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Original Article

Exploring the Factors Contributing to Low Performance in Mathematics Among Girls in Secondary Schools: A Case Study of Nyagatare, Rwanda

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ABSTRACT

The study aimed to identify the factors contributing to the low performance of girls in Mathematics at the secondary school level in Nyagatare District, focusing on public and private schools. The study addressed three specific objectives: identifying school-related factors, socio-economic influences, and outside-school factors that affect girls' performance. A descriptive survey design was employed, combining both quantitative and qualitative approaches. Simple random and purposive sampling techniques were used to select 134 respondents, with data collected through questionnaires, semi-structured focus group discussions, and interviews. Findings revealed that school-related factors significantly contributed to girls' low performance in Mathematics, with 82% of respondents strongly agreeing that low teacher commitment and poor work habits affected student outcomes. Inadequate teaching materials and textbooks were also highlighted by 80% of respondents as contributing factors. Outside school factors, particularly economic activities, were found to have a significant impact, with 79% agreeing that girls often miss classes during market days to assist their parents. Socio-economic factors, especially parental education, were also found to influence performance, with 80.6% of respondents acknowledging the critical role of parents' educational background in shaping their children's academic success. These findings suggest the need for interventions such as regular sensitization programs to raise awareness about the value of education, parental involvement in their children's academic life, and improvements in school resources to support girls' academic success in Mathematics.

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INTRODUCTION

Equal access to education must be at the forefront of global efforts to end poverty and ensure sustainable development. However, girls continue to shoulder a heavier burden. In developing countries, there are still 31 million girls out of primary school, and five million girls are at the end of primary school but cannot read a single word (Heleta, & Bagus, 2021). Furthermore, less than 40% of girls in sub-Saharan Africa, Oceania, and Western and Central Asia were enrolled in secondary education in 2018, with just 37% attending lower secondary education (Mapping Disparities in Education across Low-and Middle-Income Countries, 2020). Girls in sub-Saharan Africa experience significant exclusion from attending and completing compulsory and secondary education (Ezaki, & Ogawa, 2024). Boys are enrolled in primary schools in higher numbers than girls. The gender gap is more pronounced in poorer countries. Rwanda scores among the lowest in the gender parity index in the sub-Saharan region. A recent education for all global monitoring report provided evidence that one of the drivers of learning inequalities in the region between girls and boys is mathematics (Ngari, & Mutegi, 2023).

Girls in the African context experience disparities in accessing education, remaining in school, and performing as well as boys due to economic, cultural, and regional factors (Keller et al., 2022). African traditional gender roles place massive amounts of pressure on females to do house chores and look after their siblings (Seff et al., 2023). Such responsibilities leave them with little time and energy to study. There are numerous educational disparities on the continent, including mathematics, in which a significant percentage of women scored lower on all assessed levels of proficiency than men. While only a portion of women sat for the examinations in previous years, the increasing number of females who sat for more recent examinations performed lower on all assessed levels compared to males. Although these figures demonstrate that fewer girls enrolled for the course, data suggest that academic potential is decreasing in other levels of performance as well (Satyen, 2021).

Many African governments, world bodies, and non-governmental organizations are all working towards improving the educational climate for school-going girls (Hassan et al., 2021). Even though girls are more passionate about pursuing their education, they perform poorly in mathematics and consequently perform poorly academically. In support of this quantitative statement, Ajimudin's (2021) findings indicate that girls meet numerous educational challenges that influence their performance in mathematics, which emanates from their general socio-economic circumstances. These findings are reflected in this paper as the main educational challenges that girls in Nyagatare meet.

In the Rwandan context, in 1994, Rwanda faced a genocide, after which 70% - 80% of the population was left being women (Nyseth Nzitatira et al., 2023). Due to this genocide, Rwanda lost many individuals, including men (Jones, 2002). It has been reported that 50% of the girls were left as orphans and 2% of them were badly affected, inhibiting their ability to complete their education (Jin et al., 2020). As a result, people were distressed, and many boys disappeared. The majority of the children going to school are girls. During that time, the government minimized school fees for everyone and announced that it was free for two orphans and above, which contributed to the increase of girls in schools (Hashakimama, 2022). After that, the government called for twelve years of free basic education for everyone in the country.

In 2003, Rwanda passed an education policy of giving extra marks to the girls who passed in the same percentage as boys to encourage them to keep learning (Rubagiza et al., 2022). This policy can find a particular number of 10-20 students, especially in

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towns, with the government aiming to promote girls and prevent them from dropping out of school. It is claimed that challenging socio-economic conditions—like poverty, rural polluted water, and fetching water in general—create an extra burden for girls, which in turn influences their concentration in their studies. Around millions of families in local administrative entities are represented by extremely impoverished families. Regional differences commonly exist, but they are especially convincing in the case of girls, with the need to fetch water decreasing by 55.1%, compared to 31.8% in the Central Province (Reilly, 2021).

This study seeks to identify the factors contributing to the low performance of girls in Mathematics at the secondary school level in Nyagatare District, Rwanda. Specifically, it explores school-related, external, and socio-economic factors that influence girls' performance in Mathematics. By addressing these challenges, the study contributes directly to achieving Sustainable Development Goals (SDGs) 4 and 5, which focus on ensuring inclusive and equitable quality education and promoting gender equality. Understanding and mitigating these factors will enhance girls' academic outcomes, fostering their participation in science, technology, engineering, and mathematics (STEM) fields. This aligns with Rwanda's Vision 2050, which emphasizes equitable human capital development and gender inclusivity as critical for national progress. The findings will guide evidence-based policies and interventions aimed at reducing gender disparities in education, empowering girls, and equipping them with the skills needed for sustainable socio-economic transformation, thus contributing to the broader global and national development agenda.

METHODOLOGY

Study Area

The study was conducted in Nyagatare District, Eastern Province, Rwanda, one of the country's largest districts. Nyagatare covers an area of 1,920.11 km² and is bordered by Uganda to the north, Tanzania to the east, Gatsibo District to the south, and Gicumbi District to the west. Administratively, the district is divided into 14 sectors, 106 cells, and 630 villages. According to the 2024 population census by the National Institute of Statistics of Rwanda (NISR), Nyagatare has a total population of 466,944. Its strategic location and demographic composition make it significant for educational and socio-economic research.

Design of the Study

The study employed a descriptive survey design to sample and analyze views from teachers and students. The survey research in education focuses on gathering information from groups such as students, teachers, or individuals linked to educational matters, making it a valuable approach for exploring educational issues comprehensively (Turyasingura et al., 2023).

Population and Target Population

The study was conducted in Nyagatare District, focusing on eight selected secondary schools as the population of interest. The total target population was 1,794 individuals, comprising 84 Mathematics teachers and 1,710 students from 10 secondary schools teaching Mathematics. Mathematics teachers were included in the study because they are the primary implementers of the secondary school Mathematics curriculum. The population refers to the entire group of individuals to whom the findings of the study will apply, and from whom generalizations can be made.

Sampling Procedure

Sampling is a critical aspect of research, as emphasized by Odongo et al. (2021), who define a sample as a subset of elements representing the larger population. When a sample is selected properly, as Stratton (2021) highlights, it ensures that the collected data can be generalized to the entire population. In this study, a random sampling technique was employed to select participants. This method ensures unbiased representation and aligns with the research objective to explore factors influencing the performance of girls in Mathematics.

Sample Size

The researcher selected eight secondary schools for the study, involving 69 Mathematics teachers and 324 students, determined using Slovin's formula.

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The diverse representation of schools and participants ensures comprehensive data collection and reliable insights into the study's objectives $\mathbf{n} = \frac{N}{1+N(e)^2}$ (Yamane, 1967).

Where:
n = number of samples
N = total population
e = margin of error (5%)

Table 4: Sample Size of Teachers, Students and Schools

Teachers	Students	Schools
$n = \frac{\mathbf{84}}{\mathbf{1+84}(5\%)^2}$	$\mathbf{n} = \frac{1710}{1+1710(5\%)^2}$	$\mathbf{n} = \frac{10}{1+10(5\%)^2}$
n=69.42 ~69	n=324.17~324	n=7.81~8

Data Collection Techniques

The study employed various data collection techniques to gather comprehensive insights into the performance of girls in Mathematics. Classroom observations were conducted in eight schools to examine teaching practices and methodologies, focusing on pre-specified behaviours of teachers and students, including their attitudes related to gender (Karuhanga *et al.*, 2023). Document reviews provided historical data, statistics, and reports from schools to uncover factors influencing girls' participation and performance in Mathematics. Questionnaires, administered to 69 Mathematics teachers from both rural and urban schools, collected factual information on contributing factors. Senior Five and Senior Six Mathematics teachers were prioritized for the survey. Additionally, semi-structured interviews were conducted with students in focus groups, ensuring they understood the purpose of the research and allowing them to provide detailed responses.

Data Analysis

The data collected through questionnaires were analyzed using descriptive statistics, which provided numerical summaries of responses and facilitated inferences about the population. Therefore, descriptive statistics enable researchers to interpret data effectively and address research questions systematically. Questionnaires were scored, coded, and analyzed item by item. For interview data, content analysis was employed to identify recurring themes and categorize responses for detailed interpretation (Turyasingura *et al.*, 2024). Field notes and transcripts were carefully reviewed to extract meaningful insights.

Ethical Considerations

The researcher adhered to ethical guidelines by obtaining formal permission to conduct the study from the Mayor of Nyagatare District. Further clearance was sought from the District Director of Education (DDE) and school heads, ensuring compliance with institutional protocols. In each school, participants were informed about the study's purpose and assured of confidentiality and voluntary participation. These measures upheld ethical standards and fostered trust and cooperation throughout the research process.

RESULTS AND DISCUSSION OF THE FINDINGS

Research Question 1: What school-related factors contribute to the performance at the National Examination?

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Table 2: Illustration of the Responses of Teachers on School-related Factors that are Likely to Contribute to the Performance of Girls in Mathematics in the Secondary Level of Nyagatare District

STATEMENT	SA %	A %	U %	D %	SD %	TOT
Low teacher commitment and work habit contributes to low performance	29(43)	26(38.8)	5(7.4)	5(7.4)	2(2.9)	67(100)
T/LMs and textbooks are available and are in use for teaching and learning.	6(8.9)	6(8.9)	1(1.4)	15(22.3)	39(58)	67(100)
I teach to the relevance of the syllabus	6(8.9)	9(13.4)	1(1.4)	31(44.7)	20(29.8)	67(100)
I complete the content of the syllabus each year	6(8.9)	9(13.4)	1(1.4)	30(43.3)	21(31.3)	67(100)
I periodically get feedback on student performance through homework and exercise	14(20.8)	37(55.2)	3(4.4)	8(26.8)	5(7.4)	67(100)

The data reveals that a significant majority of teachers, 81.8%, either strongly agree (43%) or agree (38.8%) that low teacher commitment and poor work habits contribute to girls' low performance in Mathematics. This suggests that teacher attitudes and practices play a pivotal role in student outcomes (Owusu-Fordjour, 2021). With only 10.3% disagreeing or strongly disagreeing, the findings highlight the importance of teacher professionalism and accountability. This insight calls for enhanced teacher motivation through capacity-building workshops, professional development opportunities, and performance-based incentives. These findings generate new knowledge on how teacher-related factors affect gender-specific performance in Mathematics, particularly in resource-constrained areas. The current findings are in line with Naik et al. (2021) who said that in some schools where computer lessons are taught, girls can miss these lessons if they start earlier or later and are given another subject at the time computer lessons are going on. Unfortunately, this may be an overstatement when we find girls who have no knowledge of generators, watch television every day instead of using the same money on weekends to visit the cybercafé, can dial when asked, and prefer to buy overpriced goods from shops rather than buying cheap goods on the internet attributed to low teacher commitment and work habit contributes to low performance.

On the other hand, responses indicate that only 17.8% of teachers strongly agree or agree that teaching and learning materials (T/LMs) and textbooks are sufficiently available and in use (Turnbull, 2022). In contrast, a striking 80.3% either disagree or strongly disagree, with only 1.4% remaining neutral. This points to an acute shortage of resources necessary for effective Mathematics instruction. Without sufficient T/LMs, students may struggle to grasp abstract mathematical concepts, which may disproportionately affect girls. This finding highlights the need for targeted investment in educational resources, including digital tools and interactive teaching aids. New knowledge from this data emphasizes that ensuring resource availability is fundamental to enhancing girls' learning outcomes in Mathematics.

The data shows that only 22.3% of teachers strongly agree or agree that they teach according to the relevance of the syllabus, while 74.5% disagree or strongly disagree. This suggests a disconnect between teaching practices and the curriculum, which could lead to gaps in students' preparation for exams and understanding of core concepts. It raises concerns about the alignment of instructional strategies with educational standards. This finding highlights the need for teacher training programs to reinforce the importance of adhering to syllabus objectives. Furthermore, curriculum monitoring by educational authorities could ensure that teachers deliver content that meets the required standards, fostering a more robust educational foundation for girls.

Only 22.3% of teachers strongly agree or agree that they complete the syllabus each year, while a substantial 74.6% disagree or strongly disagree. This suggests that a majority of teachers face challenges in covering the full curriculum within the academic year, likely leaving students underprepared for

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assessments. Incomplete syllabus coverage can significantly hinder students' understanding of fundamental concepts, particularly in Mathematics. This insight underscores the need for improved time management and structured lesson planning. Additionally, schools could adopt periodic reviews of syllabus progress to ensure timely completion. The new knowledge here is that the inability to complete the syllabus directly impacts the quality of education and student outcomes, particularly for girls.

A majority of teachers, 76%, strongly agree or agree that they periodically provide feedback on student performance through homework and exercises. This demonstrates a positive effort to monitor and support student progress. However, 18.6% disagree or strongly disagree, indicating inconsistency in feedback practices among teachers. Regular feedback is crucial for identifying and addressing learning gaps, particularly in Mathematics, where cumulative understanding is essential. The findings suggest that schools should promote structured and consistent feedback mechanisms as a standard practice (El-Hawary, 2020). New knowledge from this data highlights the potential of feedback in fostering personalized learning and improving girls' performance in Mathematics

On the qualitative data collected, it was found that students face significant challenges due to inadequate learning materials. One student stated,

> "*We don't have enough textbooks; we have to pair to share the few available. At times some of us even do not get any to read*." Another added, "*In self-revision, we do not have an equipped library, which makes it difficult for us to get textbooks. And the ones we have are outdated, so this makes it difficult to identify some of the difficult calculations of Mathematics during an examination*."

These comments highlight the urgent need for updated and sufficient resources to support effective learning.

Also, some of the students raised concerns about their interactions with teachers during lessons. One student remarked,

> "*I don't like the way some of the teachers behave during lessons. Some of them, when you ask questions in class, they ignore you. At times I rely on my friends to help me understand certain things taught in class; they rarely give us homework*."

This feedback underscores the importance of fostering an inclusive and interactive classroom environment where students feel supported in seeking clarity and practising what they learn. A student observed,

> "*Most of our teachers give their notes to some of us to do the copying on the chalkboard for others to copy. They do not even explain to us, then give us work on it. At times I become confused. Some just sit down and would be doing their private reading*."

These remarks suggest a need for professional development programs to improve teaching strategies and ensure that lessons are engaging and focused on student understanding.

Table 2: Showing Questions that Seek to Find Responses from Teachers on Outside-school Factors that Affect the Performance of Girls

STATEMENT	SA %	A %	U %	D %	SD %	TOTA
6. My students skip classes during market days to assist parents sell their wares.	26(38.8)	27(40.2)	4(5.9)	7(10.4)	3(4.4)	67(100)
7. Students do other menial jobs to support themselves with their school needs.	32 (52.2)	25(37.3)	1(1.4)	3(4.4)	3(4.4)	67(100)
8. Parental involvement in students' education is encouraging and active.	6(8.9)	3(4.4)	5(7.4))	23(34.3)	30(43.3)	67(100)

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The data indicates that economic activities outside school significantly affect the attendance and performance of girls in secondary schools. A notable 38.8% of teachers strongly agreed and 40.2% agreed that students often skip classes during market days to assist their parents in selling wares. This suggests that household economic responsibilities are a substantial distraction from academic priorities. Additionally, 52.2% of teachers strongly agreed and 37.3% agreed that students engage in menial jobs to support their school needs, further highlighting the economic pressures faced by many students. These findings emphasize the need for interventions to alleviate the economic burden on families, such as providing financial support or scholarships, to ensure that students can focus on their studies without being compelled to miss school for work.

The above findings are in line with Georgescu, & Herman (2020) who said that family background parents, through their knowledge and experiences, significantly influence their children; for example, their educational aspirations are directly influenced by those of their parents. It is expected that girls whose parents have not accessed education will have poor academic achievement, while those whose parents have achieved relatively highly are expected to excel in examinations. If children believe that education is directly valuable to them, it is anticipated that they will perform well in the subject because the advantage of being able to read, write, and calculate will later be transformed in terms of high-wage opportunities. Also, Clark et al. (2021) reported that the interest that parents have in the subject may have a significant influence on the examination results of the girls, especially girls from areas where people are economically disadvantaged. Another factor that is worth noting is how accurately and how often parents offer support to their children when they need it. It is expected that students who are receiving academic support are likely to have better results than those who are not.

The kind of support that children receive should come with flexibility and the spirit of understanding to know when it is the right time to offer help. The Nyagatare people have negative attitudes towards mathematics, and males are believed to be the best, while girls are perceived to be less competent. This kind of attitude serves as a barrier to girls and reinforces a destructive pathway for them. Also, some informants living in rural areas indicated that most of the females see themselves as housewives. They stated that due to domestic and household chores, including cooking and looking after children and livestock, it is difficult to take advantage of all the opportunities that school provides, and this has a strong effect on their performance in mathematics. This could mean that both sexes can perform well to the extent that they can before household activities interfere with their schoolwork.

The responses reveal limited parental involvement in supporting students' education, which could negatively affect academic outcomes. Only 8.9% of teachers strongly agreed, and 4.4% agreed that parental involvement was encouraging and active, while a significant 43.3% strongly disagreed and 34.3% disagreed. This lack of engagement from parents indicates a gap in collaborative efforts to support students' academic journeys. Parents play a crucial role in motivating and supervising students, and their absence may lead to a lack of discipline, focus, and support for academic success. These results highlight the need for schools to establish parent-teacher partnerships and community sensitization programs to encourage active parental participation in their children's education.

Table 3: Teachers Responses to Socio-economic Factors Affecting Girls' Performances

STATEMENT	S.A (%)	A (%)	U (%)	D (%)	SD (%)	TOTA
The educational background of parents affects their performance.	30(43.0)	25(37.3)	3(4.4)	2(2.2)	7(10.4)	67(100)
The source of income for students' parents affects performance.	22(32.8)	20(29.8)	5(7.4)	14(20)	3(4.4)	67(100)
Cultural factors	30(43.3)	6(8.9)	8(11.9)	10(14.9)	6(8.9)	67(100)

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The data underscores the significant influence of parental education on girls' academic performance. A combined 80.3% of teachers (43.0% strongly agreed and 37.3% agreed) believe that the educational background of parents positively or negatively affects their children's academic outcomes. This suggests that parents with higher education levels are more likely to support their children academically, whereas those with limited education may struggle to provide guidance or create an environment conducive to learning. Additionally, 62.6% of teachers (32.8% strongly agreed and 29.8% agreed) emphasized that the source of income for students' parents also plays a critical role in their performance. Johnson et al. (2020) families with stable and sufficient income can provide educational materials and reduce economic stress, while those with low or inconsistent incomes may hinder students' focus and participation.

Cultural factors are highlighted as a key challenge, with 43.3% of teachers strongly agreeing and 8.9% agreeing that cultural practices negatively impact girls' academic performance. These cultural influences could include early marriages, gender biases in educational priorities, or expectations for girls to fulfil domestic roles, which limit their study time and commitment to schooling (Arafat et al., 2021). Notably, 14.9% of teachers disagreed, and 8.9% strongly disagreed, indicating that cultural practices' effects may vary across different households or communities. These findings suggest a need for community education and cultural transformation programs to promote equitable opportunities and prioritize girls' education as a critical step towards improving their academic achievements (Thi et al., 2023).

CONCLUSION AND RECOMMENDATIONS

The findings of this study underscore several critical factors for policymakers and educators to address in enhancing girls' performance in Mathematics at the secondary level in Nyagatare District. Low teacher commitment, inadequate teaching and learning materials, misalignment with syllabus objectives, and incomplete syllabus coverage emerge as key impediments. Policymakers should prioritize teacher motivation through performance-based incentives, capacity-building workshops, and stringent curriculum monitoring to ensure syllabus adherence and completion. Investments in modern and sufficient educational resources, such as textbooks and digital tools, are essential for effective teaching and self-revision. Additionally, fostering inclusive classroom environments and implementing consistent feedback mechanisms can support personalized learning and boost confidence among girls. This study contributes to the existing literature by highlighting the interplay of teacher-related factors, resource availability, and curriculum alignment in shaping gender-specific academic outcomes in resource-constrained settings. These insights provide actionable strategies for enhancing Mathematics education, ensuring equitable access, and empowering girls to excel academically.

The study findings on the impact of outside school factors on the academic performance of girls in secondary schools within Nyagatare District. Economic activities, such as assisting parents in markets (79% agreement) and engaging in menial jobs (89.5% agreement), divert students' attention from studies, indicating a pressing need for financial support programs to reduce economic pressures. Additionally, limited parental involvement, with only 13.3% of teachers perceiving active support, exacerbates the challenges faced by students. Addressing these barriers through scholarships, community sensitization, and strengthening parent-teacher partnerships is essential for improving girls' academic outcomes and fostering their holistic development.

The study highlights the substantial impact of socio-economic factors on the academic performance of girls in secondary schools in Nyagatare District. Parental education plays a pivotal role, with 80.3% of teachers acknowledging its influence on students' academic outcomes, as educated parents are better equipped to support their children's learning. Similarly, 62.6% of teachers emphasized the critical role of parents' income in providing educational materials and minimizing economic stress. Cultural factors, cited by 52.2% of teachers, further hinder girls' performance, with practices such as early marriages and domestic roles limiting study time. Addressing these challenges requires community

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sensitization and interventions to foster equitable educational opportunities for girls.

Recommendations

- **Teacher Motivation and Professional Development**: Implement performance-based incentives, capacity-building workshops, and regular training programs to enhance teacher commitment and pedagogical effectiveness, particularly in Mathematics education.
- **Provision of Educational Resources:** Invest in adequate and modern teaching and learning materials, including textbooks, digital tools, and laboratory equipment, to support effective teaching and self-revision for students.
- **Economic Support Initiatives:** Introduce financial support programs, such as scholarships, bursaries, or school feeding programs, to alleviate the economic pressures on students, enabling them to focus on their studies without the need to engage in menial jobs.
- **Parental Engagement Programs:** Strengthen parent-teacher partnerships through community sensitization initiatives and parent education programs, emphasizing the importance of active parental involvement in their children's academic pursuits.
- **Cultural Transformation Campaigns**: Promote awareness campaigns aimed at transforming cultural attitudes and practices that hinder girls' education, such as early marriages and gender biases, by involving community leaders and stakeholders.
- **Curriculum Monitoring and Alignment:** Enhance curriculum monitoring mechanisms to ensure syllabus alignment, timely completion, and inclusion of gender-sensitive teaching strategies that foster equitable learning environments.

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