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Effects of Curriculum Reforms on Learners' Outcomes in Mathematics Subjects in Public Secondary Schools in Rwanda: A Case of Nyabihu District

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Abstract: **This study examined the effect of curriculum changes on students' mathematics performance in public secondary schools in Nyabihu District, focusing on students' outcomes, teachers' involvement, and the influence of curriculum improvements on learning. A descriptive research design combining quantitative and qualitative approaches was used. The study involved 230 participants, including head teachers, deans of studies, teachers, and students. Teachers were selected through purposive sampling, while students were chosen using simple random sampling. Data were collected using questionnaires and analyzed using content analysis for qualitative data and SPSS and Microsoft Excel for quantitative data. The findings indicate that the revised mathematics curriculum significantly improves students' understanding and performance. Specifically, 65.6% of respondents agreed that the new curriculum enhances students' comprehension of mathematics, with a high mean score of 4.36 (SD = 0.94). Additionally, 73.7% agreed that teacher and administrative support positively influence students' performance, reflected in an even higher mean of 4.48 (SD = 0.89). The study further showed that teachers' focus on implementing the curriculum improves learners' outcomes (mean = 3.43, SD = 1.21). Similarly, students taught by teachers trained under the new curriculum demonstrated better performance (mean = 3.42, SD = 1.11). Overall, the study concluded that curriculum reforms enhance both teaching effectiveness and student achievement in mathematics. It recommends that the Rwanda Education Board (REB) and school administrators strengthen support and monitoring of curriculum implementation, while ensuring that students are well-oriented and adapt effectively to the revised teaching approaches.**

Keywords: **Curriculum Reforms, Learners' Outcomes, Mathematics, Public Secondary Schools, Nyabihu District, Rwanda.**

1. INTRODUCTION

Over the past decades, education systems worldwide have implemented mathematics curriculum reforms aimed at improving learners' outcomes and aligning education with 21st-century competencies such as critical thinking, problem-solving, and reasoning. In the United States, reforms such as the Common Core State Standards emphasize conceptual understanding rather than rote memorization (Schmidt & Houang, 2023). However, evidence shows that curriculum changes alone do not automatically improve performance without adequate instructional support (Polikoff et al., 2022). Similarly, experiences in Canada highlight that while reforms promote skills such as mental mathematics and problem-solving, their

effectiveness is constrained by limited teacher preparedness and professional development (Anderson, 2020; Mbonyinkebe, 2024). Across Asia, curriculum reforms integrating STEM have demonstrated positive effects on student achievement and higher-order thinking skills (Khalid et al., 2020).

Globally, organizations such as the Organisation for Economic Co-operation and Development emphasize that effective curriculum reforms must integrate content, pedagogy, and assessment, while ensuring strong implementation mechanisms (OECD, 2024). Nonetheless, the success of these reforms depends largely on implementation fidelity and contextual factors such as teacher capacity and resource availability (Fullan, 2021). Evidence from developing countries, including Tanzania, shows that overloaded curricula and misalignment with learners' abilities can hinder learning progression and academic achievement (World Bank, 2017; Mbiti et al., 2019).

In Rwanda, curriculum reforms are aligned with national development goals, particularly the transition to a knowledge-based economy (MINICOFIN, 2013). The introduction of the Competence-Based Curriculum aims to strengthen learners' competencies in science and mathematics. However, challenges remain in its implementation, especially regarding the adoption of learner-centered pedagogies and alignment between intended and actual classroom practices (MINICOFIN, 2000).

Although prior studies have examined mathematics curriculum reforms in different contexts, limited empirical evidence exists on their effects on learners' outcomes in Rwandan public secondary schools. This study therefore addresses this gap by investigating the effects of curriculum reforms on learners' outcomes in mathematics in Nyabihu District.

2. METHODOLOGY AND MATERIALS

2.1 Research design

This study adopts a descriptive research design, which is suitable for systematically describing the characteristics of the population and examining the effects of curriculum reforms on learners' outcomes in mathematics.

2.2 Location of the study

This study was carried out in Nyabihu District in Western Province.

2.3 Target population

The target population for this study comprises 230 respondents, including students, mathematics teachers, and head teachers from selected public secondary schools.

2.4 Sample size

A sample is a subset of the population that represents its characteristics and is used for statistical analysis when including the entire population is not feasible (Kenton, 2022). The sample for this study was determined using Yamane's formula: Thus, the researcher draws the sample size by using the formula of Yamane which is computed as follow:

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

$$\mathbf{n} = \frac{230}{1+230(5\%)2} = 146$$

n: is the sample size

N: represents the target population

e: Margin of error (e= 5%)

3. RESULTS

3.1 Demographic details

This section shows the background of the respondents according to their category, family status, gender, age and education level so that in designing questions the researcher might not offend anybody on the basis of the responses.

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Gender

Table 1. Gender for respondents

Gender		Frequency	Valid Percent
Valid	Male	56	38.4
	Female	90	61.6
	Total	146	100.0

Source: Primary data,2025

3.2 The Way Mathematics Curriculum Reforms Done in Public Secondary Schools in Rwanda

Table 2: The Way Mathematics Curriculum Reforms Done in Public Secondary Schools

Statements	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree		Mean	Standard deviation
	N	%	N	%	N	%	N	%	N	%		
In mathematics teaching, teachers use availability resources regarding on curriculum.	10	50.0	10	50.0	0	0.0	0	0.0	0	0.0	4.21	1.16
Teachers' availability positively influences their effectiveness in teaching Mathematics.	6	30.0	8	40.0	3	15.0	1	5.0	2	10.0	3.43	1.21
In teaching mathematics teachers use methods which motivate learners to learn mathematics	9	45.0	8	40.0	3	15.0	0	0.0	0	0.0	4.11	1.12
In teaching mathematics teachers follow curriculum design in order to rise students' outcomes.	11	55.0	9	45.0	0	0.0	0	0.0	0	0.0	4.21	1.13
Supervision and leadership contribute in curriculum reforms in mathematics.	5	25.0	4	20.0	0	0.0	5	25.0	6	30.0	2.12	1.11

Source: Primary Data (2025)

The above result about mathematics curriculum reforms done in public secondary schools where mathematics teaching, teachers use availability resources regarding curriculum 50% was strongly agreed and 50% was agreed with it, 4.21 was mean,1.16 of standard deviation. Teachers' availability positively influences their effectiveness in teaching mathematics with 30% strongly agree, 40% agreed, mean of 3.43, standard deviation was 1.21. Teaching mathematics, teachers use methods which motivate learners to learn mathematics wot 45% strongly agree with the majority of respondents and 40% agreed with it,4.11 was mean, 1.12 with standard deviation. In teaching mathematics, teachers follow curriculum design in order to raise students' outcome with most of respondents strongly agree with 55%, and others agreed at 45%, mean was 4.21 and standard deviation 1.13. Supervision and leadership contribute to curriculum reforms in mathematics with the majority strongly agree at 25% and 20% for agree with mean of 2.12 and standard deviation was 1.11.

School mathematics reforms are often conducted with changes in all different aspects of the curriculum: mathematics content, teaching and learning methodologies and resources (e.g. texts and technologies), as well as assessment and examinations. It is possible to observe different influences on school mathematics curriculum reforms over time. During the mid-twentieth century, school mathematics curriculum reforms were shaped by developments within the discipline of mathematics and by the ideas of some mathematicians. This is captured in an address by the French mathematician Jean Dieudonné, one of the proponents of what was then termed the 'New Math' in 2019.

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3.3 The evaluation on students' outcomes in public secondary schools in Rwanda

Table 3. The evaluation on students' outcomes in public secondary schools in Rwanda

Statements	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree		Mean	Std
	N	%	N	%	N	%	N	%	N	%		
The effectiveness of curriculum influence teaching mathematics effectively.	7	35.0	8	40.0	0	0.0	2	10.0	3	15.0	4.11	1.12
Teachers who focused on curriculum in teaching mathematics facilitate learners to perform mathematics.	6	30.0	8	40.0	3	15.0	1	5.0	2	10.0	3.43	1.21
Students perform better in mathematics when taught by teachers who have undergone curriculum.	5	25.0	7	35.0	3	15.0	5	25.0	5	25.0	3.42	1.11
The quality of mathematics education in public secondary schools is closely linked to the curriculum reform.	10	50.0	8	40.0	0	0.0	2	10.0	0	0.0	4.21	1.10
Curriculum reform is a critical factor in determining the effectiveness of a mathematics teacher in improving students' mathematical outcomes.	12	60.0	4	20.0	0	0.0	2	10.0	2	10.0	2.13	1.09

Source: Primary Data (2025)

The above table shows that evaluation on students' outcomes in public secondary schools with the effectiveness of curriculum on influence of teaching mathematics effectively with 35% was strongly agreed and the majority of respondents with 40% was agreed. Mean was 4.11 and standard deviation was 1.12. teachers who focused on curriculum in teaching mathematics facilitate learners to perform mathematics with 40% agreed and 30% strongly agree. With mean 3.43 and standard deviation was 1.21. Students perform better in mathematics when taught by teachers who have undergone curriculum with 25% strongly agree and 35% was the majority with agree. Mean 3.42 was and standard deviation is 1.11. The quality of mathematics education in public secondary schools is closely linked to the curriculum reform with the majority of respondents at 50% and 40% agreed with it. Mean was 4.21 and standard deviation was 1.10. Curriculum reform is a critical factor in determining the effectiveness of a mathematics teacher in improving students' mathematical outcomes with 60% was strongly agree at the most of respondents and 20% was agreeing. With a mean of 2.13 and standard deviation was 1.09 in all respondents.

It can be difficult to strike a balance between standardization and acknowledging the variety of learning needs that students have. Reforms to the curriculum should be subtle enough to take individual learning styles, cultural diversity, and regional variances into account. (Cai, J., & Ni, Y. 2011). If reforms unintentionally result in a one-size-fits-all strategy, possibly leaving some student groups behind, this should be critically discussed. The evaluation of students is a crucial aspect of the educational process (Roy, A. G. 2021). Standardized testing is criticized for frequently failing to measure students' actual comprehension levels and for discouraging creativity. Changes in assessment techniques and curriculum reforms should go hand in hand, with an emphasis on ongoing assessment and a more thorough knowledge of a student's abilities.

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3.4 The effects of curriculum reforms on students' outcomes in Mathematics in public secondary schools

Table 4. The effects of curriculum reforms on students' outcomes in Mathematics

Statements	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree		Mean	Std
	N	%	N	%	N	%	Std	%	N	%		
The availability of physical resources facilitates students in problem solving abilities.	12	60.0	8	40.0	0	0.0	0	0.0	0	0.0	3.44	.89
Presence of teachers facilitate students to increase marks in mathematics subjects.	9	45.0	8	40.0	0	0.0	1	5.0	2	10.0	3.43	1.20
Collaboration with colleagues and sharing teaching strategies positively influences teachers' effectiveness in teaching Mathematics.	10	50.0	7	35.0	0	0.0	3	15.0	0	0.0	3.42	1.11
To be familiarity with mathematics curriculum enhances teachers' ability to engage students and improve their outcomes in Mathematics.	10	50.0	8	40.0	0	0.0	2	10.0	0	0.0	4.21	1.10
The quality of curriculum influences teachers' teaching and promotes students' self-motivation and study habits in Mathematics.	7	35.0	5	25.0	4	20.0	2	10.0	2	10.0	2.13	1.12

Source: Primary Data (2025)

Based on the effects of curriculum reforms on students' outcomes in Mathematics, the availability of physical resources facilitates students in problem solving abilities with 60%, agree with 40%, mean with 3.44 and standard deviation was .89. The presence of teachers facilitates students to increase marks in mathematics subjects with 45% was strongly agree, 40% with agree, 5% with disagree and 10% with strongly disagree, mean was 3.34 and standard deviation was 1.20. Collaboration with colleagues and sharing teaching strategies positively influences teachers' effectiveness in teaching Mathematics 50% strongly agreed with 35% agreed with it 15% with disagree, mean with 3.42 and 1.11 standard deviation. To be familiar with mathematics curriculum enhances teachers' ability to engage students and improve their outcomes in Mathematics. with strongly agree of 50%, 40 % agreed and 10% disagreed, 4.21 was mean and standard deviation of 1.10. The quality of curriculum influences teachers' teaching and promotes students' self-motivation and study habits in Mathematics with 35% was strongly agreed, 25.5% agreed, 20% with neutral, disagreement was 10% and strongly agree was 10%, mean was 2.13 and standard deviation with 1.12. Therefore, this shows that curriculum reforms contribute to students' outcomes in mathematics in Nyabihu district.

A comprehensive examination of curricula, curriculum revisions, and their impact on learning outcomes reveals a dynamic environment with opportunities, challenges, and a continuing need for observation, according to other researchers. How these elements work together impacts how students' educational journeys develop and how well the educational system functions overall. The contrast between rote learning and critical thinking highlights the basic disagreement in educational theories. Curriculum reforms must be carefully designed to promote not only the acquisition of knowledge but also the ability to critically think about, evaluate, and synthesize facts in an attempt to depart from traditional approaches. (Atar, B., 2022).

Implementation challenges are one of the main barriers to curricular revisions' success. The revolutionary vision outlined in policy texts must be translated into practical plans supported by sufficient funding and in-depth teacher preparation. The gap between the development of policies and their effective execution often determines whether reform initiatives succeed or fail. The delicate balance that must be achieved between variation and uniformity highlights the necessity of determining

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each student's particular learning needs. Curriculum reforms ought to emphasize the importance of regional and cultural diversity and foster an inclusive environment that accommodates a variety of learning styles. There is a chance that the universal approach will maintain inequalities in educational possibilities. (Dhamija, R. 2019).

Table 5. The use of the New Curriculum Facilitates Learners to Improve Learning Outcomes

Statements	Storngly Agree		Agree		Neutral		Disagree		Strongly Disagree		Mean	Std
	N	%	N	%	N	%	N	%	N	%		
The use new curriculum and others documents led by teachers help students to understand Mathematics topics better	35	28.7	45	36.9	17	13.9	10	8.2	15	12.3	4.36	.94
Support and encouragement from teachers and school administration positively affect my performance in Mathematics.	40	32.8	50	40.9	21	17.2	11	9.0	0	0.0	4.48	.89
The use of different teaching documents for teachers in teaching help me to be engaged in Mathematics subjects and get more marks.	62	50.8	60	49.2	0	0.0	0	0.0	0	0.0	4.55	.60
The use of teaching resources and availability of materials improves my learning experience in Mathematics	60	49.2	53	43.4	8	6.6	5	4.1	4	3.3	4.26	.90
The different documents used by teachers help students to make some innovation in Mathematics and self- motivation.	55	45.1	56	45.9	0	0.0	6	4.9	5	4.1	4.21	0.88

Source: Primary Data (2025)

Referring to the findings about the use of the new curriculum facilitates learners to improve learning outcomes, The use of the new curriculum and other documents led by teachers help students to understand Mathematics topics better with 28.7% strongly agreed, 36.9% agreed, 8.2% with neutral 12.3 disagreed and 12.3% was strongly agree, mean was 4.36 and standard deviation was .94. Support and encouragement from teachers and school administration positively affect my performance in Mathematics 32.8% with strong agreement, 40.9% with agree, 17.2 with neutral, 9.0% with strongly disagree, mean was 4.48 and .89 with standard deviation. The use of different teaching documents for teachers in teaching help me to be engaged in Mathematics subjects and get more marks 50.8% with strongly agree, 49.2% agreed, mean was 4.55 and standard deviation with .60. The use of teaching resources and availability of materials improves my learning experience in Mathematics 49.2% strongly agree, 43.4% with agree, 6.6% with neutral and 4.1% with strongly disagree, mean was 4.26 and .90 was standard deviation. The different documents used by teachers help students to make some innovation in Mathematics and self- motivation with 45.1% was strongly agreed, 45.9% was agreed, 4.9% was disagreed and 4.1% was strongly agree, mean was 4.21 and .88 was standard deviation. This shows that the use of a new curriculum facilitates learners to improve their learning outcomes.

A broad range of stakeholders, including parents, students, and instructors, must be involved for curriculum modifications to be successful. It is important to critically assess the degree of involvement and the degree to which various points of view are truly considered throughout the reform process. A lack of stakeholder involvement may result in reforms that are unrelated to the real situation on the ground. Changes to the curriculum must be evaluated from a long-term perspective. A critical conversation should focus on whether the reforms are improving learning outcomes over the long term or if there are unintended repercussions that take longer to show up (Cai, J., & Ni, Y. 2021).

To make sure that reforms are accomplishing their intended goals and meeting the changing needs of society, ongoing assessment is crucial. When curricula, curricular reforms, and their effects on learning outcomes are critically examined, a complex environment with opportunities, challenges, and a continual need for monitoring is revealed. How these elements work together impacts how students' educational journeys develop and how well the educational system functions overall. The contrast between rote learning and critical thinking highlights the basic disagreement in educational theories. Curriculum reforms must be carefully designed to promote not only the acquisition of knowledge but also the ability to critically think about, evaluate, and synthesize facts in an attempt to depart from traditional approaches. (Atar, B., 2022).

4. FINDINGS FROM INTERVIEW

According to school administrators, the key curriculum reforms in mathematics in their schools include the adoption of competency-based teaching methods, the introduction of more practical problem-solving exercises, and the use of continuous assessment in place of solely relying on end-of-term exams. They also highlighted the increased use of ICT tools to support teaching and learning. However, administrators noted several challenges in implementing these reforms, including insufficient teaching materials, limited access to ICT resources, and the need for additional teacher training to effectively apply the new approaches. Regarding learners' performance, administrators observed improvements in students' problem-solving abilities and conceptual understanding, although the results were uneven, with some students adapting faster than others. Beyond academic outcomes, the reforms have fostered critical thinking, confidence, and greater engagement in mathematics, with some students participating in math clubs and competitions more actively. Administrators pointed out areas that still need improvement, such as expanding teacher professional development, increasing access to teaching resources, and better aligning curriculum content with students' abilities. They recommended that policymakers continue to support teachers through training and resources, that school leaders closely monitor implementation, and that teachers collaborate to share best practices, while also establishing feedback mechanisms to assess student progress and the overall effectiveness of the reforms

5. CONCLUSION

The study concludes that curriculum reforms have a significant and positive influence on learners' outcomes in mathematics in public secondary schools in Nyabihu District. The findings indicate that the revised curriculum enhances students' understanding of mathematical concepts and strengthens their problem-solving abilities, which ultimately leads to improved academic performance. Learners are better able to apply mathematical knowledge in both academic and real-life contexts.

Moreover, the study reveals that the reformed curriculum promotes creativity and critical thinking among students. By emphasizing learner-centered approaches, the curriculum encourages active participation, exploration, and innovation during the learning process. This shift has made mathematics more engaging and meaningful, thereby improving students' attitudes toward the subject.

The study further concludes that curriculum reforms foster self-motivation and independence in learning. Students become more responsible for their own academic progress, demonstrating increased interest and commitment to mathematics. Additionally, the reforms contribute to the development of effective study habits, such as regular practice, collaboration with peers, and better utilization of learning resources.

Overall, the study establishes that curriculum reforms not only enhance students' academic achievement in mathematics but also support their holistic development. The improvements in skills, attitudes, and learning behaviors highlight the critical role of effective curriculum implementation in achieving sustainable educational outcomes.

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