



Assessing the Use of Instructional Materials on the Learner's Academic Performance in Mathematics: A Case of Selected Ordinary Level Secondary Schools of Musanze District, Rwanda

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Abstract: This study aimed to investigate the influence of instructional materials on students' academic performance in mathematics. The use of instructional materials in teaching has been a subject of interest and debate in the education community, with proponents arguing that they enhance learning experiences and outcomes, while skeptics question their true efficacy. This research seeks to provide empirical evidence on the topic by examining the use of instructional materials on students' academic performance in mathematics. The study employed a descriptive research approach, quantitative data collection and analysis method. Quantitative data was gathered through survey questionnaires to measure the availability and the use of instructional materials on the learners' academic performance in mathematics. The study was conducted in four selected schools, encompassing various ordinal levels to ensure a comprehensive understanding of the topic. The population of the study was 1313 students and 10 mathematics teachers, totaling 1323 participants from four sample schools selected purposively. The sample of 328 students was selected randomly in line with the census survey method and a whole 10 mathematics teachers took part. The findings showed that the instructional materials are available and their use improved the academic performance of students in mathematics. Therefore, the findings had the potential to inform educational practices and policies, helping educators make informed decisions about the integration of instructional materials into their teaching methods.

Keywords: Instructional materials, Academic performance, Mathematics, Teaching, Learning

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1. Introduction

Mathematics, often regarded as the universal language of science and an indispensable tool in daily life, plays a fundamental role in shaping our educational systems worldwide. The proficiency in mathematics not only equips individuals with problem-solving skills but also

opens doors to a multitude of career opportunities. Therefore, the effective teaching and learning of mathematics is of paramount importance in ensuring the success of learners in their academic journeys and future endeavors. One of the key factors that significantly influences the teaching and learning of mathematics is the utilization of instructional materials. Instructional materials encompass a wide range of tools, resources,

and aids that educators employ to facilitate the learning process. These materials can take the form of textbooks, worksheets, manipulatives, digital simulations, and various other resources that help convey mathematical concepts and foster comprehension. This study aims to explore the impact of instructional materials on the academic performance of learners in mathematics. The utilization of instructional materials in mathematics education has gained increased attention and scrutiny in recent years due to the growing recognition of their potential to enhance the learning experience. By assessing their effectiveness, educators and policymakers can make informed decisions regarding the selection and integration of instructional materials into the mathematics curriculum. Understanding the relationship between instructional materials and academic performance in mathematics is particularly relevant in the context of a rapidly evolving educational landscape. Advancements in technology have revolutionized the way instructional materials are created, delivered, and accessed, providing educators with an array of innovative tools to engage and inspire learners.

2. Literature Review

2.1. Availability of instructional materials in mathematics teaching and learning

Instructional materials like textbooks, manipulatives, technology tools (E-learning, videos, audio, projectors), and physical models (charts, cards, manual paper, mathematical sets) will make teaching and learning mathematics simpler, more interesting, more enjoyable, and more closely will connect to real-world applications (Umuhzoza & Uworwabayeho, 2021). Instructional materials are the various forms of communication that a teacher might employ in the classroom to make a topic more concrete throughout the teaching and learning process (Amadioha, 2018). Instructional materials are in various classes, such as audio or aural, visual or audio-visual. Thus, audio instructional materials refer to those devices that make use of the sense of hearing only, like radio, audio tape recording, and television. Visual instructional materials on the other hand, are those devices that appeal to the sense of vision only such as the chalkboard, chart, slide, and filmstrip. An audio-visual instructional material, however, is a combination of devices which appeal to the sense of both hearing and seeing such as television, motion picture and the computer. Among the instructional materials the classroom teacher uses, the visuals outnumbered the combination of the audio and audio-visual (Oladejo, Ojebisi, Olosunde, & Isola, 2011). Instructional materials are essential and significant tools needed for teaching and learning school subjects at highlighted by Abdu

(2016), promote teachers 'efficiency and improve learners' performance, materials make learning more interesting, practical, realistic and appealing. They also enable both teachers and students to participate actively and effectively in lesson sessions. These give room for acquisition of skills and knowledge and development of self- confidence and self- actualization (Adebule & Ayoola, 2016).

2.2. The use of instructional materials in mathematics teaching and learning

The use of instructional materials in teaching mathematics courage and improve the organizations, structuring and clarity expectation or children interest and motivation (Osayame & Iyamu, 2011; Stephen, Isaac, & Lorkpilgh, 2013) in order to teach mathematics effectively, one needs not only the necessary skills, subject knowledge, methodologies, and strategies but also access to facilities like laboratories, teaching aids, instructional materials, and teacher resources. audio-visual assistance and books. The use of appropriate teaching aids, instructional materials, are necessary for effective teaching and learning. In fact; there are educational resources available today for both teaching and learning mathematics which are textbooks, audio-visual, e-learning; ICT tools, charts, mathematical sets, manual papers, and charts. According to Samwel (2009) confirmed that the challenges encountered by teachers of mathematics in using instructional materials are related to the problems about education system, the problems about educational process and the problems regarding learners. challenges faced in teaching mathematics, several challenges were shown such as lack of necessary equipment and materials, lack of skills and strategies, financial constraint, lack of appropriate materials in their school, time constraint, large number of students to the few instructional materials, insufficiency support from authority.

As the challenges encountered in teaching and learning are very different focused on mathematics' teacher, students and the other customers. Utilizing educational resources is essential to the teaching and learning process in order to enhance student performance in mathematics and sciences (Muhammad & Fayyaz, 2011). The educational tools used in the teaching and learning process aids students in understanding and aid their growth in knowledge, concepts, abilities, and attitudes throughout each learning activity by completing, clarifying, receiving, and emphasizing the teacher's vocal efforts. Effective use of instructional materials in classroom teaching is the ability of the teacher to identify the required items and to appropriately utilize them (Koko, 2016). Therefore, Instructional material is introduced to help the learner to understand the topic. The effective use of instructional materials greatly contributes to the enhancement of teaching and learning outcomes (Regina & George, 2018). In a classroom

context, the use of appropriate content encourages students to become more focused and motivated (Didace & Heslon, 2021).

In Rwanda, the current studies examined how secondary teachers teach mathematics using instructional materials effectively. The current competency-based curriculum (CBC) in Rwanda places an emphasis on building learners' abilities and competencies, with interaction with the available instructional materials serving as the primary method (REB, 2015). One of the most effective methods for raising teaching and learning standards is the integration of instructional materials into the curriculum. It is generally accepted that learners learnt best by doing and observing (Henao, Hui, & Gordon, 2017). The use of instructional materials in mathematics makes learning simpler, more attractive, tangible, pleasurable, and clear in real-life circumstances, assisting learners in learning efficiently to improve performance (Nyirahabimana, 2019). Thus, there are several methods a teacher may assist students in overcoming their mathematical challenges, like pique their interest in the subject and develop their critical thinking abilities through regular practice of easy and enjoyable assignments, use of local materials in teaching and learning mathematics, in order to motivating students to cognitively analyze the problem and on their academic's performance and come up with a solution (Rustam, Sahat, & Hasratuddin, 2019). The following are objectives guided this study:

1. To identify the availability of instructional materials related to mathematics in ordinary level secondary schools in Musanze District.
2. To assess the effective use of instructional materials in mathematics subject in ordinary level secondary schools in Musanze District.

2.3. Theoretical framework

This study incorporated Piaget's (1980) constructivism learning theory, which states that learners actively create knowledge rather than simply taking in it. People construct their own representations of the world and add new information to their prior knowledge when they interact with it and reflect on it (Ültanr, 2012). Constructivism was important in teaching and learning because it promotes social and communication skills by creating a classroom environment that emphasizes collaboration and exchange of ideas. Constructivism learning theory was therefore relevant in this study because of its emphasis and considerations are put on the use of a combination of different methods in class like use of instructional material in teaching and learning mathematics, by using instructional materials in teaching learning, learners construct knowledge. Constructivism transforms the learner from a passive recipient of information to an active participant in the learning process and humans create knowledge through the interaction between their experiences and ideas (Vygotsky, 1962) There are many factors that influence learning in constructivism which besides social

interaction and language, other major factors that influence learning is learners' pervious knowledge, learner's motivation, and learner's characteristics such as beliefs, prejudices, and fears. The learner is viewed as an active agent in the process of acquiring information in this constructivist theory of learning (Bruner, 1961; Dewey, 1929; Vygotsky, 1962; Piaget, 1980).

3. Methodology

3.1. Research design

According to Singh and Masuku (2014) research design refers to research process and they present it as consisting of a series of stages ranging from planning, conceptualizing the issues, gaining access, designing samples, designing questionnaires, measuring attitudes, interviewing and managing interviewers, coding and managing a data, budgeting and a research project, writing up the research and conclusion. In this regard, this study was basically descriptive research design.

3.2. Population of the study

A population is the complete collection of all elements that are of interest in a particular investigation. The group of interest to the researcher, the group to whom the researcher would try to generalize the study's findings, is referred to as the research population, according to Singh and Masuku (2014), the decrease in population is the result of the target population generally being too large, which demands a lot of time, effort, and money. The population of this study consisted of 1313 secondary school students and 10 mathematics teachers from four selected ordinal secondary schools of Musanze District in Rwanda. The total population of this study was 1323 respondents.

3.3. Sampling techniques and sample size

A simple random sampling is a sample in which each member or item in the population has the same probability or chance of being selected for the sample (Singh & Masuku , 2014). This technique helped the researchers to select a representative sample among the concerned population. It was essential to use the census survey method (a quarter of students' population and a whole mathematics teachers) to take a sample size of this current study, a total of 328 students were selected randomly from four selected ordinal secondary schools and a whole of 10 mathematics teachers took a part.

3.4. Data collection instruments

In data collection, designed questionnaires helped getting information about the use of instructional materials on learner's academic performance in mathematics.

3.5. Data analysis

Regarding the research objectives for this study, descriptive statistical method was used in line with percentages. Below 50% indicated not use of mentioned instructional materials, 50%-75% indicated the use of instructional materials, and above 75% indicated the effective use of instructional materials.

3.6. Ethical consideration

Names of the respondents were not exposed and remained anonymous.

3.7. Validity and Reliability

Validity is the ability of the research tools to measure what is required to measure. A measurement procedure

cannot be valid unless it is reliable. In order to check for validity, a tool for this study was checked by supervisor to see if it will be collected data and measure what was expected and revised it took place. Reliability is the extent to which a measurement instrument or procedure yields the same results on repeated trials. As a result, pilot research was conducted in this study using the redesigned data collection tool, which produced the results that had been anticipated from collecting data on the targeted individuals. The device was reliable.

4. Results and Discussion

4.1. The available instructional materials

In this section, learners and teachers of mathematics were initially asked to keep going further to find answers utilizing those tools after discussing the materials utilized. Here are some materials that teachers may utilize to teach and study arithmetic in their classrooms.

Table 1: Availability of instructional materials

Available instructional materials	Students' views	Teachers' views	% mean
Textbooks of mathematics available for all students.	97.20 %	100 %	98.60 %
Supplementary materials, such as workbooks or practice sheets.	81.60 %	100 %	90.80 %
Access of instructional resources (e.g., manipulatives, charts, graphs).	78.93 %	93.46 %	86.19 %
Availability of Mathematical sets.	89.10 %	60.00 %	74.55 %
Calculators readily available to students.	49.21 %	37.54 %	43.37 %
Availability of internet connectivity.	76.10 %	100 %	88.05 %
Availability of computers and projectors.	42.80 %	10.00 %	26.40 %
Mathematical software.	27.80 %	10.00 %	18.90 %
Films (videos or audio records).	12.90 %	20.00 %	16.45 %
Overall percentage	61.73 %	59.00 %	60.36 %

According to table 1, the classroom is an exciting environment where students from different backgrounds, with different abilities and personalities, are brought together. Therefore, in order to address the specific requirements of every student, active teaching requires the application of creative and original teaching

techniques. In this direction, 97.20 % of 328 students confirmed that textbooks are known as instructional material used in leaning and teaching mathematics. On the other hand, the teachers responded that they use instructional materials to enhance students' academic performance, extract students' attention and create a motivation to learn. These instructional materials boost

students in mathematics competence. Here, 100 % of 10 teachers confirmed that they use textbooks in teaching mathematics. Therefore, textbooks were used as instructional materials in mathematics (98.60 %). The 81.60 % of 328 students said that the Chart, Diagrams, cards and manual paper are used by mathematics teachers and students in many mathematics courses. On the other hand, 100 % of 10 teachers confirmed. Therefore, Supplementary materials, such as workbooks, practice sheets, charts, diagrams, cards, manual papers, manipulatives, and graphs were used as instructional materials in mathematics (90.80 %). The 89.10 % of 328 students confirm that in their school have the mathematical sets. on the other hand, 60.00 % of 10 teachers use mathematical sets in teaching and learning. Therefore, mathematical sets were used as instructional materials in mathematics (74.55 %). However, 42.80 % of 328 students confirmed that as the teachers have computers and projectors, the school has also projector which help teachers if the need arises and 10.00 % of 10 teachers conformed. Therefore, computers and projectors were not used as instructional materials in mathematics as its mean percentage is below a half of one hundred percent (26.40 %). Moreover, 27.80 % of 328 students, mathematical software encourages teachers to conduct his lesson in comparison with other teachers and 10.00 % of 10 teachers use projector and education software. Therefore, mathematical software was not used as instructional materials in mathematics as its mean percentage is below a half of one hundred percent (18.90 %). Teachers improve their communication and critical thinking skills, as well as their self-confidence. 12.90 % of 328 students said that using films relaxes students and makes them happy to study mathematics. While, 20.00 % of 10 teachers confirmed that they use sometimes the films. Therefore, videos or audio records were not used as instructional materials in mathematics as its mean

percentage is below a half of one hundred percent (16.45 %).

Overall percentage (60.36 %) indicated that the mentioned instructional materials was used at selected secondary schools to teach and learn mathematics. However, it was not effective. The current findings are in line with Muhammad and Fayyaz (2011); Adebule and Ayoola (2016); Umuhoza and Uworwabayeho (2021) argued that there are several types of instructional materials, including auditory, visual, and audio-visual. As a result, audio educational resources refer to technologies like radio, audio tape recording, and television that exclusively employ the sense of hearing. On the other hand, visual educational tools are those that exclusively appeal to the visual sense, such as a chalkboard, chart, slide. However, an audio-visual teaching resource is a combination of technologies like television, movies, and computers that appeal to both the senses of hearing and sight. Moreover, the findings are also in line with Abdu (2015) argued that educational resources are important instruments for teaching and studying mathematics. According to him, the benefits of instructional materials include their lower cost of production, ability to educate many students at once, ability to encourage sufficient attention and interest in learning. Technology makes learning interesting because it allows students to participate physically in some classes and conduct rapid searches for information, which improve academic performance of the students.

4.2. The use of Instructional materials in mathematics

The discussion on the students and teachers' points of view on effective use of instructional materials in teaching mathematics in lower secondary schools and its influence on the students' academic performance were analyzed.

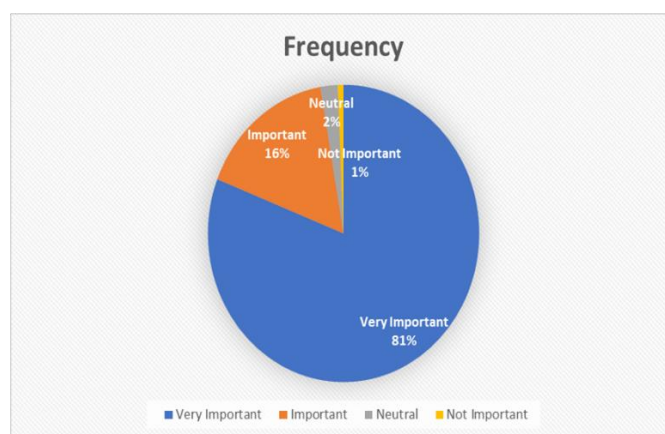


Figure 1: Students opinion on the use of Instruction materials to study mathematics

The findings indicated in figure 1 shows that the importance rate of using instructional materials to facilitate teaching and learning mathematics was 81% of

328 students indicated that the use of instructional materials to facilitate teaching and learning mathematics is very important while 16 % of 328 students indicated that the use of instructional materials to facilitate

teaching and learning mathematics is important. However, 2.0 % of 328 students indicated that the use of instructional materials to facilitate teaching and learning mathematics neutral in performance of students and only the 1.0 % of 328 students indicated that the use of instructional materials to facilitate teaching and learning mathematics is not importance. The overall, the findings reported that the use of instructional materials effectively

increase students' performance in teaching and learning mathematics according to the results at 97.00 % of 328 students highlight that instructional materials are very important in increasing students' performance. The current findings are in line with Osayame and Iyamu (2011) students actually only retain 10% of what they hear, 40% of what they debate with the others, and up to 80% of what they personally experience.

Table 2: Use of instructional materials in mathematics instruction

Teachers' views	Percentage
Use of instructional materials facilitating student independent, critical and creative thinking.	100 %
Use of instructional materials encourage effective collaboration among students.	80.00 %
Use of instructional materials increase students' investment motivation and performance.	100 %
Use of instructional materials help to make content more engaging to students.	100 %
Use of instructional materials save time for both teachers and students in mathematics.	90.00 %
Use of instructional materials boost effective learning of mathematics.	100 %
Use of instructional materials differentiate of instruction of mathematics.	60.00 %
Use of instructional materials enhance interest in mathematics achievement.	80.00 %

According to table 2, the instructional material helps developing critical thinking and logical reasoning skills. This was confirmed by 100% of 10 teachers while 80% of 10 teachers confirmed that instructional material ensures the students fully engaged and finds all the learning topics interesting enough. Inviting students to participate actively in learning environment they take more responsibility for their performance in their courses. Similarly, when they have an opportunity to make decisions about what they learn and how they use that knowledge, students get the use of instructional materials in mathematics subject increases students' investment motivation and performance as more variable and more direct related to their goals. This was point of views of 100% of 10 teachers. Also, 100% of 10 respondents said that instructional materials are important because they can significantly increase students' achievement by supporting their learning. Instructional materials help to make mathematics content more engaging. Moreover, boosting effective teaching and learning using instructional materials apply different techniques of learning and are able to make students understand every finer points easily and inculcate their power of imagination and reflection. They stimulate

students 'senses and simplify the teaching and learning process. These statements were confirmed by 100% of 10 teachers. Differentiation of instruction knowing that differentiation of instruction is the process of adapting lessons and instructions to the various learning capacities of the students present in classroom, 60% of 10 teachers confirmed that instruction materials help teachers provide differentiated instruction to promoting learning. Enhancing interest, 80% of 10 teachers said that by instructional materials, curiosity for enquiry of new topics is awakened and the students 'interest is captured. Furthermore, mathematics teachers indicated that the use of instructional materials is very important in teaching mathematics. They also mentioned same importance as: The instructional materials improve critical thinking many students, increase students' academic performance, set much skills in mathematics lesson, make lesson more understandable and enjoyable motivation for students, allows to teacher to show the rule of doing mathematics problems, helps students more understand the causes it also motivated the students in learning, their conclude that with instructional materials the students are motivated and are perform well. Students learn by doing, it makes learning more interesting, students and teachers participate actively in mathematic lesson. The findings

are in line with Abdu (2015) said that he teaching aids are always used in supporting the sense organs. Teachers are encouraged to always provide teaching aids during their teaching, because they would enhance learners' full participation in the lesson, provide room for a quirky-based learning, problem solving, discussion and clarification of issues and ideas among learners and the teacher. The findings are also in line with Nyirahabimana (2019); Umuhoza and Uworwabayeho (2021) explained that using instructional materials in education has taken on increased significance as a result in academic performance of students in mathematics.

5. Conclusion and Recommendations

5.1. Conclusion

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- Based on the findings, the availability and accessibility of instructional materials are there at four selected ordinal level secondary schools of Musanze District in Rwanda and also the use of instructional materials on academic performance was significantly revealed. Overall, students participate effectively in the teaching and learning process through the use of instructional materials.
- ### 5.2. Recommendation
- Based on the conclusion, it was recommended that teachers should improve the effective use of instructional materials in teaching Mathematics in selected ordinal level secondary schools of Musanze District and also students should be engaged more in their academic performance.
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