer to solve problems they face in cooperation and life is brought to the classroom. In brief, the project-based learning is an approach based on students' working alone or in

small groups with the aim of producing concrete products (Gültekin, 2020). At the base of the project is students' finding solutions to problems they face in any way and order in the direction of their own. This approach supports students in acquiring manual skills and learning more by performing original activities (Chen, 2021). Due to these characteristics, the thought of use of project-based learning provides many advantages to students. It is gradually becoming widespread especially in lessons where daily life is related more such as science and technology (Ayvacı & Coruhlu, 2020). Studies made in recent years have shown that students face difficulties in comprehending some concepts in physics (Jufriadi, Kusairi & Sutopo, 2021).

In Africa, academic achievement in physics in secondary schools across the continent dates back to the colonialism era of the 1900s, when science teaching was of a theoretical rather than a practical nature, and physics as a subject, alongside other science subjects, was designed mainly as an introduction to scientific studies at advanced levels (Manià, Mabin, & Liebenberg, 2018). This explains in part why

of under-development (Depaepe, 2017). In Senegal for example, initial technological instruction and manual work became basic subjects in the curriculum for the whole of the lower secondary course (Artigue et al., 2019).

In Uganda, academic achievement in physics in secondary schools has been an issue for many years (Ssekamwa, 2000). The Government of Uganda has recognized illiteracy and ignorance as the main problems to tackle through education (Jepkoech, 2012). The enrolment of Ugandans in secondary schools was low and on that small number very few students chose to offer science subjects especially physics up to higher levels. Most of the students who offered sciences went to technical institutes and other tertiary institutions that were around by that time. The performance of science subjects has been

poor ever since that time, however, there is a slight considerable improvement in performance and enrolment in the past 10 years (Sekiwu, Akena, & Rugambwa, 2022).

Therefore, Project-based learning is one of the student-centered teaching methods which have been in use both in our country and in the world. It is one of the methods providing physics students with the opportunity to take part in the learning environment, making them take the responsibility of their own learning, developing students, and having them comprehend and structure information.

Theoretical Background

Though there are many theories that explain PBL and academic achievement, this study was guided by constructivism theory advanced by Jean Piaget (1896-1980). Constructivism is 'an approach to learning that holds that learners actively construct or make their own knowledge and that reality is determined by the experiences of the learner' (Elliott et al., 2000). In elaborating on constructivists' ideas, Arends (1998) states that constructivism believes in the personal generation of meaning by the learner through experience and that meaning is influenced by the interaction of prior knowledge and new events. Constructivism is a learning theory which affirms that knowledge is best gained through a process of action, reflection and construction. Piaget focuses on the interaction of experiences and ideas in the creation of new knowledge. The theory explores the importance of learning alongside peers and how culture affects the accommodation and assimilation of knowledge. The theory emphasizes inquiry and the integration of real world and classroom activities. The constructivist framework relies on the students to be in control of their own acquisition of knowledge and skills and encourages the teacher to serve as a facilitator. Constructivism has shortcomings, but it can allow a learner to reach better planes of knowledge and skill acquisition than would be possible otherwise (Jonassen, 1993).

The theory states that the passive view of teaching and it observes the learner as 'an empty vessel' to be filled with knowledge, whereas constructivism states that learners construct meaning only through

active engagement with the world such as experiments or real-world problem-solving. It again says that, Information may be passively received, but understanding cannot be, for it must come from making meaningful connections between prior knowledge, new knowledge, and the processes involved in learning.

The theory is applicable and relevant to this study because it believes that if students only passively perceive a problem and do not experience its consequences in a meaningful, emotional, and reflective way, they are unlikely to adapt and revise their habits or construct new habits, or was only do so superficially. This theory is also relevant and applicable because it is a way of teaching where instead of just telling students what to believe, teachers encourage them to think critically for themselves. This means that teachers need to believe that students are capable of thinking and coming up with their own ideas. The primary responsibility of the teacher is to create a collaborative problem-solving environment where students become active participants in their own learning. From this perspective, a teacher acts as a facilitator of learning rather than an instructor.

Conceptual Background

Project-based learning (PBL)

A teaching strategy known as project-based learning (PBL) involves having learners actively participate in projects that are both personal and practically relevant. PBL is a collaborative form of teaching and learning as all participants need to contribute to the shared product and has elements of personal learning with active reflection and conscious engagement rather than passive experiences being involved (Kokotsaki, Menzies, & Wiggins, 2016). There are seven design elements that are key to creating successful project-based learning: these include, challenging problem or question, sustained inquiry, authenticity, student voice and choice, reflection, critique and revision and public product. The

purpose of project based learning is to bring the psychomotor domain according to Bloom's taxonomy that inculcates learners with required skills for local and international industrialization.

Academic achievement

Academic achievement is the degree of accomplishment by students in their class assessment tests, beginning of term exams, mid-term exams, project work results, terminal and national examinations at the end of cycle (Gocheva-Ilieva, Kulina, & Ivanov, 2020). Academic achievement is the measured ability and achievement level of a learner in a school, subject or particular skills (Woessmann, 2016). In education, academic achievement is often presented as performance or attainment, in carrying out of a task, course or assignment (Antaramian, 2017). The indicators of academic achievement include, Uganda certificate of education (UCE) results, beginning of term tests, mid-term tests, end of term tests, end of chapter assessment, communication skills, problem solving strategies and leadership skills.

Contextual background

The investigation was conducted in Government aided secondary schools in Ibanda municipality. According to reports from the Uganda National Examinations Board, students continue to fail Physics as a subject at Uganda Certificate of Education.

The government of Uganda has sponsored teachers and put into practice a number of initiatives to boost physics teaching and learning as part of efforts to improve academic achievement in physics. These include, among other, building new science laboratories and renovating existing ones, supplying science/physics textbooks, science kits, and resource materials, as well as providing science teachers with in-service training through the Secondary Science and Mathematics Teachers' Program (SESEMAT). However, according to the Education and Sports Sector Annual Performance Report

2020, academic achievement in physics is still low, especially in government-aided secondary schools in Ibanda municipality.

Given the aforementioned situation, where academic achievement in the subject of physics continues to decline, it is unknown whether project-based learning may play a role. For this reason, the goal of this study is to determine the relationship between project-based learning and academic achievement in physics in government-aided secondary schools in Ibanda Municipality.

Problem statement

The government of Uganda has worked hard to build new and renovate existing science laboratories, supply physics textbooks, science kits, and resource materials, as well as in-service training for science teachers through SESEMAT, all in an effort to improve academic achievement in physics (Ministry of Education and Sports report, 2021). However, the Ibanda municipality's government-aided secondary schools continue to have low academic achievement in physics despite these efforts. According to Uganda Certificate of Education (UCE) scores for four academic calendar from 2018 to 2022 school year, physics was poorly performed, with the majority of students having failure grades (Ibanda Municipal Education Department report, 2022). In the year 2022, Over 40% of the candidates have totally failed the subject," Dan Odongo, the Executive Secretary of UNEB said.

Previous research has linked project-based learning to academic success in physics (Bilgin, Karakuyu 2015). The fact that these studies weren't carried out in Ibanda Municipality and specifically among secondary schools in Ibanda Municipality, as they were in other countries like England, Turkey, Nigeria, Mbale district, and Yumbe district, leaves a knowledge gap. Therefore, the purpose of this study is to investigate the association between PBL and academic achievement in physics at ordinary level in government-aided secondary schools in Ibanda Municipality.

Purpose of the study

The purpose of the study was to examine the relationship between project-based learning and academic achievement in physics among ordinary level students in government aided secondary schools in Ibanda Municipality.

Objectives of the study

i. To examine the indicators of project-based learning (PBL) in physics at ordinary level in government aided secondary schools in Ibanda Municipality.
ii. To assess academic achievement in physics at ordinary level in government aided secondary schools in Ibanda Municipality.
iii. To determine the relationship between project-based learning and academic achievement in physics at Ordinary level in government aided schools in Ibanda Municipality.

Research Questions

i. What are the indicators of Project Based Learning in Physics at Ordinary level in Government aided secondary schools in Ibanda Municipality?
ii. What is Academic Achievement in Physic at Ordinary level in Government aided schools in Ibanda Municipality?

Hypothesis of the Study

H_0: Project Based Learning has not affected Academic Achievement in Physics at Ordinary Level in Government Aided Secondary Schools in Ibanda Municipality.

Scope of the study

The scope of the study involved geographical scope, time scope, content scope and population scope.

Geographical Scope

This study was conducted in government aided secondary schools (ss) in Ibanda Municipality. And these are; Bigyera ss, Kagongo ss, Nsasi ss, Nyabuhikye ss, Ibanda ss and Kibubura Girls' ss. Ibanda Municipality hosts Ibanda district headquarters and the district of Ibanda boarders with Kamwengye, Kazo, Mbarara, Buhweju and Kitagwenda districts. Ibanda municipality is located approximately 70 kilometers (43 mi), by road, northwest of Mbarara, the largest city in the Ankole sub-region. This is about 290 kilometers (180 mi), by road, southwest of Kampala, the capital and largest city in Uganda (Town clerk report, Ibanda municipal council). The Municipality was formerly a town council that started way back in 1990s and was elevated from a trading center to a town board and then to a town council in the 2000s. In 2016, it was granted a Municipality status and commenced its operations on 1st July 2016. Ibanda Municipality has three Divisions of Kagongo, Bisheshe and Bufunda with 21 wards.

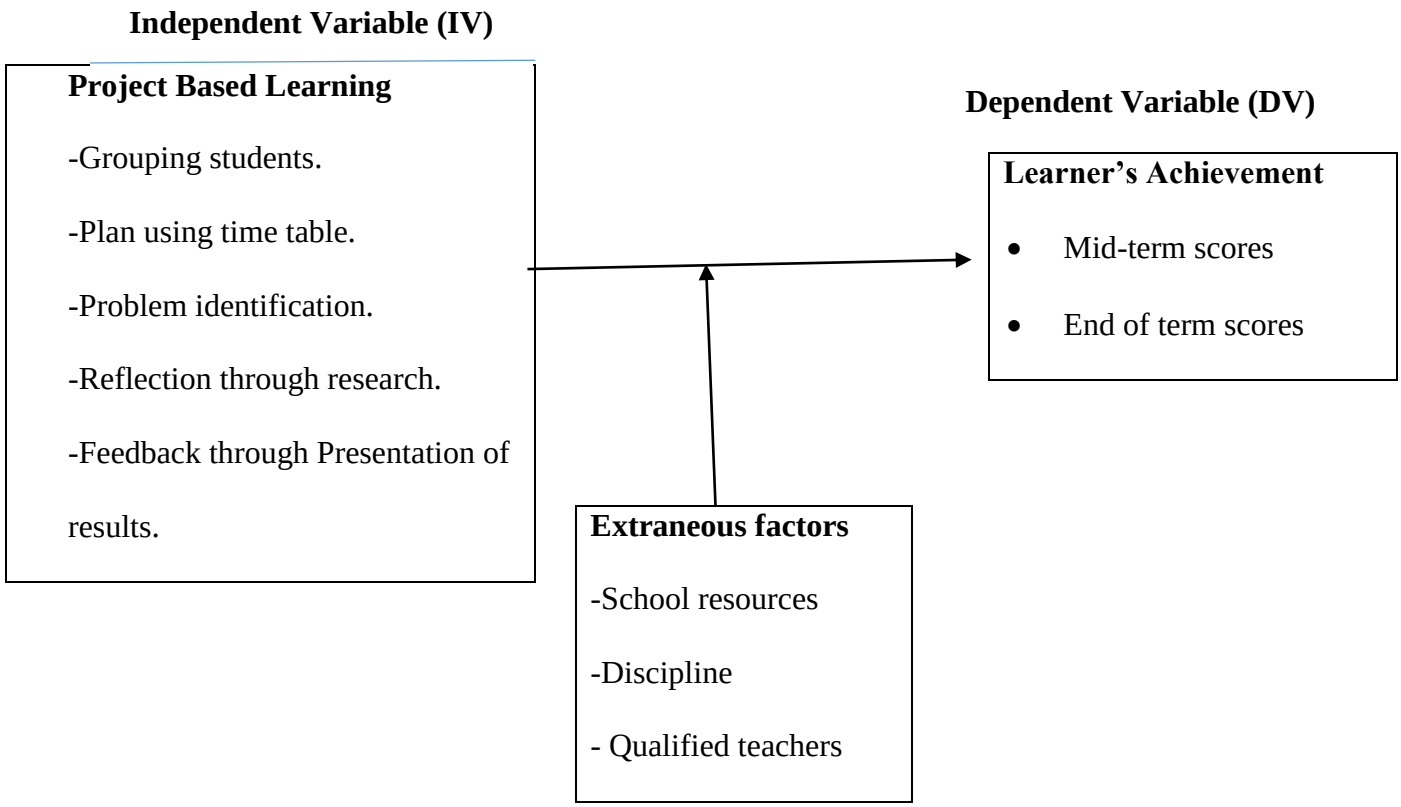
Time Scope

The study lasted for a period of one year involving; proposal preparation, data collection, data analysis and dissertation preparation. It considered the years from 2018 to 2022 because it is when physics academic achievement among ordinary level students in government aided secondary schools in Ibanda Municipality has been reported to be very low.

Content Scope

The study examined the indicators of project-based learning (PBL) in physics, assessed academic achievement in physics and determined the relationship between project-based learning and academic achievement in physics at ordinary level in government aided secondary schools in Ibanda Municipality.

Conceptual Framework *(Figure 1)*



Source: Adopted from MoES, 2022 and Modified by the Researcher (2023)

Significance of the Study

To Policy makers: This study will be used by government and other policy makers from the Education sector come up with policies to scale up academic achievement in physics among secondary school students by identifying teaching methods that make a learner comprehend the physics concept. It is achieved by training teachers to use appropriate methods of teaching.

To the Government: The government will get the information about a consistent cause of poor performance of physics in government aided schools

To Head teachers: Head teachers will be guided on how to discuss and come up with better modules to Education management and administration, and make a follow up on learners' achievement at school level. They also participate in implementation of government policies in new curriculum.

To Future researchers: Would add on the existing body of knowledge on project-based learning and its relationship with academic achievement in physics among students in government aided secondary schools.

To Teachers: This study would help teachers to make a follow up through; helping learners make constructive investigation and have required hands on skills. It is achieved by training teachers to use appropriate methods of teaching by making research.

To the Community: The community would scientifically determine the best methods of making students pass physics very well by providing favorable environment for a learner to comprehend physics concepts through project based learning.

CHAPTER TWO

LITERATURE REVIEW

Introduction

The concept of PBL, the academic achievement and their relationship in physics at ordinary level in government-aided secondary schools was discussed in this chapter. It is structured in accordance with the study objectives.

Conceptual Review

The concept of Project Based Learning in Government Aided secondary schools

PBL is a teaching strategy that involves students researching on a subject/theme, coming up with a tangible solution of the problem. As opposed to the customary teacher-centered learning that occurs in many classrooms, PBL is a student-centered learning strategy that makes learners think critically and become creative. A guided learning process is giving way to an open learning approach that exhausts the mind of a learner (D'Orio, 2018).

Aminah, Fauzan and Fauziddin (2021) investigated the impact of project-based learning via YouTube presentations on physics learning outcomes in Indonesia. A more quantitative and less qualitative methodology and a quasi-experimental method were used. The study was post-test in its design. The 32 Physics students enrolled in the fourth semester who made up the study's population**.** Using 20 multiple-choice questions, samples were taken using saturated sampling techniques. The t-test and correlation test (phi test) were applied to the data analysis. The researchers then demonstrated from the correlation test results (phi test) that project-based learning with YouTube success as the capstone project has a large impact on the cognitive domain.

Much as the above study was conducted in Indonesia, this study was conducted in Uganda. The sample population was 32 physics teachers but, in this study, the sample population was 467 comprising of

PEO, MIS, head teachers, physics teachers and students. Collected quantitative data was analyzed using phi-test however in this study, collected quantitative data was using analyzed using SPSS version 20.

Renata (2008) conducted a study in Czech Republic about Project-based learning in physics. Renata (2008) employed; interview, discussion and visits at schools as methods of data collection. The study revealed that it is necessary to educate pre-service teachers in approaches stressing the importance of the own activity of students. Project-based physics learning where learners make projects either individually or in groups seems to be one of the most effective methods for teaching physics science for understanding. It is necessary to provide in-service teachers instruction (seminars) and prepare sample projects with proposals on how to develop, run and evaluate interdisciplinary projects.

Much as the above study was conducted in Czech Republic, this study was conducted in Uganda. Data collection methods were interview, discussion and visits at schools as methods of data collection. Where as in this study, data collection tools were questionnaire, interview guide and documentary guide

In a study he conducted in Korea, Muhammad (2022) looked at the direct benefits of project-based learning, teamwork, and flipped learning on student learning effectiveness as well as the engagement effects on learning effectiveness. His study approach was empirically validated using quantitative and less qualitative. Information gathered from 247 graduate and undergraduate business students who were asked to reflect on their own participation, observations, and experiences. Using SPSS-25 statistical software for data analysis and hierarchical regression analysis, the results of the tested hypotheses were obtained. The researcher discovered that project-based learning (PBL) and team cohesion increased favorably on both the efficacy and engagement of students' learning. Flipped learning, on the other hand, had diminished positive effects on engagement and increased positive effects on student learning effectiveness.

Whereas the above study was conducted in Korea, this study was conducted in Uganda. Study population was 247 graduate and under graduate business students but in this study, sample population was 467 comprising of physics teachers, head teachers, secondary students, PEO and MIS.

In Uganda Mbale, Wakumire, Nkundabakura, and Mollel (2022) conducted a study to examine the impact of project-based learning (PBL) on students' attitudes toward physics. In their mixed-method study technique, Wakumire, Nkundabakura, and Mollel (2022) adopted a non-equivalent pretest-posttest quasi-experimental design. Fifty (50) students in the 10th grade from purposefully chosen schools in the Mbale area made up the study's population. Cluster sampling was used to randomly assign participants to the experimental and control groups**.** The survey test was piloted (a= 0.82) and validated by experts. Data were analyzed using independent samples t-tests, and effect size revealed a significant difference in the average scores of students' attitudes towards physics in favor of the experimental group. Therefore, the study recommends that science educators adopt PBL to improve students' attitudes. Much as the above study was done in Mbale, this study was conducted in Ibanda Municipality. Sampling techniques were systematic, stratified and purposive and in this study, SPSS version 20 was used.

The students’ poor achievement in physics in particular and sciences in general has been attributed to many factors. These include; poor methods of physics instruction by the teachers, insufficient number of qualified physics teachers, lack of indigenous textbooks, inadequate apparatus in the physics laboratory, poor classroom management by physics teachers, teacher’s belief and attitude towards physics, physics teacher’s inability to improvise, inadequate instructional materials and aids, educational background and parental expectations on the learners and finally students’ related factors or variables like students’ academic anxiety, academic self-efficacy, academic locus of control, academic motivation and more (Onah & Anamezie,, 2022).

According Makkonen, Lavonen and Tirri (2023) students with an interest in a subject like physics are likely to be more motivated to manage their own learning and develop the requisite skills to become effective learners of Physics. Hence, interest in physics is relevant when considering the development of effective learning strategies for physics. In contrast, anxiety about learning physics can act as a barrier to effective learning. Students who feel anxious about their ability to cope in physics learning situations may avoid them and thus lose important career and life opportunities. Godpower-Echie and Ihenko (2017) opined that physics teachers should try to identify a teaching approach, method that can motivate or arouse students' interest. Interest is, generally, student attention, greater concentration, pleasant feelings, and increased motivation towards learning a concept (Afjar & Syukri, 2020).

In the development of students' academic achievements, teachers display behaviors aimed at enabling students to grasp the subject of the lesson and reinforcing it with exercises, applying the correct assessment methods, using time efficiently, keeping students active in class, and enabling them to generate ideas (Liliana, Raharjo, Jauhari & Sulisworo, 2020). In efficient schools, teachers behave in a planned and disciplined way, target the academic success of the school and students, have sufficient knowledge in their field, consolidate students' positive behaviors, move on to the next stage for education to be provided in full, work in cooperation with students, and provide students with suitable feedback (Roberts & Webster, 2022).

Efficient teachers' preparation of the classroom for teaching, and setting and imposing the class rules together with the students, enables retention of learning and allows students to display learning behaviors (Cheah, 2021). An effective teacher trusts students and accepts them as they are, gives priority to students' achievements, appreciates them, stimulates interest towards the lesson in students, rewards them, prepares the classroom for education, is tolerant and flexible, makes the right decisions, and accepts and respects individual differences (Tanak, 2020). Teachers who are successful in their

profession are patient and controlled, respect differences, are open to development and criticism, stimulate students, display role model behaviors, establish discipline in class, have leadership characteristics, encourage and support students, are affectionate, witty and sincere, find solutions to problems, monitor homework and facilitate learning (Ozcan, 2021). When the characteristics of an effective teacher are examined, it is seen that when a teacher has these qualities, academic success can be enabled in the student.

Physics academic Achievement at Ordinary level in government aided schools

The relationship between secondary school students' conceptual understanding and their physics achievement scores was examined in a study conducted in Pakistan by Wajid and Saeed (2021). A quantitative method questionnaire used by Wajid and Saeed in 2021 was pilot tested and validated by six experts. The reliability test was determined to be 0.85 Cronbach Alpha. One hundred thirty-five (135) kids were randomly chosen from four clusters of secondary schools. The independent sample t-test and Pearson correlation were used to analyze the data. Academic achievement and conceptual understanding were found to be significantly positively correlated both locally and gender-wise in the topic of physics. The following suggestions are based on the study's findings: The development of conceptual knowledge in physics is encouraged among secondary school students, physics teachers, and stakeholders involved in the development of the secondary school physics curriculum. Secondary school physics students are advised to make their studies use self-explanation and rereading, while physics teachers are encouraged to instruct the students in a way that fosters conceptual knowledge. Basing on this, the study wishes to identify challenges facing students while doing project work and give their findings in form of products.

A study on the investigation of academic interest as a predictor of academic achievement of secondary school Physics students in the Enugu Education Zone of Enugu State was undertaken by

Kingsley et al (2022) in the South-East geopolitical zone of Nigeria. The study used a correlational survey research approach. 244 Physics students, 105 males and 139 females, were chosen using a purposeful sample approach from ten chosen schools in the Zone. Three experts approved the instruments, which underwent Cronbach's alpha reliability testing yielded a reliability value of 0.84**.** On the data, multiple regression analyses were run. The results demonstrated that academic interest significantly and proportionally contributed to the prediction of secondary school Physics academic achievement at 18%. These results led to recommendations for teachers to use educational tactics like project-based learning to spark students' academic interest in learning about physics. Basing on these arguments, the study wishes to identify the number of students failing physics at Ordinary Level in government Aided secondary schools and gives out a clear direction that can improve performance.

However, the above study was in Nigeria and used correlational research design, this study was conducted in Uganda and used descriptive research design. Three experts approved the instruments, which underwent Cronbach's alpha reliability testing but, in this study, two experts were used on Cronbach's alpha reliability. Data was collected from physics teachers only but in this study, data was collected from students, teachers, head teachers, PEO and MIS for proper gap identification and give out the way forward.

In Kenya's Kiambu sub-county, Wachira & Wanjau (2014) looked into factors influencing physics performance among students in public secondary schools. The study used a descriptive survey design to gather information on the variables that affect how well physics is taught in Kiambu Sub County's public secondary schools**.** A sample of 120 people was used, and questionnaires were used to obtain the data. Distribution tables, bar graphs, and pie charts were used to summarize the results and show them as percentages and frequencies. The study discovered those students' professional objectives, negative attitudes toward physics, perceptions of physics as difficult, and their gender all

had an impact on how well they performed in physics. The study also discovered that teachers' poor attendance habits, interactions with students, and teaching strategies affected how well students performed in physics.

However, this study had 467 respondents in Uganda compared to a sample of 120 in the above study in Kenya. Only a questionnaire was used to collect data but, in this study, both a questionnaire guide, interview guide and documentary review were used to collect data and give out reasons why students fail physics in government aided secondary schools yet project based learning has been emphasized in the New Curriculum.

Performance of passing standard students in the district of Uganda-Kiboga's chosen government-aided secondary schools. The study, which included quantitative and qualitative which is a mixed research approach, was conducted using a cross-sectional survey methodology. 266 individuals made up the study's population, and purposive and snowball sampling approaches were utilized to find them. Focused Team Data were gathered using discussions, interviews, and questionnaires. The findings, which were examined using SPSS software in Chi-square analysis, demonstrated that while the government has been essential in giving educational resources and staff to schools, more needs to be done in this area. Additionally, it was found that "lacuna" in both the home and school environments needed to be filled for students to perform up to expectations. The researcher suggests that the government increases academic resources for teachers and students so that everyone can work effectively and produce quality outcomes.

In order to investigate the impact of school culture on students' academic progress at the chosen government secondary schools in Luwero area, Nalugemwa (2022) used a cross-sectional survey strategy. Nalugemwa (2022) included qualitative and quantitative research methods**.** From a total of 650 participants, 242 made up the study's population. Key participants in the study were head teachers,

teachers, and students, as well as an interview guide and questionnaires. The findings on the impact of teacher commitment and school culture on students' academic progress, according to Nalugemwa (2022), showed that instructors' dedication is crucial since it enables constant evaluation of learners. Results on the relationship between teamwork and students' academic progress in secondary government-aided schools showed that by coordinating tasks, teamwork encourages teachers to divide their workload. In order to encourage student academic accomplishment, government secondary schools in the Luwero District should adopt a school culture that values teacher commitment, teamwork, and goal-setting. However, it is advised that secondary schools in the Luwero District seriously consider using staff meetings on a regular basis to address issues with teachers' work performance and raise academic standards for students.

Watt et al. (2019) suggest that targeting a well-defined profile of students is more effective compared with targeting each individual in a classroom, since feedback can be easily individualised and instructional approaches are flexibly adapted to cater for a group of similar students rather than each individual. However, little work has been devoted to the person-centred approach by motivational researchers (Chittum & Jones, 2017; Vansteenkiste et al., 2009), especially in developing countries. Equally, research investigating the relationship between secondary school students' motivation and cognitive learning strategies during Physics learning in third world countries is very scarce.

Akanbi et al. (2021) noted that the teaching method employed by teachers' reflects on students' understanding of the physics subject and it is the important for teachers to understand and interpret the objectives of Physics for efficient, effective teaching and learning. It is therefore, necessary to use appropriate methods which involve students' active participation in teaching and learning. Teaching needs to be participatory, where all the domains of learning are engaged in learning, hence there is the need to introduce, adopt and adapt the recently used instructional strategy that are capable of sustaining

not only the interest of the learners, but also helping them to understand the concepts (Daka, 2020). Banda (2020) inquired into the qualities of effective teachers as perceived by secondary school teachers and twelfth grade pupils in Lusaka. The findings revealed that an effective teacher was perceived as one who prepared lessons, taught in an interesting manner and explained things clearly. Banda (2020) also found that highly qualified teachers were highly perceived to be more effective in terms of teaching confidently and handling pupil's questions.

Omosewo and Ogunlade (2012) asserted that Physics education is designed to train the students to acquire proper understanding of the basic principles as well as their applications. Physics is therefore, an important science subject that makes enormous academic demands on students in its learning as well as its teaching. The teaching of Physics at secondary school level lays the foundation for the application of science and technology which is of immense benefits to the society at large.

According to Achor and Gbadamosi, (2020), Achievement is the level of success or performance students attained after test has been administered to them. Bajon (2015) regarded achievement as a task which has been accomplished successfully, especially by means of exertion, skill practice or perseverance. Students' achievement is attributed to students' personal progress which is an act of accomplishing an academic task productively. Some researchers (Bawaneh, Zain, Saleh, & Abdullahi, 2012; Saleh & Subramaniam, 2017) have indicated that teachers use inappropriate teaching methods and strategies which are teacher centered like conventional teaching strategy (lecture method) in teaching science students which among other factors accounts for the poor performance of science students.

Azhary et al. (2020) noted that adolescents who were well liked by many peers displayed high level of ego development and secure attainment, as well as better interactions with their best friends.

Furthermore, associating with friends who have a positive attitude towards school enhances students‟ own satisfaction with school whereas associating with friends who have a negative attitude toward school decreases it (Mark, 2014). Bozzi, Raffaghelli and Zani (2021) revealed that friendship among students are critical interpersonal vehicle that move them towards physiological growth and maturity, allowing social compassion which influences the development of self-evaluation. Usengimana, Kampire and Ntawiha (2021) noted that peer influence can inspire students‟ academic vigor and motivation for achievement. In the study conducted by Olalekan (2016), it was revealed that peer group generally has a lot of influence on students. In addition, observation and imitating the behavior of others, learners can avoid much wasteful random behavior and come close to reproducing the behaviours of which members are recognized.

Achor and Gbadamosi (2020) showed that one of the observed reasons for the declining students‟ achievement in Physics is the passive teaching methods or strategies that are widely employed by many teachers in the Physics classrooms. The traditional Physics instruction, which is normally conducted based on a theoretical basis, together with the teacher centred approach, may also contribute to the observed low students achievement in Physics This undesirable issue may be due to the difficulty of students‟ understanding of the underlining concepts, due to the mere absence of an appropriate learning strategy for impacting knowledge of Physics concepts. Yang et al, (2023) indicated that teachers use inappropriate teaching methods and strategies in teaching science students which among other factors have contributed to gradual poor students‟ performance in Physics. This by implication can lead to poor achievement in Physics.

The achievement is the level of success or performance students attained after test has been administered to them. According to Joof (2020), academic achievement refers to performance on a task with measures including comprehension, quality and accuracy of answers of tests, quality and accuracy

of problem-solving, frequency and quantity of desired outcome, time or rate to solution, time on task, level reasoning and critical thinking, creativity, retention and recall, and transfer of tasks. Jackson (2023) found that the child's experiences and situations, the quality of schools and educators, and many other factors affect academic achievement.

The relationship between Project Based Learning and student achievement in physics at Ordinary level in government aided secondary schools

In England, Jerrim et al. (2019) investigated the connection between inquiry-based instruction and academic attainment. A stratified and clustered sample strategy was used in this investigation. Jerrim et al. (2019) found scant evidence that the frequency of inquiry-based instruction is positively associated with adolescents' performance on science exams using nationally representative, linked survey and administrative data. Their findings hold up when different examinations and measures of achievement are used, different levels of discipline are used in different classrooms, and different gender and prior achievement subgroups are taken into account.

In order to compare the impact of project-based learning (PBL) with student cognitive achievement in studying physics, Santyasa et al. (2020) did a study in Turkey. With 9 courses totaling 278 learners, this quasi-experimental study used a pretest-posttest non-equivalent control group design. 124 students from 4 courses made up the study sample. The results of a learning achievement exam and a questionnaire about academic procrastination were used to compile data on student achievement and academic procrastination. Two-way covariance analysis was performed after descriptive data analysis. First, the academic accomplishment of students who were taught using the PBL and direct instruction methods differed significantly, according to the study's findings. The students that learned using the PBL paradigm excelled in their academics. The academic accomplishment of students with high academic procrastination and low academic procrastination significantly differed from one

another, according to the second finding. Students with low academic procrastination demonstrated higher learning achievement. Thirdly, the learning model and academic procrastination both had an impact on students' academic achievement. For both learning models, there was significant interaction in low procrastination. Project-based learning (PBL) has become increasingly common, according to a study by Abdullatif (2020), which has led to serious questions concerning its inception. A questionnaire was sent to 124 teachers who were utilizing the PBL methodology as the primary way of data collecting in order to accomplish the research goal. The results were obtained using structural equation modeling, a quantitative research technique was used to get the findings. The PBL methodology was found to significantly influence student engagement through collaborative learning, critical thinking, disciplinary subject learning, and authentic learning. The findings demonstrate that through facilitating knowledge and information sharing and discussion, the PBL technique enhances the independence of students and enables research and critical thinking. Therefore, the PBL approach is strongly advised for use in the classroom and outside classroom by students and should be promoted in secondary schools.

Two conclusions can be drawn from the study's findings: first, using a PBL approach in learning and the learning process support students by addressing their questions, which is the role that teachers must play; second, higher education institutions and universities should encourage teachers to train students in using a PBL approach, which in turn engages students in learning.

In Yumbe District, Northern Uganda, Galukande (2022) performed a research to look at how management methods impacted academic achievement in public secondary schools. Galukande (2022) used a mixed cross-sectional survey strategy for the study, conducting interviews and administering questionnaires to a subset of participants. Since most school organizational structures were dysfunctional and there were no internal policies to manage, monitor, and supervise academic

performance, finances, welfare, health, and safety, the scholars indicated that planning was a crucial managerial requirement for enhancing academic performance. To improve academic performance in public secondary schools, the study suggests increasing stakeholder involvement, resources, and financial assistance.

Karpudewan et al. (2016) explored the feasibility of improving energy literacy among secondary school students using a project-based instructional approach. The quantitative results of the study showed that students exposed to a PBL curriculum had better performance on energy-related knowledge, attitudes, behaviors, and beliefs. The quantitative results of the study showed that students exposed to the PBL curriculum outperformed students taught using the traditional curriculum. The quantitative results of the study showed that students exposed to the PBL course outperformed students taught with traditional courses in terms of energy-related knowledge, attitudes, behaviors, and beliefs. The results of Zhang Ying's intrinsic motivation scale, which was administered to 21 private university students before and after they received project-based learning, showed that there were significant differences in students' interest, autonomy, and competence before and after, which positively influenced students' intrinsic motivation to learn (Zhang & Ma, 2023).

According to De Oliveira Biazus and Mahtari (2022) conducted a quasi-experiment using project-based learning and direct instructional learning models and found that the PBL model had a significant impact on the enhancement of creative thinking skills of secondary school students. Parrado-Martínez and Sánchez-Andújar (2020) explored the effects of project-based learning on ninth-grade students' writing skills and found that cooperative work in project-based learning potentially promoted students' critical thinking, communication, and collaboration skills, significantly improving middle school students' English writing skills. Ferrero, Vadillo and León (2021) found that students in project-

based learning conditions showed significant improvements in content knowledge measures and growth in their historical thinking skills compared to students in control schools.

García et al. (2021) conducted an intervention experiment in undergraduate education to test the effectiveness of a student-centered project-based learning approach in promoting student skill acquisition. The study found that students' problem-solving and information management skills, two instrumental general competencies were not improved. The results of ÇAKICI's project-based learning activities on fifth-grade children's science achievement showed that although project-based activities significantly improved children's science achievement, attitudes toward science did not change. Gratchev (2023) explored whether the combination of traditional teaching methods and project-based learning activities improved students' learning experiences, and data collected over 3 years showed that the two groups' achievements were very similar, and the findings indicated that students were less motivated to accept new learning methods such as PBL. Parrado-Martínez and Sánchez-Andújar (2020) found that the implementation of PBL did not significantly change students' perceived utility of teamwork, communication, and creativity. Kızkapan and Bektaş (2021) examined the effects of project-based learning and traditional learning methods on the academic performance of seventh graders, and the results showed no significant differences between the experimental and control groups on post-test "achievement test" scores.

According to authors Chen, Sun and Feng (2020) it has a medium to large positive effect on students' academic achievement compared to traditional education. It is also important to bear in mind, that project-based learning cannot completely replace traditional education. Students work to solve and evaluate a problem (Tsybulsky & Muchnik-Rozanov, 2023), present the results to the audience which allows them acquire the knowledge and skills needed for life (Chen, Sun and Feng, 2020). It is characterized by students' autonomy, cooperation, communication and reflection in real life practices

(Kokotsaki & Whitford, 2023). Project-based learning promotes cooperation between students and the teacher acts only as a guide during the project (Greenier, 2020).

Onah and Achufusi (2022) observed that meta-conceptual teaching approach was capable of boosting students' interest which consequently improved their academic achievement. Again, Okafor (2020) noted that academic interest was able to predict academic achievement up to 57% from their initial 5%. In Biology (Awodun, Adekunle & Adeoye, 2013; Femi-Adeoye, & Adekunle, 2016) observed that academic interest could predict academic achievement with about 25% and 34% respectively.

Amelink (2012) found students interest to be a motivating factor to learn skills needed for accomplishing everyday tasks and for student involvement in science, technology, engineering, and mathematics (STEM) disciplines, particularly for females. On the overall, students' interest in science subjects has been relatively low (Amelink, 2012). Physics being one of the seemingly difficult science subjects, the extent to which interest could predict their achievement is crucial for educational policies that would boost student achievement in physics and national development in particular. On another hand, Wong and Wong (2019) alleged that interest only significantly and positively influences the achievement of the low achievement students and not significant predictors of the already high achievement students.

According to Al-Busaidi and Al-Seyabi (2021), Chanpet et al. (2018), Habibi et al. (2022), Manoban (2021), and Syawaludin et al. (2022), PBL helps learners understand knowledge more deeply, thereby improving learning outcomes. According to Lee and Galindo (2021), transforming a learning environment that supports PBL requires changing curricula and instruction and teachers' teaching thinking (Miller et al., 2021) and is equipped with strong professional and pedagogical knowledge.

Tsybulsky and Muchnik-Rozanov (2021) and Tsybulsky and Oz (2019) also shows that learning with PjBL affects pre-service teachers' beliefs and positive attitudes about the ability to use PBL in future teaching. But when it comes to educational technology courses for pre-service teachers, this adaptation becomes even more challenging (Umutlu, 2022). The study of Umutlu (2022) offers implications for design of online teacher education courses promoting pre-service teachers' technological pedagogical content knowledge (TPACK) framework. TPACK framework, suggesting that teachers learn to integrate technology effectively by combining their content area and pedagogical knowledge, is appropriate to be used in design of courses for pre-service teachers' learning to form teachers' knowledge required to create meaningful learning experiences in technology-integrated classes (Yadav et al., 2017).

Accordingly, Prasetiyo et al. (2023) believe online PBL can promote digital citizenship competencies among teachers and students. Through a PBL, student teachers are motivated to seek out and validate information citizens, thereby developing into informed and active (Prasetiyo et al., 2023). The need to investigate and improve the quality of the application of PBL has prompted a variety of studies conducted across different subjects of teacher education to examine the implementation of PBL, its effectiveness, and the various challenges that PBL poses to educators, pre-service teachers and institutions. Therefore, there is a demand for review studies to be carried out to survey the overview of relevant studies and to provide educators and researchers with references on how to effectively implement PBL, different results and challenges when adopting this approach to the teaching process. Some review studies on PBL have been conducted by authors such as Guo et al. (2020) and Rahmawati et al. (2020), which mainly describe how technology integrated with PBL and student outcomes.

Summary of Literature Review /Research Gap

Many other researchers' opinions and ideas have been acknowledged based on the literature review. The majority of the evaluated literature used questionnaire surveys and interview guides to obtain primary data. Mostly, the Cronbach alpha coefficient and the test-and-retest method were used to test validity and reliability respectively. According to Lee and Galindo (2021), transforming a learning environment that supports PBL requires changing curricula and instruction and teachers' teaching thinking. Studies were made in England, Turkey, Nigeria, Kenya, Mbale and Kiboga district. This leaves knowledge gap in Ibanda Municipality.

Finding out the association between project-based learning and academic achievement in physics at the ordinary level in government-aided secondary schools in Ibanda Municipality was therefore the primary focus of this study.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter presents the methodology that was used during the study. It starts with the research design, target population, sample size and selection, sampling technique and procedure, data collection methods, data collection instruments, analysis, and presentation.

Research Design

According to Zikmund (2022) a research design is a structure of research methods, procedures and techniques chosen by a researcher to conduct a study. The design allowed researchers to analyze and identify the research methods suitable for the subject matter. There are many of research designs but in this study, descriptive research design was used to describe the current state of project-based learning and physics academic achievement in order to provide a picture of the situation as it naturally occurs. Descriptive research design is a type of research design which aims at systematically obtaining the information to describe a situation, or population. More specifically, it does not answer a question of why but rather helps answer the what, when, where, and how questions regarding the research problem (Shrutika Sirisilla, 2023). Descriptive research design was used because it's cheap and enables the description of the relationship between the study variables that is Project Based Learning and academic Achievement in physics at Ordinary Level in Government Aided secondary Schools in Ibanda Municipality,

Study Population

Principal Education Officer (PEO), Municipal Inspector of Schools (MIS), head teachers, physics teachers and students constituted the study population. Study population was selected from Ibanda municipality offices and government aided secondary schools.

PEO and MIS are government representatives at the Municipality level. Their wok is to collaborate with other stakeholders and ensure that government policies are implemented in schools through monitoring and inspection respectively. PEO and MIS were chosen because of their knowledge in methods of teaching in different subjects including physics.

A head teacher is a manager of an institution on behalf of all the stakeholders. A head teacher is responsible for planning, controlling, directing, guiding and supervision of all the school activities. Head teachers were chosen because they are responsible for overseeing learning methods used by teachers.

A teacher is a trained personnel meant to impart knowledge and skills to learners guided by a syllabus. Physics teachers were selected because they have enough knowledge about the study methods of teaching physics.

A learner is any human being who attends to a learning institution with the aim of knowledge and skill acquisition. In this study, learners were chosen because they have evidence about methods being used by teachers when learning physics (Kathy, Sasha & Barab, 2023).

Sample Size and Selection

A sample population of 467 was selected from a study population of 578 participants. Sample population was determined using the tabulation method of Krejcie and Morgan (1970) in which the sample size versus total population is presented, Appendix I. According to the table, the smaller the population of the study the smaller the sample size and the bigger the population of study the bigger the sample size. Usually, the sample size is determined using the line crossing the table in the middle in relation to the population.

Sampling Procedures / Techniques

There are many sampling techniques used in research but in this study, stratified, systematic, purposive sampling techniques were used.

Principal education officer (PEO), Municipal Inspector of schools (MIS), head teachers and physics teachers were chosen purposively. This is because they serve as the Ministry of Education's representatives and are tasked with assessing all of the school's activities.

The researcher chose physics teachers because they are knowledgeable about physics teaching methods. The sampling technique was purposive sampling.

Systematic sampling is a sampling technique where a list of elements in the population is randomly arranged either in alphabetical order or numerical order digits (Ken Black, 2004). It was used to select students in single sex schools that is; Ibanda ss and Kibubura girls' ss. It uses fixed and periodic intervals to create a sampling group that generates data for researchers to evaluate without bias. Stratified sampling is applied when a researcher wishes to ensure that particular categories in the population are represented in the sample in the same proportion as in the population. Such sub-groups may be about age, gender, class levels and religion. If well applied, stratified sampling is efficient in a sense that it provides more information with regard to given sample size. This design was used to reach students in mixed schools because of their nature of different sexes. This technique was used to sample students in mixed schools to cater for gender inclusiveness. After arranging learners in small groups called strata, systematic sampling was used.

Table 3.1: *Illustration of the sample size and selection*

Sample category	Population scope	Sample	Sampling Technique
Bigyera SS	160	113	Stratified, systematic, simple random
Kagongo SS	89	73	Stratified, systematic, simple random
Nyabuhikye SS	69	59	Stratified, systematic, simple random
Nsasi SS	44	40	Stratified, systematic, simple random
Ibanda SS	101	86	Systematic, simple random sampling
Kibubura Girls SS	95	76	Systematic, simple random sampling
Head teachers	6	6	purposive sampling
PEO	1	1	purposive sampling
MIS	1	1	purposive sampling
Physics teachers	12	12	Simple random and purposive sampling
Total	578	467	

Source: Ibanda Municipal Council Secondary schools' reports, 2022

Total study population is 578 participants and therefore sample size becomes 467 participants.

Kibubura Girls, Ibanda Secondary school, Bigyera secondary school, Nyabuhikye secondary school, Kagongo secondary school and Nsansi secondary school.

Data Collection Methods

Questionnaire Survey

In this study, closed ended questions were administered to collect quantitative data for the study. These close ended questions entailed the respondents (students) to choose from the provided responses. According to Combo & Trompo (2016), closed ended questions are preferred because they are normally easy to fill in, take little time and effort, keep the subjects to the point, giving them a wide range of

choice. A questionnaire was used to collect information from students because it is quick, easy to administer and ensures confidentiality (Combo & Trompo, 2016).

Interview Method

Interviews were very usefully in the study because they permit greater depth in understanding the issues at hand, permits probing to obtain more complete data and makes it possible to establish and maintain rapport with respondents, or at least determine when rapport has not been established (Kothari, 2013). The researcher employed structured interview questions to collect information from Principal Education Officer (PEO), Municipal Inspector of Schools, head teachers and Physics teachers.

Document Review

The document review method was used to obtain secondary data. Primary data was collected from the field by Questionnaires and interviews.

Secondary data was collected from the documentary review through internet sources and text books. These presented fresh and current information on the subject under study (Amin, 2015).

Data Collection tools

Self-administered questionnaires

Onen and Oso (2008) asserts that questionnaires are items or tools used to collect information over a short period. A self-administered questionnaire is a tool that is designed explicitly to be completed by a participant without an interviewer's assistance (or bias). Self-administered questionnaires are widely used for collecting quantitative research data. In this study, questionnaire was subjected to students since they know how to read and write. A considerable advantage of the self-administered questionnaire was the potential anonymity of the participant, which can lead to more truthful or valid responses. Also, the questionnaire can be filled out at the convenience of the participant. The questionnaire was comprised of two sections. Section A is bio demographic data about gender of the respondent and section B is a Likert scale ranging from strongly agree (5), agree (4), undecided (3), disagree (2) and strongly disagree (1).

Interview Guide

An interview guide is a list of key questions you want to cover during the interview. It was subjected to physics teachers, PEO, MIS, and head teachers. The advantages of utilizing an interview guide include establishing an organized procedure, giving each applicant the same candidate experience, and making it simpler to evaluate each applicant uniformly, hence lowering the possibility of bias throughout the interview process. Section A of the interview consisted of open-ended questions about PBL, and Section B consisted of questions about academic success in physics at the ordinary level that are both open-ended and closed-ended

Documentary Guide

Documentaries are powerful storytelling devices such as films or video examining an event or person based on facts or words on pieces of papers. Documentary analysis checklist was used to analyze quality

of documents like appropriate derived questions in a PBL lesson and performance of students at UCE. Reviewing existing documents helped the researcher understand the history, philosophy, and operation of the variables.

-Quality Control

Quality control dealt was through validity and reliability of the instruments.

Validity of Instruments

Validity is the appropriateness and effectiveness of the instruments used in research. It is the measure of the extent to which research instruments measure what they are intended to measure (Ahuja, 2021). To establish validity of instruments, the researcher administered two questionnaires to the key informants, to establish the weaknesses relating to ambiguity of the questions. The researcher also gave the instruments to two independent professional judges on a rating system of relevant and non-relevant. Judges being two with two different scores, the scores were added up and then divided by two in order to get the average. The questionnaires were collected and amended by the researcher, after which Content Validity Index (CVI) is calculated as below.

CVI=n/N; Where; n=number of items rated as relevant, N=total number of items in the instrument.

Table 3.1. Validity test results

Raters	**No of Items**	**Relevant**	**CVI**
Indicators	5	4	0.8
Achievement	6	5	0.83
Average % (CVI)	11	9	0.82

Source: Primary data (2023)

The average Content Validity Index for the questions across all the variables was 0.82 which was above the 0.7 recommended by Amin (2005) for the instrument to be valid. This means that the questions used in the questionnaire measured correctly issues concerning PBL and academic achievement in

physics. In other words, the instrument was valid for primary data collection. Nikolopoulou (2022) asserts that for the instruments to obtain what it intends to measure; the average index should be greater or equal to 0.7.

Reliability of Instruments

Reliability is the consistency of instruments to produce same results each time it is measured under the same condition with the same subjects (Barifaijo, & Oonyu, 2020). Amspoker (2021) noted that reliability estimates are used to evaluate;

(1) The stability of the instrument administered at different times to the same individuals under the same conditions or using the same standard (test–re-test reliability).

(2) The equivalence of sets of items from the same test (internal consistency) or of different observers scoring a response or event using the same tool or instrument (inter-rater reliability). The inter rater reliability was done by the researcher before carrying out the study.

Table 3.3; Reliability test results

Raters	**Cronbach Alpha**
Indicators	0.855
Achievement	0.859
Average	0.857

Source: Primary data (2023)

Reliability of the instruments for this study was first be pre-tested on 5% of the study sample and then determine their Cronbach‟s Alpha using SPSS (Statistical Package for Social Scientists). The

Chronbach Alpha coefficient was 0.857 which was above the 0.7 recommended by Gay (1996) for the instrument to be reliable. This meant that the tools were reliable for data collection.

Data Collection Procedure

The researcher applied to the Research Ethical Committee (REC) of Bishop Stuart University (BSU) for permission before moving further with the research for approval. Informed consent was sought by the Principal Investigator. An introductory letter was obtained from BSU-Directorate of graduate studies, and from Ibanda municipal education department to introduce the researcher to schools. For the study involving human subjects, informed permission is a moral and legal obligation. In order to inform respondents of the information gathered, the researcher gave them the letter of introduction. In order to gather accurate data from the field that later produced fruitful results, the researcher recorded responses from the respondents for easy discussion and interpretation of the study findings; asked for permission from respondents to do so; protect and preserve the information obtained to avoid leakages into the hands of unauthorized customers before lawful processing, analysis, and presentation of the findings; and again, ensure an adequate level of confidentiality of the research. Finally, the researcher made sure that all research-related communications are conducted honestly, an enormity, transparentcy, and without the use of false information or biased representations of primary data. Since we are in post Covid-19 epidemic, the researcher took standard operating procedures into account.

Data Analysis Plan

The data was analysed as per the following objectives:

Objective one

Quantitatively, data was coded, entered into the computer using Statistical Package for Social Scientist version 20 and cleaned for quality assurance. Quantitative data was analyzed using descriptive and inferential statistics to derive relevant descriptive statistics (Frequencies, means and percentages) which

was additionally analyzed in order to attain relevant conclusions and was presented using tables. Descriptive statistics were used to find out the means and frequencies of responses as shown in chapter IV.

Qualitative data that was collected using interview guide was analysed using content analysis of NVIVO software which was done by reading through each transcript carefully to identify and eliminate bias; the transcripts were interpreted by labelling relevant words, phrases, sentences, or sections with codes. The data was further segmented by creating a spreadsheet to easily compile the data and describe the connections between them and finally the segments were analysed and results were written using verbatim quotes in italics.

Objective two

Quantitatively, the data was coded, entered into the computer using Statistical Package for Social Scientist version 20 and cleaned for quality assurance. Quantitative data was analyzed using descriptive and inferential statistics to derive relevant descriptive statistics (Frequencies, means and percentages) which was additionally analyzed in order to attain relevant conclusions and was presented using tables. Descriptive statistics were used to find out the means and frequencies of responses as shown in chapter IV.

Qualitative data that was collected using interview guide was analysed using thematic analysis using NVIVO software which was done by reading through each transcript carefully to identify and eliminate bias; the transcripts were interpreted by labelling relevant words, phrases, sentences, or sections with codes. The data was further be segmented by creating a spreadsheet to easily compile the data and describe the connections between them and finally the segments were analysed and results were written using verbatim quotes in italics.

Objective three

Inferential statistics such as Pearson correlation coefficient and multilinear regression were used to analyse data in Social Scientists (SPSS) version 20 software.

Pearson Correlation Coefficient was used to gauge the strength of a linear relationship between independent variables and the dependent variable. Pearson moment correlation coefficient was used to obtain the relationship between project based learning and academic achievement in physics at ordinary level in government aided secondary schools in Ibanda municipality.

The multivariate analysis methods were used include, dependence techniques, which look at cause-and-effect relationships between variables, and interdependence techniques, which explore the structure of a dataset. In multivariate analysis, numerous variables (more than two) are analyzed to find any potential relationships between them. By examining every potential independent variable and how it relates to other dependent variables, multivariate analysis provides a more thorough interpretation of the data.

Ethical considerations

Primary data was collected from 6 schools and municipal education office after getting approval from REC of BSU. Before starting data collecting, the Researcher got approval letter from REC of Bishop Stuart University. Informed consent was sought by the Principal Investigator. An introductory letter was obtained from BSU-Directorate of graduate studies, and from Ibanda municipal education department to introduce the researcher to schools. For the study involving human subjects, informed permission is a moral and legal obligation. In order to inform respondents of the information gathered, the researcher gave them the letter of introduction.

In order to gather accurate data from the field that later produced fruitful results, the researcher recorded responses from the respondents for easy discussion and interpretation of the study findings; asked for permission from respondents to do so; protect and preserve the information obtained to avoid leakages into the hands of unauthorized customers before lawful processing, analysis, and presentation of the findings; and again, ensure an adequate level of confidentiality of the research. Finally, the researcher made sure that all research-related communications are conducted honestly, an enormity, transparency, and without the use of false information or biased representations of primary data. Since we are in post Covid-19 epidemic, SOP's were considered like wearing face masks use of sanitizer.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTEPRETATION OF FINDINGS

Introduction

This chapter presents the analysis and interpretations of the study findings arising from the data collected from the respondents using questionnaires and interview guides. The first section presents the response rate and demographic characteristics followed by a presentation and analysis of the study findings in relation to specific objectives. The purpose of the study was to examine the relationship between project-based learning and academic achievement in physics among ordinary level students in government aided secondary schools in Ibanda Municipality.

Response Rate

The questionnaires and interviews were employed to respondents. Questionnaires were distributed and returned giving an overall response rate of 92.5% as shown in the Table 4.1.

Table 4. 1 Response rate of Respondents

	Stratum	Target	Response	Percent	Tool used
Quantitative approach	Bigyera SS	113	104	92.1%	Questionnaire
	Kagongo SS	73	72	98.6%	Questionnaire
	Nyabuhikye SS	59	54	91.5%	Questionnaire
	Nsasi SS	40	37	92.5%	Questionnaire
	Ibanda SS	86	74	86.1%	Questionnaire
	Kibubura Girls SS	76	71	93.4%	Questionnaire
Qualitative approach	Head teachers	6	6	100%	Interview guide
	PEO	1	1	100%	Interview guide
	MIS	1	1	100%	Interview guide
	Physics teachers	12	12	100%	Interview guide
Grand total		**467**	**432**	**92.5%**	

Source: Field data (2023)

The overall response rate for interviews and questionnaires were 92.5% which was a reasonable number; hence the collected data and the findings from the study can be relied on. According to

Mugenda and Mugenda (2009) a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent. The response rate was excellent and attributed to carry out constant follow-ups on variance of responses and the researcher carried out the research with the help of research assistants.

In obtaining primary data, 35 respondents were not considered because; some never returned the filled questionnaires and others returned un filled questionnaires.

Demographic Characteristics of Respondents for quantitative data

In this section, data is presented on the socio-demographic composition of the sample obtained through the questionnaire, which included; Gender, Age, education level and years of teaching of the respondents. All the Tables are based on the 412 respondents that filled the questionnaires. The purpose of collecting demographic data on respondents was to help in establishing the respondent sample characteristics and be able to form appropriate opinions about the research findings. The demographic factors also gave the overview about the kind of respondents who gave the information about the study. The detailed analysis of these characteristics and interpretation are presented in the Table 4.2.

Table 4. 2 Respondents' background characteristics

Variable	Sub-Variable	Frequency	Percent
Gender	Male	224	54.4
	Female	188	45.6
Age	12-14	241	51.9
	15-17	154	37.4
	18-20	14	3.4
	Above 20 year	3	0.7

Source: Primary data (2023)

The above table is for quantitative primary data collection and respondents were students. That's why the table shows only 3 respondents above 20 years of age.

The results in Table 4.2 further shows that the majority (54.4%) of the respondents were male

compared to 45.6% of them who were female. This implies that there are more males involved in physics at O level in Government Aided Secondary Schools. Though there was a small difference in the distribution of males and females, it was a fair representation of the study population.

Table 4.2 shows that majority (89.3%) were in age brackets (12-14 + 15-17). Thus, an indication that majority of the respondents are in the age 12-17 years of ages which gives a positive edge in informing the study.

Descriptive statistics

The findings were presented objective by objective using descriptive statistics of frequencies to find out the frequency and percentage of the variables. All the variables were measured on a five point Likert scale ranging from 1-Strongly Disagree (SD), 2 – Disagree (D), 3 – Not Sure (NS), 4 – Agree (A) and 5 - Strongly Agree (SA). In this study Strongly Agree and Agree were taken to mean Agree and Strongly Disagree and Disagree were taken to mean Disagree.

Objective One

Responses on indicators of project-based learning in physics at ordinary level in government aided secondary schools

This section shows the elicited responses to understand whether there are indicators of project-based learning (PBL) in physics at ordinary level in government aided secondary schools in Ibanda Municipality basing on table 4.3 below.

This is line with Qualitative findings whereby according to key informant D noted that;

> *Many teachers automatically create groups of two to four and forget that pairs are an option. If they teach young students in PBL, then pairs are a good choice. For classes, they are*

> *challenging to manage, pairs can help hold everyone accountable to complete the task of a project assigned in time. (Int. on 24th, October 2023).*

With regards to Key Informant F pointed out that;

> *In Project Based Learning, small, temporary groups of two to four students work together for brief projects in a class, to answer questions or respond to prompts posed by the teachers. For example in this school, physics teachers always group students to undertake some activities such as bulb wiring, mechanical projects, making projects and other related projects that need demonstration. (Int. on 25th, October 2023).*

Contrary, Key Informant E had this to say;

> *There are a few situations where I do let students choose their own groups. I always let students choose their groups for team builders at the beginning of the year. I am allowing them to identify their friends in the class and in a short, one hour activity, I quickly learn of any students who should not be teamed up together for a full scale project. Sometimes at the end of the year, I have a great project planned with an important public audience. I want a super-group that will create something amazing to show off. This is easy to create: I let them all choose their own groups. The super-group forms automatically and I sometimes end up with a group of duds-kids who have a reputation of trying to coast through everything and no one else wants to work with them. (Int. on 25th, October 2023).*

This implies that student groups are effective and appropriate in implementation of project based learning. Although students generally like the idea of a group or in collaboration with others, they may have a bad experience of working together in a group and this results in poor physics performance of student.

It was also established that 58 (14.1%) strongly disagreed, 67 (16.3%) disagreed, 21 (5.1%) were neutral, 129 (31.3%) agreed and 137 (33.2%) strongly agreed that class timetable has a provision for project work. The mean of 4.22 implies that the majority of the respondents agreed with the statement. Basing on Key Informant B, has this to say;

> *Schools also have timetables for every subject/project for example the timetable places students at the proper time and in the proper manner. It prevents wastage of time and energy for both students and teacher. In my School, the timetable shows exactly which project is to be done at a particular time. It, directs the attention of both the learner and the teacher to one project at a time. (Int. on 23rd, October 2023).*

The results in Table 4.3 shows that 148 (35.9%) strongly disagreed, 133 (32.3%) disagreed, 28 (6.8%) were neutral, 56 (13.6%) agreed and 47 (11.4%) strongly agreed that student identify the critical project problem. The mean of 1.84 implies that the majority of the respondents disagreed with the statement. However, according to Key informant A claimed that;

> *Certain projects require specific skillsets in every group. A good example is creating a podcast. Each group needs a strong writer, speaker, and sound editor. I give students a survey a week ahead of time and ask them to identify their project according to the existing problem. Then I group them by skillset before we launch the project, balancing achievement level and skills. This is a great opportunity to honor students' skills that fall outside of the normal range of what we measure in schools, building self-confidence in them. A student who loves ICT technology might not be that excited about the content of the project, but is geeked to edit audio or video. This becomes the hook to get them to engage in classes after choosing the problem they are comfortable with. (Int. on 23rd, October 2023).*

It was noted that 48 (11.7%) strongly disagreed, 33 (8%) disagreed, 18 (4.4%) were neutral, 155 (37.6%) agreed and 160 (38.8%) strongly agreed that students conduct research and hands on during the assessments. The mean of 4.62 implies that the majority of the respondents agreed with the statement.

The results in Table 4.3 shows that 165 (40%) strongly disagreed, 144 (34.9%) disagreed, 11 (2.7%) were neutral, 53 (12.9%) agreed and 39 (9.5%) strongly agreed that students present results from projects. The mean of 1.91 shows that the majority of the respondents disagreed with the statement. According to key informant F pointed out that;

> *Students hardly give feedback to teachers and this was mostly during Covid-19 pandemic up to now. They like the ability to get immediate feedback, see their marks in the note board, and return to view the assessment later. The online method eliminates some of the potential problems of the pen-and-paper method for students: failure to obtain the paper assessment, failing to submit responses, failure to receive feedback on the responses and the teacher's failure to record the grade affects their performance especially in physics subject. (Int. on 25th, October 2023).*

Objective Two

Descriptive statistics on academic achievement in physics at ordinary level in Government Aided secondary schools in Ibanda municipality.

This section shows the elicited responses to understand whether the academic achievement in physics at ordinary level in Government Aided secondary schools in Ibanda Municipality. The results were summarized in Table 4.4.

Table 4. 3 Academic achievement

Variables	SD	D	NS	A	SA	M
Progress assessment scores determines physics academic achievement	72	69	16	117	138	4.21
End of term scores manifests physics performance in schools	78	65	12	124	133	3.12

Source: Primary source (2023)

The mean of 4.21 shows that the majority of respondents agreed with the findings. According to Key informant F noted that;

> *Academic achievement is commonly measured in this school through examinations or continuous assessments but there is no general agreement on how it is best evaluated or which aspects are most important to ascertain procedural knowledge such as skills. (Int. on 25th, October 2023).*

According to key informant H;

> *The academic achievement through progress assessment scores is almost entirely measured with grades. This is unsurprising since grades measures are by far the most readily available assessments for schools in the country. The overall Grade document indicates all the marks and it guides the general achievement of a learner. (Int. on 23rd, October 2023).*

It was found out that 78 (18.9%) strongly disagreed, 65 (15.8%) disagreed, 12 (2.9%) were neutral, 124 (30.1%) agreed and 133 (32.3%) strongly agreed that the end of term scores manifests physics performance in schools. The mean of 3.12 shows that the majority of respondents agreed with the findings.

The results in Table 4.4 shows 89 (21.6%) strongly disagreed, 73 (17.7%) disagreed, 11 (2.7%) were neutral, 114 (27.7%) agreed and 125 (30.3%) strongly agreed that Grades at UCE is an indicator of physics academic achievement. The mean of 3.73 shows that the majority of respondents agreed with the findings. This is in line with key informant C who noted that;

> *The academic performance is measured by the final grade earned in the course. Intellectual ability and skills of students reached in the academic context is usually maintained. The academic performance is determined by students' Grades at UCE for the each year. Unless otherwise, the level of skills acquired by a learner is in line with the grade obtained at UCE. (Int. on 24th, October 2023).*

It was noted that 127 (30.8%) strongly disagreed, 146 (35.4%) disagreed, 14 (33.9%) were neutral, 49 (11.9%) agreed and 76 (18.4%) strongly agreed that project teaching practices improve physics performance. The mean of 2.72 shows that the majority of respondents disagreed with the findings. According to Key Informant L narrated that;

> *Project-based learning help students learn important skills by doing actual projects. Students apply core academic skills and creativity to solve authentic problems in real world situations in relation to physics. Students use a wide range of tools and the culminating projects are tangible and observable artifacts that serve as evidence of what the students have learned. For example students produce videos, artwork, reports, photography, music, model construction, live performances, action plans, digital stories and websites. (Int. on 24th, October 2023).*

This implies that Project-based learning is deeper and more meaningful when students are involved in constructing their own knowledge. Students are given the opportunity to select a topic that interests them within the required content framework which are not applicable in physics perspective thus affecting their performance.

It has been noted by key informant G that;

> *It has been realized unfortunately that schools still teach the low ability thinking skills of knowledge and understanding and ignore the higher ability thinking skills. Instruction in most cases has tended to stress knowledge acquisition to the detriment of the higher quality behaviors such as application, analysis. The persistence of this situation in the school system means that students will only do well on recall items and questions and perform poorly on questions that require higher ability thinking skills. (Int. on 26th, October 2023).*

This implies that students are not encouraged to apply their knowledge, develop analytical skills, develop plans, and generate new and creative ideas and solutions and to use their knowledge in a variety of ways thus affecting their performance in physics subject.

The results of in Table 4.4 show that 125 (30.3%) strongly disagreed, 139 (33.7%) disagreed, 35 (8.5%) were neutral, 44 (10.7%) agreed and 69 (16.7%) strongly agreed that hands on learning can influence physics good grades among students in schools. The mean of 2.63 shows that the majority of respondents disagreed with the findings. This finding suggests that high academic hands on learning as a cause of failure is greater, whereas low academic hands on learning has a greater opportunity to obtain better learning achievements in physics.

The results indicate that 35 (8.5%) strongly disagreed, 41 (9.9%) disagreed, 28 (6.8%) were neutral, 129 (31.3%) agreed and 179 (43.4%) strongly agreed that collaboration between teachers and students can improve their performance in physics. The mean of 3.67 shows that majority of the respondents agreed with the findings. Therefore, a teacher is needed to guide the learner in making research and interpreting abstract concepts in physics to the learner.

Basing on Key informant N pointed out that;

> *During the collaborative classroom, teachers split the authority with students in ways that are very special. Collaborative teachers invite students to set learning goals on the subject matter taught, provide an appropriate choice of activities and tasks of different interests and goals of the students, and encourage students to assess their learning. The collaborative teacher encourages students to use their own knowledge, ensure that they share knowledge and learning strategies, treat each person respectfully, and focus on high-level understanding. In the process, the collaborative teacher helps students listen to various opinions, support knowledge accompanied by evidence, involve creative and critical thinking, as well as participate in an open and meaningful dialogue. (Int. on 25th, October 2023).*

This suggests that collaborative learning aims to improve critical thinking skills. Its main value lies in the development of all knowledge and ideas through dialogue with friends, comments posting, discussion, cooperation, and conceptualization with the essence of improving performance. It should be noted that collaborative learning creates an environment that can revive and enrich the learning process. Placing the interactive partner into an educational system would create a more realistic social context; thereby it can enhance the system effectiveness.

Objective Three

Relationship between Project Based Learning and Academic Achievement in Physics

Descriptive statistics on indicators of project based learning in physics at ordinary level in Government Aided secondary schools in Ibanda municipality.

This section shows the elicited responses to understand whether there are indicators of project-based learning (PBL) in physics at ordinary level in government aided secondary schools in Ibanda Municipality. The results were summarized in Table 4.3.

Table 4. 4 Indicators of project-based learning in physics

Statement	SD	D	NS	A	SA	M
Students are grouped and given supervisors for project learning	65 (15.8%)	71 (17.2%)	13 (3.2%)	121 (29.4%)	142 (34.4%)	3.42
Class timetable helps students to plan	58 (14.1%)	67 (16.3%)	21 (5.1%)	129 (31.3%)	137 (33.2%)	4.22
Student identify the critical project problem.	148 (35.9%)	133 (32.3%)	28 (6.8%)	56 (13.6%)	47 (11.4%)	1.84
Students conduct research, reflection and hands on.	48 (11.7%)	33 (8%)	18 (4.4%)	155 (37.6%)	160 (38.8%)	4.62
Students give feedback through present results from projects	165 (40%)	144 (34.9%)	11 (2.7%)	53 (12.9%)	39 (9.5%)	1.91

Source: Primary data (2023)

The results in Table 4.3 shows that 65 (15.8%) strongly disagreed, 71 (17.2%) disagreed, 13 (3.2%) were undecided, 121 (29.4%) agreed and 142 (34.4%) strongly agreed that students are grouped and given supervisors for project learning. The mean of 3.42 implies that the majority of the respondents agreed with statement.

Assessment of academic achievement in physics at ordinary level.

This section shows the elicited responses to understand whether the academic achievement in physics at ordinary level in Government Aided secondary schools in Ibanda Municipality. The results were summarized in Table 4.4.

Table 4. 5 Academic achievement

Variables	SD	D	NS	A	SA	M
Progress assessment scores determines physics academic achievement	72 (17.5%)	69 (16.7%)	16 (3.9%)	117 (28.4%)	138 (33.5%)	4.21
End of term scores manifests physics performance in schools	78 (18.9%)	65 (15.8%)	12 (2.9%)	124 (30.1%)	133 (32.3%)	3.12
Grades at UCE is an indicator of physics academic achievement	89 (21.6%)	73 (17.7%)	11 (2.7%)	114 (27.7%)	125 (30.3%)	3.73
Project teaching practices improves physics performance	127 (30.8%)	146 (35.4%)	14 (33.9%)	49 (11.9%)	76 (18.4%)	2.72
Hands on learning can influence physics good grades among students in schools	125 (30.3%)	139 (33.7%)	35 (8.5%)	44 (10.7%)	69 (16.7%)	2.63
Collaboration between teachers and students can improve their performance in physics	35 (8.5%)	41 (9.9%)	28 (6.8%)	129 (31.3%)	179 (43.4%)	3.67

Source: Primary source (2023)

The results in Table 4.4 shows that 72 (17.5%) strongly disagreed, 69 (16.7%) disagreed, 16 (3.9%) were neutral, 117 (28.4%) agreed and 138 (33.5%) strongly agreed that Progress assessment scores determines physics academic achievement. The mean of 4.21 shows that the majority of respondents agreed with the findings.

To obtain the relationship between Project Based Learning and Academic Achievement in Physics at Ordinary Level in Government Aided Secondary Schools in Ibanda Municipality, a correlation analysis was conducted using Pearson's correlation coefficient and significance at the 95% confidence limits (two tailed level) and the findings obtained are in Table 4.5.

Table 4. 6 Pearson correlation coefficient between Project Based Learning and learners' achievement in physics.

		Project based Learning	Academic learners achievement
Project based Learning	Pearson Correlation	1	.302*
	Sig. (2-tailed)		.002
	N	412	412
Academic learners achievement	Pearson Correlation	.302*	1
	Sig. (2-tailed)	.002	
	N	412	412

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Primary data (2023)

Table 4.5 shows that there is a positive weak but significant relationship between Project based Learning and Academic learners achievement (r=0.302, p=0.002, N=412). The relationship is statistically significant at 95% confidence level (2-tailed) since p-value 0.002 <0.05. This implies that Project based Learning leads to improvement in learner's Academic Achievement in physics at O level in government aided secondary schools in Ibanda Municipality. Therefore, project-based learning provides opportunities for students to actively build their knowledge and solve a problem through activities in producing a product. Through this learning model, students are facilitated to develop their scientific characters such as honesty, responsibility, and the ability to communicate and accept criticisms and suggestions from others. The implementation of project assignments makes students active in finding references independently and guide them to learn more meaningfully and deeply because the material learned is associated with experience in real life.

Test of Hypothesis

The hypothesis (H_0) of this study was; Project Based Learning has not affected Academic Achievement in Physics at Ordinary Level in Government Aided Secondary Schools in Ibanda Municipality. In testing this hypothesis, simple linear regression was used because the relationship between the variables is linear and the independent variable can be used to predict the value of dependent variable. However, before testing the hypothesis, a regression model summary was first presented in Table 4.6 below.

Table 4. 7 Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of estimate
1	.742[a]	.608	.521	4.8134

a. Predictors (constant), Project Based Learning

b. Dependent variable, Academic Achievement

Regression Model is to test whether this study had the right variables.

From the above Table 4.6, the adjusted R value is high at 0.521 which shows the contribution of Project Based Learning on Academic Achievement. Therefore any deviation in academic Achievement is as a result of 52.1% contribution in Project Based Learning thus a goodness of fit is achieved.

Table 4. 8 ANOVA

Model	**Sum of Squares**	**Df**	**Mean of Squares**	**F**	**Sig**
Regression	92.623	1	88.761	132.266	.000[a]
Residual	71.313	411	.264		
Total	163.956	412			

a. Predictors (constant), Project Based Learning

b. Dependent variable, Academic Achievement

Table 4.7 above indicates ANOVA, and tests the acceptability of the model from a statistical perspective. The level of significance of the P-value statistic is 0.000, which is much less than 0.05. Therefore, it can be noted that Project Based Learning has a positive and high statistically significant contribution on Academic Achievement in physics at Ordinary level in government aided secondary schools in Ibanda Municipality.

Therefore, the null hypothesis (H_0); Project Based Learning does not significantly affect Academic Achievement is hereby rejected and the alternative is accepted.

The policy implication of this finding suggests that PBL students pursue solutions to problems by asking and refining questions, debating ideas, making predictions, designing plans, collecting and analyzing data, drawing conclusions, communicating ideas, asking new questions, and creating physics artifacts. Students are placed in realistic, problem-solving environments that serve to make connections between phenomena in the classroom and real life experiences, In addition, PBL promotes interdisciplinary studies, coupled with in-depth exploration of the subject matter over extended periods of time that are then linked to meaningful activities for students thus resulting in a deep level of understanding of the content and concept. Above and beyond, the PBL approach is more than student mastery of content knowledge; rather it enables students to transfer their learning to new kinds of situations and problems and to use knowledge more proficiently in performance situations. However, there is no guarantee that Project Based Learning provides students with the opportunity to work autonomously over periods of time and produce realistic products that may include presentations to strategic audiences who have interest in the solutions thus making in insignificant in achieving the desired goal.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

Introduction

The study aimed at examining the relationship between project-based learning and academic achievement in physics among ordinary level students in government aided secondary schools in Ibanda Municipality. This chapter, presents summary of discussion, conclusion and recommendations. These were based on three specific objectives of the study these are; to examine the indicators of project-based learning (PBL) in physics at ordinary level in government aided secondary schools, to assess academic achievement in physics at ordinary level in government aided secondary schools, to determine the relationship between project-based learning and academic achievement in physics at Ordinary level in government aided schools in Ibanda Municipality.

Discussion

In this section, the researcher discusses the findings of the study. The discussion cross references the findings of other scholars on sustainability of paved roads with a view of discovering agreement and disagreement between the study findings and those of other scholars. The findings of this study are discussed objective by objective.

Objective One

The study revealed that Students are grouped and given supervisors for project learning; class timetable has a provision for project work; Students conduct research and hands on during the assessments.

The results are in line with Aminah, Fauzan and Fauziddin (2021) who revealed that it is necessary to educate pre-service teachers in approaches stressing the importance of the own activity of students. Moe so, the time table helps learners have time to prepare for project work. Project-based physics learning where learners make projects either individually or in groups seems to be one of the most

effective methods for teaching physics science for understanding. It is necessary to provide in-service teachers instruction (seminars) and prepare sample projects with proposals on how to develop, run and evaluate interdisciplinary projects.

The findings are line with Muhammad (2022) who discovered that project-based learning (PBL) and team cohesion increased favorably on both the efficacy and engagement of students' learning. Flipped learning, on the other hand, had diminished positive effects on engagement and increased positive effects on student learning effectiveness.

The results are also in agreement with Wakumire, Nkundabakura, and Mollel (2022) who revealed a significant difference in the average scores of students' attitudes towards physics in favor of the experimental group. Therefore, the study recommends that science educators adopt PBL to improve students' attitudes. Much as the above study was done in Mbale, this study was conducted in Ibanda Municipality.

Furthermore, the results in line with Watt et al. (2019) who suggest that targeting a well-defined profile of students is more effective compared with targeting each individual in a classroom, since feedback can be easily individualised and instructional approaches are flexibly adapted to cater for a group of similar students rather than each individual. However, little work has been devoted to the person-centred approach by motivational researchers (Chittum & Jones, 2017; Vansteenkiste et al., 2009), especially in developing countries. Equally, research investigating the relationship between secondary school students' motivation and cognitive learning strategies during Physics learning in third world countries is very scarce.

Also the results are in line with Makkonen, Lavonen and Tirri (2023) who noted that students with an interest in a subject like physics are likely to be more motivated to manage their own learning and

develop the requisite skills to become effective learners of Physics. Hence, interest in physics is relevant when considering the development of effective learning strategies for physics. In contrast, anxiety about learning physics can act as a barrier to effective learning. Students who feel anxious about their ability to cope in physics learning situations may avoid them and thus lose important career and life opportunities. Godpower-Echie and Ihenko (2017) opined that physics teachers should try to identify a teaching approach, method that can motivate or arouse students' interest. Interest is, generally, student attention, greater concentration, pleasant feelings, and increased motivation towards learning a concept (Afjar & Syukri, 2020).

Also the results are in agreement with Liliana, Raharjo, Jauhari and Sulisworo (2020) who noted that in the development of students' academic achievements, teachers display behaviours aimed at enabling students to grasp the subject of the lesson and reinforcing it with exercises, applying the correct assessment methods, using time efficiently, keeping students active in class, and enabling them to generate ideas. In efficient schools, teachers behave in a planned and disciplined way, target the academic success of the school and students, have sufficient knowledge in their field, consolidate students' positive behaviours, move on to the next stage for education to be provided in full, work in cooperation with students, and provide students with suitable feedback (Roberts & Webster, 2022).

In addition the results are in agreement with Cheah (2021) who stated that efficient teachers' preparation of the classroom for teaching, and setting and imposing the class rules together with the students, enables retention of learning and allows students to display learning behaviours. An effective teacher trusts students and accepts them as they are, gives priority to students' achievements, appreciates them, stimulates interest towards the lesson in students, rewards them, prepares the classroom for education, is tolerant and flexible, makes the right decisions, and accepts and respects individual differences (Tanak, 2020). Teachers who are successful in their profession are patient and

controlled, respect differences, are open to development and criticism, stimulate students, display role model behaviours, establish discipline in class, have leadership characteristics, encourage and support students, are affectionate, witty and sincere, find solutions to problems, monitor homework and facilitate learning (Ozcan, 2021). When the characteristics of an effective teacher are examined, it is seen that when a teacher has these qualities, academic success can be enabled in the student.

Objective Two

The study revealed that progress assessment scores determine physics academic achievement; end of term scores manifests physics performance in schools; grades at UCE is an indicator of physics academic achievement and collaboration between teachers and students can improve their performance in physics.

However, it was established that respondents disagreed that project teaching practices improves physics performance and hands on learning can influence physics good grades among students in schools.

First and foremost, the results are in agreement with Wajid and Saeed (2021) who noted that the development of conceptual knowledge in physics is encouraged among secondary school students, physics teachers, and stakeholders involved in the development of the secondary school physics curriculum. Secondary school physics students are advised to make their studies use self-explanation and rereading, while physics teachers are encouraged to instruct the students in a way that fosters conceptual knowledge. Basing on this, the study wishes to identify challenges facing students while doing project work and give their findings in form of products.

The results are in agreement with Kingsley et al (2022) who assert that academic interest significantly and proportionally contributed to the prediction of secondary school Physics academic achievement at

18%. These results led to recommendations for teachers to use educational tactics like project-based learning to spark students' academic interest in learning about physics.

The findings are in line with Wachira and Wanjau (2014) who discovered that teachers' poor attendance habits, interactions with students, and teaching strategies affected how well students performed in physics. The results are also in agreement with Nalugemwa (2022) who showed that instructors' dedication is crucial since it enables constant evaluation of learners. Results on the relationship between teamwork and students' academic progress in secondary government-aided schools showed that by coordinating tasks, teamwork encourages teachers to divide their workload. In order to encourage student academic accomplishment, government secondary schools in the Luwero District should adopt a school culture that values teacher commitment, teamwork, and goal-setting. However, it is advised that secondary schools in the Luwero District seriously consider using staff meetings on a regular basis to address issues with teachers' work performance and raise academic standards for students.

In addition the results are in agreement with Akanbi et al. (2021) who noted that the teaching method employed by teachers reflects on students' understanding of the physics subject and it is the important for teachers to understand and interpret the objectives of Physics for efficient, effective teaching and learning. It is therefore, necessary to use appropriate methods which involve students' active participation in teaching and learning. Teaching needs to be participatory, where all the domains of learning are engaged in learning, hence there is the need to introduce, adopt and adapt the recently used instructional strategy that are capable of sustaining not only the interest of the learners, but also helping them to understand the concepts (Daka, 2020). Banda (2020) inquired into the qualities of effective teachers as perceived by secondary school teachers and twelfth grade pupils in Lusaka. The findings revealed that an effective teacher was perceived as one who prepared lessons, taught in an interesting

manner and explained things clearly. Banda (2020) also found that highly qualified teachers were highly perceived to be more effective in terms of teaching confidently and handling pupil's questions.

Furthermore the results are in agreement with Omosewo and Ogunlade (2012) who noted that Physics education is designed to train the students to acquire proper understanding of the basic principles as well as their applications. Physics is therefore, an important science subject that makes enormous academic demands on students in its learning as well as its teaching. The teaching of Physics at secondary school level lays the foundation for the application of science and technology which is of immense benefits to the society at large.

Also, the results are in line with Achor and Gbadamosi (2020) who said that achievement is the level of success or performance students attained after test has been administered to them. Bajon (2015) regarded achievement as a task which has been accomplished successfully, especially by means of exertion, skill practice or perseverance. Students' achievement is attributed to students' personal progress which is an act of accomplishing an academic task productively. Some researchers (Bawaneh, Zain, Saleh, & Abdullahi, 2012; Saleh & Subramaniam, 2017) have indicated that teachers use inappropriate teaching methods and strategies which are teacher centered like conventional teaching strategy (lecture method) in teaching science students which among other factors accounts for the poor performance of science students.

Also the results are in line with Azhary et al. (2020) who noted that adolescents who were well liked by many peers displayed high level of ego development and secure attainment, as well as better interactions with their best friends. Furthermore, associating with friends who have a positive attitude towards school enhances students' own satisfaction with school whereas associating with friends who have a negative attitude toward school decreases it (Mark, 2014).

Similarly, the results are in agreement with Bozzi, Raffaghelli and Zani (2021) who revealed that friendship among students are critical interpersonal vehicle that move them towards physiological growth and maturity, allowing social compassion which influences the development of self-evaluation. The results are in agreement with Usengimana, Kampire and Ntawiha (2021) noted that peer influence can inspire students‟ academic vigor and motivation for achievement. In the study conducted by Olalekan (2016), it was revealed that peer group generally has a lot of influence on students. In addition, observation and imitating the behavior of others, learners can avoid much wasteful random behavior and come close to reproducing the behaviors of which members are recognized.

In the same way, the results are in agreement with Achor and Gbadamosi (2020) showed that one of the observed reasons for the declining students‟ achievement in Physics is the passive teaching methods or strategies that are widely employed by many teachers in the Physics classrooms. The traditional Physics instruction, which is normally conducted based on a theoretical basis, together with the teacher centred approach, may also contribute to the observed low students achievement in Physics This undesirable issue may be due to the difficulty of students‟ understanding of the underlining concepts, due to the mere absence of an appropriate learning strategy for impacting knowledge of Physics concepts. Yang et al, (2023) indicated that teachers use inappropriate teaching methods and strategies in teaching science students which among other factors have contributed to gradual poor students‟ performance in Physics. This by implication can lead to poor achievement in Physics.

Finally, the results are in agreement with Joof (2020) who noted that academic achievement refers to performance on a task with measures including comprehension, quality and accuracy of answers of tests, quality and accuracy of problem-solving, frequency and quantity of desired outcome, time or rate to solution, time on task, level reasoning and critical thinking, creativity, retention and recall, and

transfer of tasks. Still, Jackson (2023) found that the child's experiences and situations, the quality of schools and educators, and many other factors affect academic achievement.

Objective Three

The results show that there is a positive significant but weak relationship between Projects based Learning and Academic learners' achievement. Project Based Learning contributes low to academic achievement in physics at ordinary level in government aided secondary schools in Ibanda Municipality. Therefore, the null hypothesis (H_0); Project Based Learning doesn't significantly affect Academic Achievement is hereby rejected. The alternative is then accepted.

First and foremost, the results are in agreement with Jerrim et al. (2019) who investigated the connection between inquiry-based instruction and academic attainment and found scant evidence that the frequency of inquiry-based instruction is positively associated with adolescents' performance on science exams using nationally representative, linked survey and administrative data. Their findings hold up when different examinations and measures of achievement are used, different levels of discipline are used in different classrooms, and different gender and prior achievement subgroups are taken into account.

The findings are also in line with Santyasa et al. (2020) who found out that students that learned using the PBL paradigm excelled in their academics. The academic accomplishment of students with high academic procrastination and low academic procrastination significantly differed from one another. It was found out that students with low academic procrastination demonstrated higher learning achievement. Thirdly, the learning model and academic procrastination both had an impact on students' academic achievement. For both learning models, there was significant interaction in low procrastination.

In addition, the findings are also in agreement with Abdullatif (2020) and found to significantly influence student engagement through collaborative learning, critical thinking, disciplinary subject learning, and authentic learning. The findings demonstrate that through facilitating knowledge and information sharing and discussion, the PBL technique enhances the independence of students and enables research and critical thinking. Therefore, the PBL approach is strongly advised for use in the classroom and outside classroom by students and should be promoted in secondary schools.

Also the findings are in line with Galukande (2022) who performed a research to look at how management methods impacted academic achievement in public secondary schools and showed that planning was a crucial managerial requirement for enhancing academic performance. To improve academic performance in public secondary schools, the study suggests increasing stakeholder involvement, resources, and financial assistance.

Similarly, the results are in line with Onah and Achufusi (2022) who observed that meta-conceptual teaching approach was capable of boosting students' interest which consequently improved their academic achievement. Again, Okafor (2020) noted that academic interest was able to predict academic achievement. In physis Femi-Adeoye and Adekunle (2016) observed that academic interest could predict academic achievement with about 25% and 34% respectively.

To add on, the results are in agreement with Amelink (2012) found students interest to be a motivating factor to learn skills needed for accomplishing everyday tasks and for student involvement in science, technology, engineering, and mathematics (STEM) disciplines, particularly for females. On the overall, students' interest in science subjects has been relatively low (Amelink, 2012). Physics being one of the seemingly difficult science subjects, the extent to which interest could predict their achievement is crucial for educational policies that would boost student achievement in physics and national development in particular. On another hand, Wong and Wong (2019) alleged that interest only

significantly and positively influences the achievement of the low achievement students and not significant predictors of the already high achievement students.

Furthermore, the results are in agreement with Al-Busaidi and Al-Seyabi (2021), Chanpet et al. (2018), Habibi et al. (2022), Manoban (2021), and Syawaludin et al. (2022) who observed that PBL helps learners understand knowledge more deeply, thereby improving learning outcomes. According to Lee and Galindo (2021), transforming a learning environment that supports PBL requires changing curricula and instruction and teachers' teaching thinking (Miller et al., 2021) and is equipped with strong professional and pedagogical knowledge.

Lastly, the results are in agreement with Tsybulsky and Muchnik-Rozanov (2021) and Tsybulsky and Oz (2019) also shows that learning with PBL affects pre-service teachers' beliefs and positive attitudes about the ability to use PBL in future teaching. But when it comes to educational technology courses for pre-service teachers, this adaptation becomes even more challenging (Umutlu, 2022). According to Umutlu (2022) offers implications for design of online teacher education courses promoting pre-service teachers' technological pedagogical content knowledge with TPACK framework. It was observed by Yadav et al. (2017) who noted that TPACK framework, suggesting that teachers learn to integrate technology effectively by combining their content area and pedagogical knowledge, is appropriate to be used in design of courses for pre-service teachers' learning to form teachers' knowledge required to create meaningful learning experiences in technology-integrated classes

Conclusion

Objective one

The study therefore concluded that students are grouped and given supervisors for project learning, supervisors are responsible for guiding students in the given specified time and awards scores to students.

Class timetable for planning has a provision for project work; in schools, the assessments have increased to include; end of cycle assessment, activity of integration, and project assessment. Schools have a time table shat favors both within their own different schedules.

Students conduct research and hands on during the assessments. This is a reflection of what is done in class basing on the syllabus, theme and learning outcomes. Reflection through research is done through internet, interview, documentaries, laboratories and research from text books.

It was disagreed that students identify the critical project problem and students present results from projects. This is a feedback from students to their supervisors about what has actually been done by a learner. Thus, students should perform projects basing on the problems affecting the society in order for school education to be meaningful.

The study concluded that students use a wide range of tools and the culminating projects are tangible and observable artifacts that serve as evidence of what the students have learned. It shows that the majority of respondents agreed with the statement that PBL helps learners acquire important skills. According to Key Informant L, Project-based learning help students learn important skills by doing actual projects. Students apply core academic skills and creativity to solve authentic problems in real world situations in relation to physics.

Objective two

It is concluded that academic achievement is commonly measured in schools through examinations or continuous assessments but there is no general agreement on how it is best evaluated or which aspects are most important to ascertain procedural knowledge such as skills.

The study also concluded that grades at UCE are an indicator of physics academic achievement and collaboration between teachers and students can improve their performance in physics. However, it was established that respondents disagreed that project teaching practices improves physics performance and hands on learning can influence physics good grades among students in schools.

Objective three

Therefore, since the study shows a significant but weak relationship between project-based learning and academic achievement in physics, the study concluded that secondary schools should not put all the emphasis on projects. They should consider other examination subunits like Activity of integration and end of cycle national assessment.

Findings hold up when different examination measures of achievement in physics are used, different levels of discipline are used in different classrooms, and different subgroups are taken into account. Therefore, the study concludes that project based be emphasized in government secondary schools since they a contribution on learner's achievement.

The hypothesis (H_0) of this study was; Project Based Learning has not affected Academic Achievement in Physics at Ordinary Level in Government Aided Secondary Schools in Ibanda Municipality. On testing this hypothesis, using simple linear regression and Pearson moment correlation coefficient, the study concluded that project assessment should not be left out as it helps a learner to think critically but should not take much of the student's time.

Recommendations

The indicators of project-based learning in physics at ordinary level in government aided secondary schools in Ibanda Municipality.

School administrators should organize workshops about how learners can identify a project, planning, project implementation, project report, project marks allocation and project record keeping.

Schools should set exhibitions where learners present their findings and explain the methodology. This improves on the communication skills and critical thinking.

Academic achievement in physics at ordinary level in government aided secondary schools in Ibanda Municipality.

There is a need for effective supervision of teachers on the methods of teaching, availability of teachers, quality of tests set for students, progressive assessment and record of marks for school based assessment.

The relationship between project-based learning and academic achievement in physics at Ordinary level in government aided schools in Ibanda Municipality.

The Government through the Ministry of Education and sports should provide mandatory policy guidelines about new lower secondary curriculum especially on project work to teachers and head teachers to ease the teaching and learning process. The reflection of what is done in classroom be experienced in projects. This improves academic scores in physics by a learner.

Areas for further studies

This study focused on Project Based Learning and Academic Achievement in Physics at Ordinary level in Government Aided Secondary Schools in Ibanda Municipality. Further research is therefore recommended on the same topic in other municipalities, districts and cities in Uganda. This will help in establishment of the general trend of the investigated variables to make conclusions and national recommendations.

Further research is also recommended to be carried out on the same topic but in privately owned secondary schools in municipalities, cities and districts in Uganda. This helps government to understand the attitude of project work in private secondary schools. In doing so, government can identify the gap and plan to bridge it accordingly.

Further research is also recommended to be carried out in all secondary schools in countries of East Africa. This enhances comparative education standards and promotes regional development through East African educational integration.

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APPENDICES

Appendix A: Questionnaire for students

Dear Participants;

This questionnaire is presented to you by a student of Bishop Stuart University conducting a research study on "***Project Based learning and Academic Achievement in Physics at Ordinary Level in Government Aided Secondary Schools in Ibanda Municipality*".** The questionnaire is for academic purposes and will not be used for any other interests whatsoever; your assistance is therefore kindly sought in answering the questions as follows.

SECTION A: BACKGROUND INFORMATION

In question one tick appropriately in the box provided.

1. Gender
    a) Male
    b) Female

2. Age……..

SECTION B: Project based learning on physics academic achievement government Aided Schools

1. Tick in the appropriate number to indicate your level of agreement with the statements

5= Strongly agree, 4=Agree, 3=Undecided, 2= Disagree, 1=Strongly disagree

Statement	**SD**	**D**	**NS**	**A**	**SA**
Students are grouped and given supervisors for project learning					

Class timetable has a provision for project work					
Student identify the critical project problem					
Students conduct research and hands on during the assessments					
Students present results from projects					

SECTION C: **Academic achievement in physics at Ordinary level in Government Aided secondary schools.**

Variables	**SD**	**D**	**NS**	**A**	**SA**
Progress assessment scores determines physics academic achievement					
End of term scores manifests physics performance in schools					
Grades at UCE is an indicator of physics academic achievement					
Project teaching practices improves physics performance					
Hands on learning can influence physics good grades among students in schools					
Collaboration between teachers and students can improve their performance in physics					

Thank you for your cooperation

Appendix B: Interview guide for; Principal Education Officer, Municipal Education Officer, Head teachers & Teachers

Dear Participants;

This Interview Guide is for a student of Bishop Stuart University conducting a research study on *"**Project Based Teaching and Academic Achievement in Physics at Ordinary Level in Government Aided Secondary Schools in Ibanda Municipality***". The tool is for academic purposes and will not be used for any other interests whatsoever; your assistance is therefore kindly sought in answering the questions as follows.

Section A: Project Based Learning

1. Has grouping been taking place? Yes/No
2. If yes, what benefits have you gained from grouping?
3. If no why, and give reasons to your answers

Section B: Academic Achievement in Physics

1. How have been students performing physics at UCE for the last three years?
2. Do you have progressive assessment scores in your school(s)?

Yes ☐

NO ☐

If yes, how have progressive assessment scores influenced physics achievement in your school(s)?

……

……

3. What roles have both end and midterm exams played towards the performance of physics in your school(s)?

……

……

Thank you for your cooperation

Appendix C: Determining the Sample size

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Source: Krejcie and Morgan (1970)

Appendix D

BISHOP STUART UNIVERSITY

P.O.BOX 9, MBARARA

Tel: 0772 512551

Website: www.bsu.ac.ug
E-mail: rec@bsu.ac.ug/info@bsu.ac.ug

RESEARCH ETHICS COMMITTEE

BISHOP STUART UNIVERSITY
RESEARCH ETHICS COMMITTEE
17 OCT 2024
APPROVED VALID UNTIL DATE SHOWN ABOVE
P.O.BOX 09, MBARARA

17/10/2023

To: TUKAKIRA ARTHUR

BISHOP STUART UNIVERSITY
0776144160

Type: Initial Review

Re: BSU-REC-2023-219: Project Based Learning and Learner's Achievement in Physics in O level Government Aided Secondary Schools In Ibanda Municipality

I am pleased to inform you that at the **16** convened meeting on **14/09/2023**, the Bishop Stuart University (BSU) REC meeting voted to approve the above referenced application.
Approval of the research is for the period of **17/10/2023** to **17/10/2024.**

As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the REC for re-review and approval **prior** to the activation of the changes.
3. Reports of unanticipated problems involving risks to participants or any new information which could change the risk benefit: ratio must be submitted to the REC.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The REC may conduct audits of all study records, and consent documentation may be part of such audits.
5. Continuing review application must be submitted to the REC **eight weeks** prior to the expiration date of **17/10/2024** in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following is the list of all documents approved in this application by Bishop Stuart University (BSU) REC:

BISHOP STUART UNIVERSITY

RESEARCH ETHICS COMMITTEE

P.O. Box 09 Mbarara-Uganda Tel: +256 485-433468 E-mail: rec@bsu.ac.ug

INFORMED CONSENT FORM

This document outlines the research study and expectations for potential participants. It should be written in lay man terms and typed on BSU-REC letterhead.

Instructions

1. The wording of this document should be directed to the potential participant not BSU- REC.
2. If a technical term must be used, then define it the first time it is used and any acronyms or abbreviations used should be spelled out the first time they are used.
3. All the sections of this document must be completed without any editing or deletions.
4. Please use a typing font that is easily distinguishable from the questions of this form. Preferably the font size should be 12.

Study title – This should be the same as on all other documents related to the study.

Project Based Learning and Learner's Achievement in Physics in O Level Government Aided Secondary Schools In Ibanda Municipality

Principal Investigator(s)

Arthur Tukakira

2021/BSU/MEAP/0890

Leave blank for REC office only:	**REC OFFICE USE ONLY:**
BSU-REC Stamp: BISHOP STUART UNIVERSITY P.O.BOX 09. MBARARA 18 OCT 2023 RESEARCH ETHICS COMMITTEE	APPROVAL DATE: 17/10/2023 APPROVED CONSENT IRB VERSION NUMBER: PI NAME: Tukakira Arthur IRB NO: BSU-REC-2023-219

BISHOP STUART UNIVERSITY
P.O BOX 09, MBARARA

Office Tel: 0772590865
Mob Tel: 0782873086

DIRECTORATE OF GRADUATE STUDIES, RESEARCH AND INNOVATIONS

mail: pgd@bsu.ac.ug
dgsri@bsu.ac.ug
Website: www.bsu.ac.ug

19th October, 2023

To Whom It May Concern

Dear Sir/Madam,

RE: INTRODUCTORY LETTER FOR MR. TUKAKIRA ARTHUR

This is to introduce to you Mr. Tukakira Arthur, a student of Bishop Stuart University pursuing Master of Education Administration and Planning, Reg. No; 21/BSU/MEAP/0890 who is conducting his Masters' Research in Ibanda Municipality.

His research topic is "**Project Based Learning and Learner's Achievement in Physics in O Level Government Aided Secondary Schools in Ibanda Municipality**"

Any assistance rendered to him is highly appreciated

Yours faithfully

GRADUATE SCHOOL
15 OCT 2023
BISHOP STUART UNIVERSITY

Dr. Johnson Atwiine (PhD)
Caretaker – Director, Directorate of Graduate Studies, Research and Innovations.
Bishop Stuart University

IBANDA MUNICIPAL COUNCIL
P. O. Box 54, Ibanda
Email: ibandatown@gmail.com
Tel: 0392-003585, 0782-546728

Date: 20/10/2023

To; The Head teachers of Government aided secondary schools-

Ibanda Municipal Council.

RE; MR. ARTHUR TUKAKIRA

I hereby introduce to you the above mentioned person. He is a male Masters student at Bishop Stuart University Mbarara, Reg. No. 21/BSU/MEAP/0890.

He is making research and needs your assistance in obtaining primary data from your school. Any service rendered to him is highly welcome.

Thank you.

Yours,

Ntare Denis
Principal Education Officer.