Effect of School Facilities on Learner's Academic Performance in Science Subjects in Secondary Schools: A Case of Rutsiro District, Rwanda (2021-2023)

Ntahomvukiye Simon Pierre[1]
Dr. Sikubwabo Cyprien, PhD[2]

[1]Simonntahomvukiye52@gmail.com (+250789313015)
[2]cskubwabo@uok.ac.rw (+250788221063)

[1,2]School of Education, University of Kigali (UOK), [2]Kigali Independent University ULK, Rwanda

ABSTRACT

The purpose of this research was to investigate the effect of school facilities on learners' academic performance in science subjects in secondary schools in Rutsiro district, Rwanda. The following objectives guided the study: The study aimed to investigate the impact of physical facilities and physical instructional materials on students' academic performance in science subjects in Rutsiro district secondary schools. Furthermore, it aimed to investigate the influence of electronic instructional materials on the academic performance of science students in Rutsiro district secondary schools. Environmentalist Bandura's theory of learning, also known as the social cognitive learning theory (SCLT), guided the research. Based on the descriptive research design and mixed-methods approach, the study was conducted in five selected secondary schools in the Rutsiro District. The study's target population consisted of 460 respondents: five head teachers, five directors of studies, 150 teachers, and 300 students. The study involved 214 participants, including 2 head teachers, 2 directors of studies, 70 teachers, and 140 students. Systematic sampling was used to select the five schools, purposive sampling to select the student sample size, and the census sampling technique to select the head teachers and directors of studies. Data was collected using structured questionnaires, interview guides, and documentary reviews. The data was analyzed using descriptive statistics (frequencies, percentages, mean, and standard deviation) and inferential statistics. The study found a significant correlation between the availability of school facilities and academic performance. There were positive and significant correlations between academic performance and school facilities in Rutsiro District, Rwanda, and measures of the availability of school facilities were as follows: physical facilities ($r = 0.814$, $p<0.01$), electronic and technology facilities ($r = 0.826$, $p<0.1$), and physical instructional materials ($r = 0.949$, $p<0.01$). The findings from regression analysis revealed that physical facilities have a positive and significant effect on learners's academic performance in science subjects in Rutsiro district secondary schools ($\beta = 0.814$, P value <0.05), The findings from regression analysis revealed that physical instructional materials have a negative and significant effect on learners's academic performance in science subjects in Rutsiro district secondary schools ($\beta = -0.417$, P value <0.05), The findings from regression analysis revealed that electronic instructional materials have a positive and significant effect on learners's academic performance in science subjects in Rutsiro district secondary schools ($\beta = 0.308$, P value <0.05). Teachers, district education officials, and head teachers all agree that school facilities influence academic performance in science subjects positively. Specifically, physical facilities motivate learners and enhance their performance. It was observed that students taught in classrooms equipped with school facilities outperformed those without access. Consequently, the study recommends that science teachers utilize available school facilities for instruction and adapt when materials are unavailable.

Key words: Academic Performance, Schools Facilities, Secondary Schools, Students

I. INTRODUCTION

The quality of a school's facilities is a key determinant of its educational excellence. It serves as one of the benchmarks for assessing the degree of educational progress and growth. Inadequate management and maintenance of the school system's infrastructure can negatively affect students' academic performance. (Ikegbusi et al., 2021) defined school facilities, as the practice of coordinating the physical workplace with the people and the work of the organization; integrate the principles of school administration, architecture, and the behavioral and engineering sciences. School facilities refer to the process of ensuring that buildings and other technical systems support an organization's operations. Schools exist to facilitate teaching and learning. The correct accommodations for teachers and students are even more critical in order to enable the teaching and learning that take place there.

As a result, school facilities serve as the physical representation of the curriculum in space (Alimi, 2014). Secondary schools in Nigeria generally and Lagos State in particular are intended to operate in accordance with the accomplishment of the national education objectives, regardless of ownership - this is one of the criteria used to assess a school system's efficacy.

Philas (2015) asserts that a significant and positive correlation exists between the quality of school facilities and the academic achievements of students, with the perception of system effectiveness increasing as student performance improves. The prevailing consensus in Nigeria is that private schools outperform public schools in terms of personnel and physical facilities availability, as well as student achievement.

Experience shows that private secondary schools with high-quality educational resources produced the majority of students accepted into higher institutions such as colleges of education, polytechnics, and universities. The term "facility" refers to both the physical and material resources made available to students and teachers in the school to support the teaching-learning process. It also refers to the school or organization's overall atmosphere. The three main categories of facilities identified in the school system or environment are classrooms, libraries, and science labs. One cannot overstate the value and applications of libraries. Both teachers and students greatly benefit from libraries and literature (Ullah & Usman, 2023).

Ikegbusi (2019) asserts that the majority of Nigerian public secondary school classrooms cannot effectively conduct meaningful teaching and learning activities, despite the presence of highly intelligent teachers and students.

School facilities, considered a significant contributor to both qualitative and quantitative instruction (Ikegbusi, 2019), complete the educational system, asserting that learning can occur through interactions with the environment. In this context, the environment refers to the resources available to support students' academic goals. A suitable environment for efficient and successful learning comprises a library, lab, and Information and Communication Technology (ICT) center (Ikegbusi et al., 2021).

Facilities play a strategic role in organizational performance, claims Ikegbusi (2019). This is because they greatly influenced how well every institution and social organization, including schools, functioned. She went on to say that their suitability, sufficiency, and relevance have an impact on productivity and efficiency.

According to Farombi (2018), a society's wealth can influence the quality of education in that country. He emphasized that a wealthy society would establish good schools with quality teachers and learning infrastructure, allowing students to learn easily and achieve good academic outcomes. No efficient science education program can exist without the availability of appropriate equipment, according to a paper on the function of facilities in teaching and learning (Balos, 2021). This is so that teachers and students can develop problem-solving abilities and a scientific mindset.

Ajayi (2020) highlighted that students would not only have access to the reference materials indicated by the teacher when facilities are supplied to fulfill the relative needs of a school system, but also individual students would learn at their paces when good school facilities support the educational enterprises.

Research indicates that while elements like student socioeconomic position and parental participation are among the most influential aspects of most school architecture, clean air, good light, and a compact, cozy, and safe atmosphere are crucial for academic accomplishment (Cotton, 2001), districts and states all play a significant role in predicting kids' academic achievement. Therefore, upgrading educational infrastructure presents a practical chance to enhance academic achievement. He claimed that the increase in secondary schools had brought with it attendant problems such as insufficient school infrastructure and, as a result, low academic performance on the part of pupils (Okeke, 2009).

Over the years, there has been widespread dissatisfaction in Nigeria regarding the overall quality of education in the country; exam results have declined. This indicates that the majority of students performed quite poorly academically.

To meet these objectives, we still need to make significant improvements to the academic performance of educational systems. Numerous elements, including school infrastructure and teacher credentials, to name a few, appear to have an impact on students' academic achievement (Steward, 2006).

Like many other countries, Rwanda prioritizes the teaching and learning of sciences, technology, and mathematics (STEM) to accelerate its economic development. However, inadequate facilities for science subjects lead to subpar academic performance among students (Ministry of Education, 2019).

The major goal of science education is to develop scientifically literate individuals who are concerned with high competence for rational thoughts and actions, observation and exploration of the environment, the need to explain basic natural phenomena, the development of scientific attitudes such as curiosity, critical reflection, and objectivity, the application of scientific skills and knowledge to solve environmental problems, and the development of self-confidence and self-reliance through problem-solving activities in science.

Nations around the world have recently made significant efforts to advance their technological and scientific capabilities, particularly emerging nations like Nigeria, according to Farombi (2018). This is because the world is becoming more scientific, and all aspects of human life are heavily dependent on science.

Okunola (1985) asserts that science is a dynamic human endeavor that aims to comprehend how the world functions. With this understanding, man can learn more about the universe. Without science, it would have been

difficult for man to explore the other planets of the universe. The fundamental fields of science include physics, chemistry, mathematics, and biology. In Rwanda, the proportion of schools with internet connectivity increased, from 52.9% in 2018 to 61.1% in 2019, which is above the target of 52.5% as set in the ESSP for 2019. Similarly, the proportion of secondary schools with access to science kits increased from 63.8% in 2018 to 79.9%, which is above the ESSP target of 75.8% by 2019. The proportion of schools with science laboratories increased from 21.6% in 2018 to 25.5% in 2019. This is below the ESSP target of 32.8% in 2019.

Therefore, the study seeks to investigate the effect of school facilities on learners' academic performance in science subjects in Rutsiro district secondary schools in Rwanda.

1.1 Statement of the Problem

Inadequate facilities will surely affect the smooth teaching and learning process in all schools. It is known that the academic performance of each student depends to a large extent on the facilities they are exposed to while learning, but when they are lacking, some problems are faced. The number of secondary schools and students is on the rise; however, the GER still remains low at 35.5% in 2011. In 2009, there were 686 schools providing secondary education (age 13 to 18). This number almost doubled to 1,362 in 2011 (Ministry of Education, 2019). However, the number of schools and their facilities are not sufficient yet to fully accommodate increasing enrolment (Ministry of Education, 2019).

According to the types of institutions, a larger number of students are now enrolled in public secondary schools than in private institutions. The rate of students enrolled in private schools decreased from 45.3% in 2000 to 37.1% in 2008. The number of enrolled students in secondary education was 218,517 in 2005, which more than doubled to 486,437 in 2011. In 2005, there were more boys enrolled than girls by 12,183.

However, the girls outnumbered the boys by 14,937 in 2011 (Ministry of Education, 2010). The GER rose from 16.6% in 2005 to 35.5% in 2011 (Ministry of Education, 2010). In 2011, the GER was 34.9% for boys and 36.2% for girls. This trend contrasts with the situation in 2007, when the rate for boys at 21.9% was above that for girls at 19.1% (Ministry of Education, 2019). The ratio of girls' enrolment against boys' was 1.02 in 2010 and 1.06 in 2011, with girls achieving a higher number.

In 2019, 86.6% of the 114,424 students who sat for lower secondary exams passed the national exam. However, 15,304 students (13.4%) failed the national exam. Females did not perform well compared to males (84.9% and 88.7% pass rate, respectively) (Ministry of Education, 2019). The repetition rate in Rutsiro District is 14.9%, and the dropout rate is 14% (Ministry of Education, 2019). This is pushing the research to investigate the effect of school facilities on learners' academic performance in science subjects in Rutsiro district secondary schools.

1.2. Research objectives

(i) To examine the effect of physical facilities on leaner's academic performance in science subjects in Rutsiro district secondary schools.

(ii) To examine the effect of physical instructional materials on leaner's academic performance in science subjects in Rutsiro district secondary schools.

(iii) To examine the effect of electronic instructional materials on leaner's academic performance in science subjects in Rutsiro district secondary schools.

1.3. Hypotheses

H_{O1}: There is no significant effect of physical facilities on learner's academic performance in science subjects in Rutsiro district secondary schools

H_{O2}: There is no significant effect of physical instructional materials on learners' academic performance in science subjects in Rutsiro district secondary schools

H_{O3}: There is no significant effect of school electronic instructional materials on learners' academic performance in science subjects in Rutsiro district secondary schools

II. LITERATURE REVIEW

2. 1. Theoretical review

2.1.1 The Environmentalist Bandura's theory of learning

This study is based on environmentalist learning theory. Environmentalist learning theory by Bandura et al. (1977) Environmentalist learning theory is the understanding that a child's environment shapes learning and behavior. It is also thought that behavior and learning are reactions to the environment. This perspective encourages families, schools, and educators to understand how the child develops and learns new skills in reaction to items she finds

around her (Bandura et al., 1977). Through observation learning, the young child will observe and copy the behaviors of others, leading to decision-making skills and development.

Another study that finds the environment an important factor in the learning and development of the young mind includes Julia (2003). His social learning concept focused on the idea that personality represents an interaction of the individual with his or her environment. Along with taking into consideration the individual's reaction to the environment, the individual's experience plays a role, too. The combination of the environment, the individual, and her reaction encourages behavior and learning.

When the child is in an environment not conducive to learning, she will not learn to her best abilities. When the environment is altered to encourage greater learning, her educational opportunities increase. Whether in the home or classroom, creating an environment conducive to and supportive of learning aids in the young mind's evolution to greater knowledge.

According to Julia (2003), simple things can be adjusted to motivate learning in your environment, which include: Lighting: Dimly lit areas make reading or studying challenging for young learners. Keeping areas that are designated for play or learning well lit encourages positive learning skills and habits. Light deprivation not only affects learning but can also lead to depression in children. Furniture Arrangement: The way a space is arranged and created for learning affects those within it. In the classroom, the furniture arrangement not only reflects the teacher's style but also encourages the child to explore and react to her environment, causing learning. Creating an arrangement that offers eye contact with children is beneficial, as is creating quiet corners and work areas.

2.1.2 Social Learning Theory (SLT)

According to Bandura, imitation involves the actual reproduction of observed motor activities (Bandura et al., 1977) SLT has become perhaps the most influential theory of learning and development. It is rooted in many of the basic concepts of traditional learning theory. Due to its integration of motivation, memory, and attention, this theory has frequently been referred to as a link between cognitive learning theories and behaviorist learning theories.

However, Bandura is of the opinion that not all forms of learning can be accounted for by direct reinforcement. Because of this, he included a social component in his theory, contending that people might pick up new knowledge and behaviors by observing others. There are three overarching concepts for how people might learn from one another, according to the components of this idea. According to this study, a teacher should be able to provide pupils with educational materials that would help them overcome transductive learning challenges.

The study here is about the fact that the inability of teachers to utilize the appropriate methods and materials to teach certain concepts in science has contributed to poor students's academic performance in the subject (Farrant, 1980).

2.1.3 Social Cognitive Learning Theory (SCLT)

Considering the debate just had The SCLT is a learning theory that was developed on the tenets that people learn by seeing what others do and that thinking is a key component of personality. By the middle of the 1980s, Bandera's research had a more holistic focus, and his findings had a tendency to provide a more thorough review of human cognition in relation to social learning. He developed social learning theory into what is currently referred to as social cognitive theory (Bandura, 1999).

2.2 Empirical review

2.2.1. Effect of physical facilities on Leaner's Academic Performance

The term "physical facilities" refers to the school's physical infrastructure, including its buildings, classrooms, libraries, laboratories, restrooms, offices, and other components that are likely to inspire pupils to learn. Physical amenities are important for a student's ability to learn well and their academic performance. In support of this, Hallak (1990) determined that the primary factor influencing academic attainment in the school system was amenities. They include, among other things, school buildings, classrooms, libraries, labs, and recreational equipment. Performance in the educational system is said to be influenced by three factors, according to Hallak (1990), appropriateness, and sufficiency (Adeyemi, 2008), who asserted that performance is a gauge of educational output.

Academic performance can be interpreted as the degree to which a learner acts or completes a task, as well as how successfully or poorly he or she completes the duties or tasks included in a learning process. However, poor performance might be interpreted as having achieved less than the required level of academic performance. They underlined how crucial it is to have access to these resources for the educational system to be effective at delivering curriculum and supervising students.

They emphasized further that the lack of essential amenities, including classrooms, office space, workshops, recreational facilities, labs, libraries, etc., that secondary schools currently endure is a perfect representation of what is

present in the university system. For schools to operate effectively, laboratories must be sufficient and in good shape, as they play a crucial role in the teaching and learning of science (Adedeji, 1998).

As evidence for the aforementioned, Okunola (1985) claimed that properly situated school buildings with aesthetically pleasing surroundings, a lab, and a playground frequently contribute to increased performance in the educational system. Altbach (1998) believes that having suitable facilities is crucial for academic work and further suggests that the availability of school buildings and other plant facilities is highly important as they might boost successful teaching and learning. Additionally, Chandan (1999) asserted that the provision of appropriate and high-quality physical amenities was necessary for successful teaching to occur in any educational setting.

He further emphasized that an adequate number of physical facilities should be supplied to state primary schools (Ademilua, 2002). In his study, he observed that inadequate provision of school resources has been a major factor in poor students's academic performance in the State of Ekiti. He added that without sufficient physical resources and facilities, there would be a continuous decline in students's academic performance.

In support of this view, Ajayi (2000) emphasized the need for the availability of physical materials in the school system in order to boost teachers' job performance. This would, invariably, enhance the academic performance of students. A remedy (solution) for any academic burden is adequate provision and maintenance of the educational infrastructure. This means that managing the educational system without sufficient provision and upkeep of the school infrastructure can be quite difficult for instructors. The provision and upkeep of physical facilities, such as buildings, labs, libraries, furniture, equipment, etc., are crucial for effective and efficient school administration. According to Nwankwo (1982), who made this claim as well as better academic performance.

His research in Nigeria showed that although some schools had enough facilities, they were not being used to their full potential. He also underlined the importance of ensuring that the educational system's aims and objectives are realized effectively and efficiently. This suggests that having physical amenities available does not automatically improve learning; rather, it is the use of these facilities that can only encourage students to learn and improve their academic performance.

A study by Bello et al. (2020) on the effect of dilapidated buildings of secondary schools on academic performance in Sokoto State, Nigeria shows that the availability of physical facilities and equipment in the state is disheartening. His studies reveal that most secondary schools' buildings in the state were old and in a dilapidated condition. Many of the classrooms, laboratories, examination halls, libraries, and office furniture were in a terrible state of disrepair, and this has contributed to poor academic performance. Most windows were out of use, thereby causing hazards to life, while fluorescent tubes for providing electricity were out of place.

2.2.2 Effect of physical instructional materials on leaner's academic performance

According to Adeogum (2001), schools that possess more instructional resources perform better than schools that have fewer instructional resources. This finding supported the study by Babayomi (1999) that private schools performed better than public schools because of the availability and adequacy of teaching and learning resources. Adeogum (2001) noted the low level of instructional resources available in public schools, stating that there was a severe lack of both teaching and learning resources in public schools. He further commented that effective teaching and learning cannot occur in the classroom environment if essential instructional resources are not available.

Fuller and Clark (1994) suggested that the quality of instructional processes experienced by a learner determines the quality of education. In their view, they suggest that quality instructional materials contribute to the learner's quality learning experience. Mwiria (1995) also supports the idea the idea that a student's performance is affected by the quality and quantity of teaching and learning resources. This implies that schools that possess adequate teaching and learning materials, such as textbooks, charts, pictures, and real objects for students to see, hear, and experiment with, stand a better chance of performing well in examinations than poorly equipped ones.

A study by Chonjo (1994) on the physical facilities and teaching materials in primary schools in Tanzania supports the above views. Chonjo (1994) interviewed teachers and students on the role of instructional materials in effective learning. From his study, he learned that performance could be attributed to adequate teaching and learning materials and equipment that are in a school. He recommended that, in order to provide quality education, the availability of sufficient quality facilities is very important. The Chonjo (1994) study was one of its kinds in Tanzania and directly linked the role of physical facilities with students' academic performance in primary schools. However, Chonjo (1994) focused only on physical facilities, leaving out instructional.

2.2.3 Effect of electronic instructional materials on leaner's academic performance

Instructional materials are essential and significant tools needed for the teaching and learning of school subjects to promote teachers 'efficiency and improve students' performance. They make learning more interesting, practical, realistic, and appealing. They also enable both the teachers and students to participate actively and

effectively in lesson sessions. They give room for the acquisition of skills and knowledge and the development of self-confidence and self-actualization. Ibeneme (2000) defined teaching aids as those materials used for practicals and demonstrations in the class situation by students and teachers (Ikerionwu, 2000), and instructional materials as objects or devices that assist the teacher in presenting a lesson to the learners in a logical manner. According to Abdu-Raheem and Oluwagbohunmi (2015), instructional materials are things or tools that help teachers convey their teachings to students in a logical and sequential manner. It is understood that during the teaching-learning process, teachers employ instructional resources to help with explanations and make subject matter intelligible to pupils.

In a similar vein, Obanya (2004) said that a number of studies conducted in several regions of Nigeria showed that the results of senior school certificate examinations were appalling in practically every topic that the pupils offered. He emphasized once more that just 10% of applicants 'meaningfully passed' the test.

According to Abdu-Raheem (2011), inadequate and unavailable teaching resources are a crucial factor in the inefficiency of the inefficiency of the educational system and pupils par academic achievement. According to Ahmed (2003), teaching and learning take place in the majority of secondary schools in Nigeria in a very unfavorable environment without access to necessary materials. According to Eniayewu (2005), it is crucial to use instructional aids when delivering teaching in order to help students learn more and raise their academic standards.

Additionally, Ajayi and Ayodele (2001) emphasized the significance of having access to instructional resources in order to achieve efficacy in the delivery of education and monitoring in the educational system (Ogbondah, 2008), raising awareness of the alarming underutilization and gross insufficiency of instructional resources required to make up for the deficiencies of sense organs and strengthen the capacity of dominant organs.

He stated that teachers should make every effort to provide locally produced materials in place of standard ones to support their lessons (Enaigbe, 2009). He also mentioned that many schools lack basic supplies like text books, chalkboards, and necessary technology like computers, projectors, televisions, and video. In a self-conducted study, it was found that instructional materials make it easier for teachers to teach and for students to learn effortlessly and without difficulty (Olumorin, 2010).

They argued that all sense organs are in direct contact with educational materials. The importance of instructional materials as instruments for learning and teaching is reinforced by Kochhar (2012). In order to expand on concepts and pique students' interest in the content, he proposed that teachers locate additional instructional tools to augment what is offered in textbooks. Abolade (2009) lists the benefits of instructional materials as being less expensive to develop, useful for teaching a large class of pupils at once, motivating students to pay attention, and arousing their interest. Although Esu et al. (2004) agree that instructional materials are essential to effective teaching and learning, Akinleye (2010) attests that effective teaching and learning requires a teacher to teach the students with instructional materials and use practical activities to make learning more vivid, logical, realistic, and pragmatic. This also confirms the value of educational aids in bolstering the senses.

In Nigerian secondary schools, instructional resources are not always easily available, despite the fact that they are crucial instruments that can make learning practically easier and knowledge acquisition simpler (Abdu-Raheem, 2011). As a result, students do poorly in government tests. Because they greatly increase students' active participation in the lesson and allow for inquiry, problem-solving, discussion, and the clarification of ideas between students and the teacher, instructional materials are everything that are used to support, facilitate, influence, or encourage the acquisition of knowledge and competency (Afolabi, 2010). They also encourage teachers to improvise teaching aids. They suggested that improvising instructional materials for teaching and learning in schools engages students, instructors, parents, the Parents or Teacher Association, the government, and benefactors. As a result, Ogbondah (2008) pushed for teachers to be resourceful and encouraged them to look for essential teaching materials using local resources to either augment or replace the traditional ones. (Jekayinfa, 2012) also noted the significance of improvisation of instructional materials as making learning concrete and real, substituting one thing for another, allowing the students to participate in the production of materials, being economical, and being more teacher-student resource-oriented. (Oso, 2011) agreed that the best way for teachers to use their manipulative skills is to improvise so as to achieve their lesson objectives, at least to a reasonable extent.

According to Abdu-Raheem (2014), the improvisation of teaching materials produced locally could help raise the caliber of graduates who leave schools and the grade of education in general. (Abdu-Raheem & Oluwagbohunmi, 2015) also supported the notion that creative and skilled teachers ought to improvise the required educational resources to advance academic standards in Nigerian schools. Wall clocks, televisions, radios, V.C.D. players, pianos, flutes, chalkboards, cardboards, apparatus for science practicals, models, drawings, and charts are among the teaching materials and equipment included in this list.

III. METHODOLOGY

3.1 Research Design

The descriptive research design using both mixed methods approach was used. Descriptive research designs, as a survey tool, assist researchers in identifying traits within their target market group. These traits within the population sample can be recognized, observed, and assessed to inform decision-making. The descriptive research design was suitable for this study since it needed first-hand knowledge of how school facilities affect students' academic performance in science classes at secondary schools in the Rutsiro district in order to provide an authentic and accurate description.

3.2 Study Population

Borg and Gall (1989) define the study population, also known as the research universe, as every member of a real or imagined group of individuals, occasions, or items from whom the researcher hopes to generalize the research study. Every one of the five schools in the Rutsiro District participated in the study. Specifically, the target population consisted of administrative staff, teaching staff (which includes 5 head teachers, 5 directors of studies, 150 advanced and regular level instructors, and 300 students from the aforementioned institutions) and students.

The total study population was 460 individuals.

3.3 Sample Size and Sampling Technique

Choosing a specific number of participants from a target community to serve as a representative sample of the population is known as sampling (Gall & Borg, 1989). A sample is a subset of the entire population being studied that represents the features of the population, according to Cohen et al. (2000). The sample size calculation procedure provided by Yamane (1967) was utilized to establish the sample size for this investigation. For him, the following formula determines the sample size:

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

Where N stands for population, n: stands for sample size, and e: stands for sampling error, which equals 0.05.
Population (N) = 5+5+150+300=460
The application of this formula gives a sample size of 214 people.

$n = 214$

3.4 Sampling technique

In this study, a researcher was used two types of sampling techniques namely stratified simple random and purposive sampling. This study, involves three groups of respondents: administrative staff members, teaching staff members; advanced level and Ordinary levels and students.

3.6 Data Collection Methods

In order to obtain wide range of information with the intention of the study, three methods of data collection were used namely questionnaires; Interview and documentary review.

3.4.1 Questionnaires

A questionnaire involves the use of written-down items or questions to which the individual responds in writing. Questionnaires are designed for administrative and teaching staff members to form a major data collection tool as they allow the study to include large samples for representativeness to inform the study on the practices, opinions, and attitudes of respondents (Mugenda, 1999) concerning the effect of school facilities on learners' academic performance in science subjects in Rutsiro district secondary schools. Questionnaires were made of closed-ended questions.

3.4.2 Interview Guide

An interview is a conversation between two people (the interviewer and the interviewee) where questions are posed by the interviewer to obtain information from the interviewee to get more information concerning the particular study. The interviews were considered for a small number of respondents. In fact, the only category that was considered for interviews was management. This was because these respondents were thought to have a busier work schedule relative to the others. This method allowed further probing and clarification of questions that tended to be difficult and not clear to the respondents. It also enhanced responses to questions that were regarded as sensitive. In this study, the interview guide was constructed to capture supplementary information and triangulate information that

was obtained from respondents. In this case, the heads of schools, DOs and Teacher, were picked to be involved in the study.

3.4.3 Documentary Review

Documents are written or recorded materials, which are prepared after the request in the inquiry for the objective of the evaluation. The method was used in reviewing official documents on student's examination results especially Advanced level and ordinary level national examinations (2021-2023) for determining students' academic achievement. The use of document review guide was help to obtain additional information and validate the information collected through questionnaires.

3.4.4 Validity and Reliability of research instrument

Reliability of the instrument is the measure of consistence over time and over similar sample (Cohen et al.., 2007). The questionnaire will be piloted to ascertain its validity and reliability. Mugenda (1999) recommends 10% of the cases for a pilot test in a descriptive study. The purpose of the pre-test in order to help the researcher to identity the items, which may be inappropriate so as to make necessary corrections, examine responses to determine the level of ambiguity of the questions and determine the percentage of responses. A total number of 70teacher, 2 head teacher, 2 director of studies, 140 students, was be involved.

3.4.4 Validity

Experts were given the instruments to determine validity, like educational managers and lecturers in the education field for review, who examined them in light of the research questions and provided the appropriate improvement comments before the data was collected.

3.4.5 Reliability

The reliability co-efficient of 0.99 was obtained respectively. The correlation between availabilities of school facilities and academic performance produced significant correlations ($p<0.05$) implying that the relationship is strongly positive and significant. The data was collected using a structured questionnaire, interview and documentary review. The data was analysed using SPSS and descriptive statistics and inferential statistics

3.4.6 Data Processing and Analysis

In this study, both qualitative and quantitative research data were analyzed using different methods. In qualitative research, data analysis involves coding and categorizing the data to identify themes and patterns. This was done through techniques such as content, thematic analysis, and grounded theory. On the other hand, quantitative research data analysis involved statistical techniques such as descriptive statistics, inferential statistics, and regression analysis to analyze numerical data and test hypotheses. The IBM SPSS statistics 2021 were used to produce percentages, frequencies, means, standard deviations, and regression analyses.

IV. FINDINGS & DISCUSSIONS

4.1.1 Response Rate

The researcher achieved a response rate of 100% from the 214 questionnaires of respondents. This was considered sufficient for analysis.

Table 1

Response Rate

Category	Respondents	Percentages
Questionnaire administered	140	100
A questionnaire was filled out and returned	140	100
Interview Guided	74	100

4.1.2 Demographic Characteristics of Respondents

Table 2 displays the age distribution of the respondents, revealing that 4.7 of the total were under 13 years old; 100 respondents, or 46.7% of the total, were between 13 and 18 years old; and 104 respondents, or 48.6% of the total, were over 18 years old.

Table 2
Distribution of Respondents by Age

Respondents by age	Frequency	Percent
less than 13years	10	4.7
from 13 up to 18 years	100	46.7
above 18 years	104	48.6
Total	**214**	**100.0**

The results in Table 3 indicate that the study involved 214 participants, including 214 students, 113 (52.8%) male participants, and 101 (47.2%) female participants.

Table 3
Distribution of Respondents by Gender

Respondents by gender	Frequency	Percent
Male	113	52.8
Female	101	47.2
Total	214	100.0

The results in Table 4 show that 40 (18.7%) of respondents were in senior one, 40 (18.7%) were in senior two, 30 (14.0%) were students in senior three, 15 (7.0%) were students in senior four, 10 (4.7%) were students in senior five, and 5 (2.3%) were students in senior six. 10 (4.7%) were teachers with A1, 44 (20.6) were teachers with A0, and additionally, 20 (9.3%) were teachers with a Post-Graduate Diploma in Education (PGDE).

Table 4
Distribution of Respondents by Education

Respondents by Education	Frequency	Percent
Senior one	40	18.7
Senior two	40	18.7
senior three	30	14.0
senior four	15	7.0
senior five	10	4.7
senior six	5	2.3
A1	10	4.7
A0	44	20.6
Post graduate diploma	20	9.3
Total	**214**	**100.0**

According to Table 5 below, concerning the age of respondents, it is clear that 30 (14.01%) were below 10 years old, 34 (14.01%) were 10 to 20 years old, and 10 (4.67%) were above 20 years old.

Table 5
Distribution of Respondents by Experience

Respondents by experience	Frequency	Percent
Below 10 years	30	14.0
Between 10 and 20 years	34	15.9
Above 20 years	10	4.7
Total	74	34.6
Missing	140	65.4
Total	**214**	**100.0**

Table 6 below indicates that the study involved 214 participants, including 140 (65.42%) students, 70 (32.71%) teachers, and 2 (0.93%) head teachers and 2 (0.93%) deputy head teachers in charge of studies.

Table 6

Distribution of Respondents by Position

Participants by position	Frequency	Percent
Headteacher	2	.9
Deputy Headteacher in charge of studies	2	.9
Teachers	70	32.7
Student	140	65.4
Total	**214**	**100.0**

4.1.3 Effect of Physical Facilities on learner's Academic Performance in Science Subjects in Secondary Schools in Rutsiro District

The study aimed to investigate the level of agreement with selected statements regarding the effect of physical facilities on learners' academic performance in science subjects in secondary schools in Rutsiro District. The level of agreement was measured on a scale where: "Disagree Strongly" corresponded to a mean range of [1-2), indicating a very low mean; "Disagree" corresponded to a mean range of [2-3), indicating a low mean; "Neutral" corresponded to a mean range of [3-4), indicating a moderate mean; "Agree" corresponded to a mean range of [4-5), indicating a high mean; and "Strongly Agree" corresponded to a mean range of [5-6), indicating a very high mean.

Table 7

Descriptive Statistics for Physical Facilities

Physical facilities	N	Min	Max	Mean	Std. Dev.
There are enough classrooms in the school.	140	1	5	3.43	1.480
The school has a very good playground and sports.	140	1	5	3.50	1.244
My school has sufficient desks in all classrooms	140	1	5	3.00	1.609
My school has school playgrounds and sports facilities	140	1	5	2.57	1.641
The school has sufficient recreational facilities.	140	1	5	2.07	1.492
The school toilets are adequate	140	1	5	2.50	1.457
There is enough furniture and seating for teachers.	140	1	5	3.79	1.428
My school has sufficient I. C.T Rooms	140	1	5	2.14	1.557
My school has Laboratory sciences	140	1	5	2.58	1.513
My school has sufficient tap water	140	1	5	2.50	1.552
Overall	140			**2.808**	**1.4973**

The results show that there are enough classrooms in the school (μ =3.43; STD =1.480); The school has a very good playground and sports (μ =3.50; STD=1.244); My school has sufficient desks in all classrooms (μ =3.00; STD=1.609); My school has school playgrounds and sports facilities (μ = 2.57; STD=1.641); The school has sufficient recreational facilities (μ = 2.57; STD=2.57); The school toilets are adequate (μ = 2.50; STD=1.457); My school has sufficient I. C.T Rooms (μ = 2.14; STD=1.557); My school has Laboratory Sciences (μ =2.58; STD=1.513); My school has sufficient tap water (μ = 2.50; STD=1.552). The results from Table 7 show that the overall mean of disagreement is low (μ = 2.808, low mean), and the overall standard deviation is 1.4973. This low mean suggests that the respondents tend to disagree with the statements. This implies a relative strong or positive effect of physical facilities on learners's academic performance in science subjects in secondary schools in Rutsiro District.

Table 8

Inferential Statistic on Physical facilities

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.814[a]	.663	.661	.780

a. Predictors: (Constant), Physical facilities

Table 8 indicates that an R-Square (R = 0.663) was obtained. This indicates that independent variables have a strong explanatory power in relation to the dependent variable. This shows that 66.3% of the variation in the dependent variable (academic performance) can be explained by the effect of physical facilities, and the remaining percentage can be attributed to other variables that are not explained in this model.

Table 9
Analysis of Variance on Physical facilities

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	165.319	1	165.319	271.701	.000[b]
	Residual	83.967	138	.608		
	Total	**249.286**	**139**			

a. Dependent Variable: Academic performance
b. Predictors: (Constant), physical facilities

The results of the ANOVA analysis for the regression model, which examines the impact of school facilities on students' academic performance in science subjects in Rutsiro District secondary schools, are presented in Table 9. The F value is 271.701, which indicates that the regression model is statistically significant. The significance level (Sig.) is 0.000, which is less than the alpha level of 0.05. This means that there is a statistically significant relationship between the predictors (physical facilities) and the dependent variable (academic performance).

Table 10
Regression Coefficients on Physical facilities

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.401	.167		2.405	.017
	Physical facilities	.737	.045	.814	16.483	.000

a. Dependent Variable: Academic performance

The data in Table 10 Show that one unit of increase in factor increase in academic performance by 0.737.

$Y=\alpha+ BX +Ɛ$
Y= Academic Performance
α constant (the value of Y if X is ZERO)
x= Physical facilities
B= The value of increase in Y as per one unit of increase in X
Ɛ= error term (other variables)
$Y= 0.401+0.737x+ Ɛ$

4.1.4 Effect of Electronic and Technological Instructional Materials on leaner's Academic Performance in Science Subjects in Secondary Schools Rutsiro District

The study aimed to examine the effect of electronic and technological instructional materials on learners' academic performance in science subjects in secondary schools in Rutsiro District.

Table 11
Descriptive Statistics of Electronic and Technological Instructional Materials

Electronic and technological instructional materials	N	Min	Max	Mean	Std. Dev.
My school has sufficient computers	140	1	5	3.44	1.490
My school has access to the Internet	140	1	5	3.50	1.244
My School has sufficient Projectors	140	1	5	3.01	1.607
My school has sufficient Radios or Television	140	1	5	2.57	1.641
My school has sufficient tape recordings	140	1	5	2.07	1.492
My school has sufficient smart classrooms	140	1	5	2.50	1.457
My school has a sufficient laptop	140	1	5	3.78	1.430
My school has a sufficient telephone	140	1	5	2.14	1.557
My school has printers	140	1	5	2.56	1.509
My School has a sufficient photocopy	140	1	5	2.50	1.552
Overall	**140**			**2.807**	**1.4979**

The results show that my school has sufficient computers (μ = 3.44; STD = 1.490); my school has access to the internet (μ = 3.50; STD = 1.244); my school has sufficient projectors (μ = 3.01; STD = 1.607); my school has sufficient radios or televisions (μ = 2.57; STD = 1.641); my school has sufficient tape recordings (μ = 2.07; STD = 1.492); my school has sufficient smart classrooms (μ = 2.50; STD = 1.457); my school has sufficient laptops (μ =

3.78; STD = 1.430); my school has sufficient telephones (μ = 2.04; STD = 1.557); my school has printers (μ = 2.56; STD = 1.509); my school has sufficient photocopies (μ = 2.50; STD = 1.552).

The results from Table 11 show that the overall mean of disagreement is low (μ = 2.807, low mean) and the overall standard deviation had a mean of is 1.4). This low mean suggests that the respondents tend to disagree with the statements. This implies a relative strong or positive effect of electronic and technological instructional materials on learners' academic performance in science subjects in secondary schools in Rutsiro District.

Table 12

Model Summary on Electronic and Technological Instructional Materials

Model	R	R Square	Adjusted R Square	Std Error of the Estimate
1	.308[a]	.095	.088	4.519

A. Predictors: electronic and technological materials

The data in Table 12 show that 95% of the change in academic performance can be accounted for by electronic and technological instructional materials, and the remaining percentages are accounted for by other variables that are not presented in this model.

Table 13

Analysis of Variance on Electronic and Technological Instructional Materials

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	295.782	1	295.782	14.487	.000[b]
	Residual	2817.611	138	20.417		
	Total	3113.393	139			

a. Dependent Variable: Academic performance

b. Predictors: (Constant), electronic and technological

The data in Table 13 shows the results of the ANOVA analysis for the regression model examining the effect of schools' facilities on learners' academic performance in science subjects in Rutsiro District secondary schools. The F value is 14.487, which indicates that the regression model is statistically significant. The significance level (Sig.) is 0.000, which is less than the alpha level of 0.05. This means that there is a statistically significant relationship between the predictors of electronic and technological materials and the dependent variable (academic performance).

Table 14

Regression Coefficients of Electronic and Technological Instructional Materials

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.972	.963		-1.009	.315
	Electronic and technological materials	.979	.257	.308	3.806	.000

a. Dependent Variable: academic performance

The data in Table 14 show that there is a significant relationship between electronic and technological instructional material and performance in science subjects in Rutsiro District, Rwanda (t = 3.806; p<0.05). The data in Table 14 shows that one unit of decrease in factor increase in academic performance by 0 .979.

$Y=\alpha+Bx+\varepsilon$

Y= Academic Performance

α = constant (the value of Y if X is ZERO

x= electronic and technological materials

B= The value of increase in Y as per one unit of increase in X

Ɛ= error term (other variables)

$Y= -0.972+0.979x+\varepsilon$

4.1.5 Physical Instructional Materials on learners' Academic Performance in science subjects in Rutsiro District Secondary Schools

The study sought to examine the impact of physical instructional materials on learners' academic performance in science subjects in secondary schools in Rutsiro District.

Table 15

Descriptive Statistics of Physical Instructional Materials

Physical Instructional materials	N	Min	Max	Mean	Std. Dev.
The teacher uses audio recording for teaching to students in class	140	1	5	1.86	1.189
The teachers use specimen and practical items to demonstrate practical subjects	140	1	5	2.46	1.620
The teachers use the chalkboards to illustrate and make clear their teaching	140	1	5	3.15	1.414
The teachers use charts to illustrate what they are teaching to students	140	1	5	2.71	1.437
The teachers use drawings on paper and clipboards when providing instructions in class	140	1	5	2.49	1.552
The teachers use the chalkboards to illustrate and make clear their teaching	140	1	5	2.29	1.537
The teachers guide the students in their discussions using several Visual materials	140	1	5	2.93	1.492
Teachers use appropriate Charts and diagrams for the immediate illustration of science lesson	140	1	5	2.85	1.314
The teachers also employee textbooks that are given to students in class while teaching	140	1	5	3.06	1.268
The teachers use effective laboratory equipment in teaching the science Subjects	140	1	5	2.01	1.381
Overall	**140**			**2.581**	**1.4204**

The results show that the teacher uses audio recordings for teaching to students in classes (μ = 1.86; STD = 1.189); the teachers use specimens and practical items to demonstrate practical subjects (μ = 2.46; STD = 1.620); the teachers use chalkboards to illustrate and make clear their teaching (μ = 2.29; STD = 1.414); The teacher's guides guide the students in their discussions using several visual materials (μ = 2.71; STD = 1.4370); Teachers use appropriate charts and diagrams to illustrate the science lesson immediately (μ = 2.85; STD = 1.314); The teachers also provide employee textbooks that are given to students in class during teaching (μ = 3.06; STD = 1.268); The teachers use effective laboratory equipment in teaching science subjects (μ = 2.01; STD = 1.381).

The results from Table 15 show that the overall mean of disagreement (**μ = 2.581, low mean**) and the overall standard deviation are 1.4204. This low mean suggests that the respondents tend to disagree with the statements. This implies a relatively strong or positive correlation. Physical instructional materials have a significant impact on learners' academic performance in science subjects in Rutsiro District Secondary Schools.

Table 16

Model Summary on Physical Instructional Materials

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.803[a]	.644	.642	.801

a. Predictors: (Constant), Physical instructional materials

b. Dependent Variable: Academic Performance

The data in Table 16 show that 64.4% of the change in academic performance can be accounted for by physical instructional materials, and the remaining percentages are accounted for by other variables that are not presented in this model.

Table 17

Analysis of Variance of Physical Instructional Materials

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	542.603	1	542.603	29.127	.000[b]
	Residual	2570.789	138	18.629		
	Total	**3113.393**	**139**			

a. Dependent Variable: Academic performance

b. Predictors: (Constant),Physical instructional materials

The results of the ANOVA analysis for the regression model, which examines the impact of school facilities on students' academic performance in science subjects in Rutsiro District secondary schools, are presented in Table 17. The F value is 29.127, which indicates that the regression model is statistically significant. The significance level (Sig.) is 0.000, which is less than the alpha level of 0.05. This means that there is a statistically significant relationship between the predictors (physical instruction materials) and the dependent variable (academic performance).

Table 18

Regression Coefficients on Physical Instructional Materials

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	B		
1	(Constant)	-.706	.680		-1.037	.301
	Physical Instructional Materials	1.662	.308	.417	5.397	.000

a. Dependent Variable: Academic performance

The data in Table 18 show that there is a significant relationship between physical instructional materials performance in science subjects in Rutsiro District, Rwanda ($t = 5.397$, $p<0.05$), and the data in Table 14 show that one unit decrease in factor increase in academic performance by 1.662

$Y=\alpha+Bx+\varepsilon$

Y= Academic performance

α = constant (the value of Y if X is ZERO)

x= Physical instructional materials

B= The value of increase in Y as per one unit of increase in X

Ɛ= error term (other variables)

$Y= - 0.706+1.662X+\varepsilon$

Table 19

Descriptive Statistics on the DV (Academic Performance)

Academic performance	N	Min	Max	Mean	Std. Dev.
In the last three years, my academic performance has been good	140	1	5	2.93	1.339
In the last three years, the average academic achievement was above 80%	140	1	5	2.25	1.645
In the last three years, the average academic achievement was above 70%	140	1	5	2.28	1.536
In the last three years, the average academic achievement was above 60%	140	1	5	2.50	1.598
In the last three years, the average academic performance was above 50%	140	1	5	2.36	1.235
In the last three years, the average of academic achievements was above 40%	140	1	5	3.21	1.377
In the last three years, the average of academic achievements was above 30%	140	1	5	3.14	1.360
In the last three years, the average academic achievements were above 20%	140	1	2	2.64	2.199
In the last three years, I repeated the class twice	140	1	5	2.39	4.733
In the last three years, I repeated the class once	140	1	5	2.21	1.572
Over all mean	140			**2.591**	**1.8594**

The findings indicate that I have performed well academically over the last three years (μ = 2.93; STD = 1.339); the average academic achievement over the previous three years was above 80% (μ = 2.25; STD = 1.645); the average academic achievement over the previous three years was above 70% (μ = 2.28; STD = 1.536); the average academic achievement over the last three years was above 60% (μ = 2.50; STD = 1.598); The average academic achievement over the previous three years was greater than 50% (μ = 2.36; STD = 1.235); the average academic achievement over the previous three years was more than 40% (μ = 3.21; STD = 1.377); and over the previous three years, the average academic accomplishment was more than 30%. (μ = 3.14; STD = 1.360); over the past three years, I have repeated the class twice (μ = 2.39; STD = 4.733); once (μ = 2.21; STD = 1.572); and my average academic achievement has been above 20% (μ = 2.64; SD = 2.199); in the last three years, I repeated the class twice (μ = 2.39; STD = 4.733); in the last three years, I repeated the class once (μ = 2.21; STD = 1.572).

The results from Table 19 show that the overall mean of disagreement is low (μ = 2.591, low mean), and the overall standard deviation is 1.8594. This low mean suggests that the respondents tend to disagree with the statements. This implies a relative strong or positive academic performance.

Table 20

Correlation Analysis between school facilities and Academic Performance

		Physical Facilities	Electronic and technology	Physical Instructional Materials	Academic Performance
Physical Facilities	Pearson Correlation	1	.927**	.890**	.814**
	Sig. (2-tailed)		.000	.000	.000
	N	140	140	140	140
Electronic and Technology	Pearson Correlation	.927**	1	.916**	.826**
	Sig. (2- tailed)	.000		.000	.000
	N	140	140	140	140
Physical Instructional Materials	Pearson Correlation	.890**	.916**	1	.949**
	Sig. (2- tailed)	.000	.000		.000
	N	140	140	140	140
Academic Performance	Pearson Correlation	.814**	.826**	.949**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	140	140	140	140

** Correlation is significant at the 0.01(2- Tailed)

As shown in Table 20, there were positive and significant correlations between academic performance and measures of availability of school facilities as follows: physical facilities ($r = 0.814$, $p<0.01$), electronic and technology facilities ($r = 0.826$, $p<0.01$), and physical instructional materials ($r = 0.949$, $p<0.01$). This shows that school facilities were strongly positively correlated with the academic performance in science subjects in secondary schools in Rutsiro District, Rwanda.

Table 21

Model Summary on Physical Instructional Materials, Physical Facilities, Electronic and Technological Instructional Materials

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.436[a]	.190	.172	4.307

a. Predictors: (Constant), physical instructional materials; physical facilities; electronic and technological instructional materials

The data in Table 21 show that 19% of the change in academic performance can be accounted for by physical instruction materials, physical facilities, electronic, and technological instructional materials, and the remaining percentages are accounted for by other variables that are not presented in this model.

Table 22

Analysis of Variance of Physical Instructional Materials, Physical Facilities, Electronic and Technological Instructional Materials

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	591.009	3	197.003	10.622	.000[b]
	Residual	2522.384	136	18.547		
	Total	3113.393	139			

a. Dependent Variable: Academic performance

b. Predictors: (Constant), physical Instructional materials, physical facilities; electronic and technological instructional materials

The data in Table 22 shows the results of the ANOVA analysis for the regression model examining the effect of schools' facilities on learners' academic performance in science subjects in Rutsiro District secondary schools. The F value is 10.622, which indicates that the regression model is statistically significant. The significance level (Sig.) is 0.000, which is less than the alpha level of 0.05. This means that there is a statistically significant relationship between the predictors (physical instructional materials, physical facilities, electronic, and technological instructional materials) and the dependent variable (academic performance).

Table 23

Regression Coefficients of School Facilities

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.960	.096		10.008	.000
	Physical Facilities	.163	.054	.181	3.005	.003
	Electronic and Technology	1.022	.073	1.154	13.901	.000
	Physical Instructional Materials	.056	.057	.050	.985	.0326

a. Dependent Variable: Academic performance

In order to assess the effect of the school's facilities on learners In the study of academic performance in science subjects in Rutsiro District secondary schools, the researcher also preferred to use multiple regression models that assume a linear relationship $Y = \alpha + \beta X + \varepsilon$ between the dependent variable Y (academic performance) and the explanatory variable X (the school's facilities), where the error term ε includes the omitted factor.

The multiple regression model was: $Y = a + bX1 + cX2 + dX3 + \epsilon$. Where: Y: Academic Performance X1, X2, and X3: independent (explanatory) variables: physical facilities (x1), electronic and technological (x2), and physical instruction (x3). A: Intercept b, c, d: Slopes ϵ: Residual (error)

Therefore, the regression model for the research can be stated as: *Academic Performance = 0.960 + 0.163 Physical Facilities + 1.022 Electronic and Technology + 0.56 Physical Instructional Materials + 0.096.* According to the regression equation, the school facilities will have a performance of 0.960 percent when all school facilities are kept constant. A p-value less than 0.05 indicated that all variables were statistically significant.

4.2 Discussions

4.2.1 Effect of Physical Facilities on Leaner's Academic Performance in Science Subjects in Rutsiro District Secondary Schools

The physical facilities, like furniture and classroom maintenance, influence students' achievement. The school's physical facilities promote the quality of teaching and learning, enhancing quality education. The physical facilities of the school remained the most vibrant factor in students' achievement. Facilities like laboratories, libraries, school buildings, and white boards are very essential for higher academic achievement. The achievement is the utility of all the available resources for the students (Alimi, 2014). Ajayi (2020) highlighted that the actual equipment used to support and facilitate the teaching and learning process within the institution is represented by the physical school facilities. The physical environment of the school, such as spacious classrooms, attractive school buildings, and better facilities, reduces tension, depression, frustration, and anxiety. The basic physical facilities of a school play an important and positive role in the high achievement of the schoolchildren. The school size as well as the physical infrastructure affect the attitude and method of personality development of the students. Physical facilities improve confidence levels and students's potential. The findings from regression analysis revealed that physical facilities have a positive and significant effect on learners's academic performance in science subjects in Rutsiro district secondary schools ($\beta = 0.814$, P value <0.05).

4.2.2 Effect of Physical Instructional Materials on Leaner's Academic Performance in Science Subjects in Rutsiro District Secondary Schools

The research therefore demonstrated that the majority of secondary schools did not have well-equipped and updated laboratories and libraries for enriching and improving the knowledge and skills of both students and teachers; particularly in secondary schools, books are stored in the head teachers' offices and some classrooms serve as libraries. The respondents therefore showed that there is a link between school facilities such as libraries and laboratories and poor students' academic performance in national examinations in the last three years (2021–2023). This study concurred with the findings of Afolabi (2010), who found that government financial support, trained teachers, classrooms, laboratories, textbooks, and student ratios could be used to predict academic performance in mathematics.

The study further lends credence to the findings of Balos (2021), who determined that a lack of scientific laboratory equipment, its improper use, and its improper allocation all waste money, reduce the effectiveness of science laboratories, and lower academic achievement; and supports the findings of Philas (2015), who focused on studies that were conducted since 1990 and found that school libraries can have a positive impact on student achievement, whether such achievement is assessed using reading tests, literacy, or learning levels. Generally, test scores are higher when there is higher usage of the school library; collaborative relationships Libraries positively impact students' self-worth, confidence, independence, and sense of personal responsibility for their education. The

findings from regression analysis revealed that physical instructional materials have a negative and significant effect on learners's academic performance in science subjects in Rutsiro district secondary schools (β = -0.417, P value <0.05).

4.2.3 Effect of Electronic Instructional Materials on Leaner's Academic Performance in Science Subjects in Rutsiro District Secondary Schools

The research therefore demonstrated that the majority of secondary schools did not have well-equipped and updated laboratories and libraries for enriching and improving the knowledge and skills of both students and teachers; particularly in secondary schools, books are stored in the head teachers' offices, and some classrooms serve as libraries. The respondents therefore showed that there is a link between school facilities such as libraries and laboratories and poor students' academic performance in national examinations in the last three years (2021–2023). This study concurred with the findings of Afolabi (2010), who found that government financial support, trained teachers, classrooms, laboratories, textbooks, and student ratios could be used to predict academic performance in mathematics.

The research investigated the relationship between instruction material usage and the academic performance of students in science subjects in Rutsiro District. Its findings indicated that there is a relationship between instruction materials and the academic performance of students in secondary schools in Rutsiro District, according to the teachers. Even though the results are weak, their significance is undisputable. These findings are backed by previous research studies that undertook to establish a similar purpose, as elaborated below. Hallak (1990) emphasized that the availability of relevant educational resources contributes to academic performance.

Further, Hale (2002), in a study of the relationship between educational resources and students's academic performance in Kenya, noted a very strong positive and significant relationship between instructional resources and academic performance. The findings from regression analysis revealed that electronic instructional materials have a positive and significant effect on learners's academic performance in science subjects in Rutsiro district secondary schools (β = 0.308, P value <0.05).

V. CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusions

The study was adopting a mixed approach. Research was carried out in five selected secondary schools in Rutsiro District. The main objective of this research was to investigate the effect of school facilities on learners's academic performance in science subjects in secondary schools in Rutsiro District, Rwanda. The target population of the research comprised 460 populations, including 5 head teachers, 5 DOSs, 150 teachers, and 300 students. The study used a sample of 214 participants, including 2 head teachers, 2 DOSs, 70 teachers, and 140 students. The findings from regression analysis revealed that physical facilities have a positive and significant effect on learners's academic performance in science subjects in Rutsiro district secondary schools (β = 0.814, P value <0.05). The findings from regression analysis revealed that physical instruction has a positive and significant effect on learners's academic performance in science subjects in Rutsiro district secondary schools (β = -0.417, P value <0.05). The findings from regression analysis revealed that electronic instructional materials have a positive and significant effect on learners's academic performance in science subjects in Rutsiro district secondary schools (β = 0.308, P value <0.05). The teachers, the DOS, and the headteachers said that the school facilities affect the academic performance in science subjects in secondary schools in Rutsiro District, Rwanda. The physical facilities motivate the learners and increase the performance of science subjects in secondary schools in Rutsiro District, Rwanda. According to the study's findings, kids who were taught in classrooms with school facilities outperformed those who were not. The study thus advised science teachers to use school facilities for their instruction and to adapt when the materials are unavailable. In this research, the researcher found that the school facilities affect learners' academic performance in science subjects in secondary schools in Rutsiro District, Rwanda.

According to the obtained results of the study, the researcher concluded that the objectives were achieved and the hypotheses of the study were significant.

6.2 Recommendations

Based on the above findings and conclusions, the following recommendations were made: The district and schools should encourage parents to contribute and buy some school materials, such as laboratory and science subject teaching aids, that cannot be made locally, to help schools achieve their goals. All education actors should contribute to the building and equipping of school libraries and laboratories with updated materials in each domain to raise the academic performance of students in secondary schools as well as teachers' performance. Schools should be prepared

to collaborate with educators in creating and modifying educational resources to enhance the quality of instruction in schools. In order to improve funding and support for teaching, school principals should also encourage students, instructors, parents, and the government to improvise educational materials. Schools should improvise with little funding and subpar teaching and learning materials that are easy to use, practical, engaging, and enjoyable.

REFERENCES

Abdu-Raheem, B. O. (2011). Availability, adequacy, and utilisation of social studies instructional materials in Ekiti State secondary schools. *Journal of Current Discourse and Research, 3*, 242-255.

Abdu-Raheem, B. O. (2014). Improvisation of instructional materials for teaching and learning in secondary schools as predictor of high academic standard. *Nigerian Journal of Social Studies, 17*(1), 131-143.

Abdu-Raheem, B. O., & Oluwagbohunmi, M. F. (2015). Pre-service teachers' problems of improvisation of instructional materials in social studies in Ekiti State University. *Journal of Education and Practice, 6*(3), 160-163.

Abolade, A. (2009). Basic criteria for selecting and using learning and instructional materials. In I. O. Abimbola & A. O. Abolade (Eds.), *Fundamental principles and practices of instruction* (pp. 497-504). Department of Science Education, Ilorin.

Adedeji, T. (1998). In Abiodun-Oyebanji, O. A. (2008). *Resource situation and academic staff job performance in South-West Nigerian universities* (Ph.D. Thesis, University of Ado-Ekiti).

Ademilua, A. (2002). *Factors affecting academic performance of students in some selected schools in Ekiti State* (Unpublished M.Ed. Dissertation, University of Ilorin, Nigeria).

Adeogum, A. A. (2001). The principal and the financial management of public schools. *Journal of Educational System and Development, 5*(1), 1-10.

Adeyemi, T. (2008). The influence of class size on the quality of output in secondary schools in Ekiti State, Nigeria. *Pakistan Journal of Social Sciences, 5*(2), 202-208.

Afolabi, S. (2010). Assessment of resources and instructional materials status in teaching of mathematics in southwestern Nigeria. *European Journal of Scientific Research, 43*(1), 406-410.

Ahmed, T. (2003). Education and national development in Nigeria. *Journal of Studies in Education, 10*, 35-46.

Ajayi, A. (2000). *Capacity strengthening seminar for the Local Education Secretaries (SPEB)*. Ekiti State. April 28.

Ajayi, I. A., & Ayodele, J. B. (2001). *An introduction to educational planning: Administration and supervision*. Ado-Ekiti: Yemi Prints Publishing Services.

Ajayi, K. (2020). *Educational facility age and the academic achievement of upper elementary school students* (PhD Dissertation, University of Georgia).

Akinleye, G. (2010). *Enhancing the quality of life in this complicated but dynamic world*. 25th Inaugural lecture, University of Ado-Ekiti, April 6.

Alimi, R. (2014). *Management of school physical facilities in Ondo state, Nigeria: A case study of Ikale and Ondo Local Government Area* (Unpublished PhD Thesis, University of Ife, Ile-Ife, Nigeria).

Altbach, P. (1998). Gigantic peripheries: India and China in the world knowledge. In P. G. Altbach (Ed.), *Comparative higher education knowledge: The university development* (pp. 497-504). Greenwich, CT: Ablex.

Amin, M. (2005). *Social science research; conception, methodology and analysis*. Kampala: Makerere University.

Babayomi, A. A. (1999). *Comparative study of the teaching and learning resources*. Department of Educational Administration, University of Lagos, Nigeria.

Balos, T. M. (2021). *School facilities, conditions and students' academic achievement*. New York, NY: Guilford Press.

Bandura, A., Adams, N. E., & Beyer, J. (1977). Cognitive processes mediating behavioral change. *Journal of Personality and Social Psychology*. https://doi.org/10.1037/0022-3514.35.3.125

Bello, K., Kalgo, N. A., & Dankolo, H. M. (2020). Effect of dilapidated buildings of secondary schools on academic performance in Sokoto State. *Sospoly Journal of Engineering, Entrepreneurship & Environmental Studies, 3*(1), 1-8.

Borg, R., & Gall, M. (1989). *Educational research: A guide for preparing a thesis or dissertation proposal in education*. White Plains, NY: Longman, Inc.

Chandan, J. (1999). *Management theory and practice*. New Delhi: Vikas Publishing House.

Chonjo, P. N. (1994). The quality of education in Tanzanian primary schools. *UTAFITI (New Series), 1*(1), 36-47.

Cohen, L., Manion, L., & Morrison, K. (2000). *Research methods in education* (5th ed.). London: Routledge Falmer.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th ed.). London and New York, NY: Routledge Falmer.

Cotton, H. D. (2001). Misbehavior, suspension, and security measures in high school: Racial/ethnic and gender differences. In D. Losen (Ed.), *Closing the school discipline gap*. New York, NY: Teachers College Press.

Enaigbe, A. P. (2009). Strategies for improving supervisory skills for effective primary education in Nigeria. *Edo Journal of Counselling, 2*(2), 235-244.

Eniayewu, J. (2005). Effect of instructional materials on teaching of economics in secondary schools in Akoko North-East Local Government Area of Ondo State. *Ikere Journal of Education, 7*, 117-120.

Esu, A. E. O., Enukoha, O. I. T., & Umorem, G. U. (2004). *Curriculum development in Nigeria for colleges and universities*. Owerri: Whyte and Whyte Publishers.

Fadeiye, J. (2005). *A social studies textbook for colleges and universities*. Ibadan: Akin-Johnson Press and Publishers.

Farombi, G. (2018). *The impact of location, amenities, and class size on secondary school students' academic performance in Ekiti State, Nigeria* (Unpublished PhD Thesis, University of Ibadan, Nigeria).

Farrant, J. S. (1980). *Principles and practices in education*. Singapore: Longman Publishers Limited.

Fuller, B., & Clark, P. (1994). Raising school effects while ignoring culture? Local conditions and the influence of classroom tools, rules, and pedagogy. *Review of Educational Research, 64*(2), 119-157.

Hale, A. J. (2002). *The nature of environmental quality in the workplace.* Milwaukee, WI: University of Wisconsin-Milwaukee Architecture and Urban Planning.

Hallak, J. (1990). *Investing in the future: Setting educational priorities in the developing world*. Paris: IIEP and Pergamon Press.

Ibeneme, O. (2000). Provision and utilization of instructional equipment for teaching and learning science and technology. *Issues in Educational Journal, 1*, 139-144.

Ikegbusi, N. G. (2019). *Effective strategies for improving school environment in climate change in Anambra State secondary schools*. Paper presented at the first Annual International Conference of the Faculty of Education, AE-FUNAI, Ndufu-Alike, Ikwo, Ebonyi State, Nigeria.

Ikegbusi, N. G., Egwu, J. U., & Iheanacho, R. (2021). Students' perception of utilization of ICT in teaching and learning in post-COVID-19 era in Nigeria. *ANSU Journal of Arts and Social Sciences, 8*(2), 127-138.

Ikerionwu, J. (2000). Importance of aids and resources in classroom teaching. In A. M. Oyeneyin (Ed.), *Perspective of Classroom Teaching.* Abuja: Martmonic Investment Ltd.

Jekayinfa, A. (2012). *Fundamentals of instructional methods*. Ilorin, Kwara State: Olives Production Ltd.

Julia, W. Y. (2003). *Shaping school culture: The heart of leadership.* San Francisco: Jossey-Bass.

Kochhar, S. K. (2012). *The teaching of social studies*. New Delhi, India: Sterling Publishers Private Limited.

Maduekwe, A. N. (2006). Perspective on Teacher Education and ICTs in the Language Classroom. In V. B. (Ed.), *An Introduction to Educational Technologies in Education.* Lagos: Sibon Books Ltd.

Ministry of Education. (2010). *Education Sector Strategic Plan 2010 – 2015.* Kigali: MINEDUC.

Ministry of Education. (2019). *Rwanda Education Statistics Report.* Kigali: MINEDUC.

Mugenda, O. M. (1999). *Research Methods: Quantitative and Qualitative Approaches*. Nairobi: African Centre for Technology Studies.

Mulusa, T. (1990). *Evaluating Education and Community Development programmes*. Deutsche Stitung for International Entwicklung and Collage of Adult and Distance.

Mwiria, K. (1995). *Issues in Educational Research in Africa*. Nairobi: East African Educational Publishing Limited.

Nwankwo, J. (1982). *Educational Administration: Theory and Practice*. New Delhi: Vikas Publishing House Pvt. Ltd.

Obanya, P. (2004). *The dynamics of secondary education: A synthesis of studies in four states of the federation*. Washington D.C.: The World Bank.

Ogbondah, L. (2008). An appraisal of instructional materials used to educate migrant fishermen's children in Rivers State, Nigeria. *International Journal of Scientific Research in Education, 1*(1), 13-25.

Ogunleye, A. O. (2006). *Towards the Optimal Utilization and Management of Resources for the effective Teaching and Learning of physics in Schools*. Proceedings of the 41st Annual conference of the Science Teachers' Association of Nigeria (STAN).

Okeke, C. I. (2009). Status of missing physical facilities in Government Schools of Punjab. *Journal of Research and Reflection in Education, 5*(2), 105-127.

Okunola, P. (1985). *Resource Utilization and Projection in secondary Education in Oyo State of Nigeria*. (Unpublished Ph.D. Thesis, University of Ibadan, Nigeria).

Olumorin, C. O. (2010). *Development of instructional materials from local resources for art-based courses*. *Asian Journal of Information Technology, 9*(2), 107-110.

Oso, L. (2011). *Need for improvisation in classroom teaching*. *The Punch*, June 20.

Philas, A. (2015). *The relationship between resource utilization and Academic Performance in Osun State Secondary schools*. (Unpublished Ph.D. thesis, University of Ibadan, Nigeria).

Steward, G. J. (2006). *Improving educational standard and productivity*. Berkeley: McCutchhan Publishing Corp.
Ullah, A., & Usman, M. (2023). *Role of Libraries in Ensuring Quality Education at Higher Education Institutions: A Perspective of Pakistan*. *Inverge Journal of Social Sciences*, *2*(4). Retrieved from https://invergejournals.com/
Yamane, T. (1967). *Statistics: An Introductory Analysis*, 2nd Edition. New York: Harper and Row.