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RESEARCH ARTICLE

REMEDIAL PRACTICES AND STUDENTS' COMPETENCES IN MATHEMATICS IN PUBLIC SECONDARY SCHOOLS IN RWANDA A CASE OF GICUMBI DISTRICT

Dukuzimana Olivier and Dr. Mugiraneza Faustin (PhD)
Education, Mount Kigali University, Rwanda.

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Abstract

Background: Mathematics plays a crucial role in both vocational success (Jetter, 2017) and everyday life (Unameh, 2011), yet many students face challenges in mastering it. Globally, educational equity remains a priority, with persistent disparities in math education, especially among low-SES students (UNESCO, OECD). Tanzania and Rwanda are actively addressing these challenges to enhance educational outcomes.

Materials and Methods: This descriptive survey study involved 171 participants from 32 secondary schools in Gicumbi District: 105 mathematics instructors, 50 subject leaders, 35 head teachers, and 110 students. Data collection employed random sampling, with Slovine's method used to select the study sample. SPSS version 21.0 facilitated analysis, encompassing descriptive statistics (frequency, percentage, mean, standard deviation) and inferential statistics (correlation, regression coefficients).

Results and Discussions: Findings revealed strong consensus among respondents on the efficacy of modifying instructional methods (80.0%), using personalized learning materials (63.1%), integrating visual and auditory resources (60.0%), and creating tailored exercises (68.0%) to improve math competencies. Key indicators such as problem-solving (64.3%), method application (96.6%), reasoning (92.3%), and mathematical representation (92.3%) demonstrated significant improvements. Enhanced physical facilities also correlated positively with student outcomes, underscoring the role of supportive environments in fostering mathematical competence.

Conclusion: The study emphasizes the effectiveness of adapting teaching methods and environments to enhance students' math skills. Customized approaches, including personalized materials and multimedia integration, proved instrumental in improving competencies like problem-solving and reasoning. Statistical analyses consistently supported these findings, highlighting the importance of personalized and diversified teaching strategies in enhancing math education in Gicumbi, Rwanda.

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Corresponding Author:- Dukuzimana Olivier

Address:- Education, Mount Kigali University, Rwanda.

Introduction:-

Mathematics, according to Jetter (2017), is the key to a variety of chances for vocational and educational success. Umameh (2011) emphasized that mathematics is closely related to everyone's long-term goals and everyday activities. Therefore, without mathematical information, education and humanity's existence cannot function properly. However, not all students enjoy mathematics, and others struggle with the ideas and abilities needed to flourish in this subject. Mathematical concepts have the power to amaze and stimulate creativity. Math is far more than counting and arithmetic; it may provide unquestionable confirmation of complex ideas and predict future scientific discoveries (Azana, 2020).

Worldwide, Educational goals encompass the Millennium Development Goals, also known as the MDGs, and Education for All (EFA) are significant worldwide commitments to achieving universal secondary education for all children and include children with SNE in education at all levels. Globally: According to recent UNESCO data from the EFA Global Monitoring Report, roughly 27 million children in the Common Wealth do not attend school owing to special needs schooling, such as those with Mathematical Difficulties. While there are no concrete numbers to show how many children with Mathematics Disabilities are not in school, research show that 10-20% of students in a standard class in India and 6-10% in the United States have MD (Jordan, 2010). There is consensus that one of the most important aspects of mathematics education is mathematics for all (Cuban, & Tyack, 2019). Not only should every student be able to approach mathematics equally, but they should also all be able to study and comprehend it equally.

It is the responsibility of educators to guarantee that every student receives education, with additional attention given to those who require it. However, the proportion of low-socioeconomic-status (SES) households' math-challenged students in Taiwan is still rising (Ministry of Information Taiwan, 2010). Despite their strong performance on mathematical concepts exams, a significant percentage of 15-year-old children in Taiwan remain among the lowest performers, based on the findings of the PISA, or Programme for International Student Assessment (OECD, 2016). Trends in the International Mathematics and Science Study, or TIMSS, was published lately, findings in Taiwan, for instance, show a notable disparity between high and poor socioeconomic categories (Council, 2015). According to study, many underachievers, particularly in mathematics, come from low-income homes, demanding further assistance in order to enhance their mathematical abilities (Ministry of Education Taiwan, 2010).

Previous studies suggest that children with low incomes and those who struggle in mathematics and are at risk of performing poorly need more support and guidance; nevertheless, researchers and educators often do not pay enough attention to them (Empson, 2020). Therefore, some action must be made to address this little discussed topic.

School teachers, math educators, and researchers have a significant difficulty in achieving equity in mathematics education (Bartell, 2016). This is a particularly urgent issue in Taiwan because the number of low-SES students has increased over the past ten years (Ministry of Education Taiwan, 2010). For instance, despite their strong performance on the TIMSS achievement in mathematics test, Taiwanese children in the fourth and eighth grades continue to lag behind their low-SES counterparts in terms of achievement (Martin & Pierre, 2019).

In the eastern African region, researchers, governments, and non-governmental organisations in Tanzania have attempted to identify reasons contributing to the subpar arithmetic skills of children across all educational levels. Many claim that there are insufficient teaching and learning materials, such as books (Ponera, Mhonyiwa, & Mrutu, 2011), instructional aids, and inadequate staffing in the majority of schools are the causes of the high failure rates (Kitta, 2014). Increased rates of failure are also linked to low motivation among educators, opinions regarding students and mathematics, inadequate teaching techniques, inadequate subject-matter expertise, and feelings among educators in the teaching environment (Frenzel et al., 2019).

In Rwanda, through the Human Capital Development Project for Rwandan Quality Basic Education, the Rwandan government decided to enhance basic education student retention and competency as well as learning in order to raise the Human Capital Index. (REB, 2020), The initiative will assist remedial and catch-up programmes for students who are in danger of repeating coursework or dropping out owing to COVID-19 effects. It is aimed at certain schools. It is anticipated that 2,520 secondary and lower secondary schools around the nation will get financial and technical help from it. Based on the test results, the number of students who will get help will be decided. When schools reopen, students will have a week to review before taking an exam that has been prepared at

the school level. The results of this evaluation will be used to determine which students require more help, and those students' instructors will provide remedial instruction to aid them (REB, 2020).

The goal of remedial programmes is to bridge the knowledge gap between students and expectations for their knowledge and performance. They frequently focus on fundamental abilities, including writing, reading, basic math, and some elementary science. It should be mentioned that special education, which is intended to address the ongoing requirements of students with disabilities and support their academic development, is not the same as remedial programmes. Remedial lessons are meant to enhance learning, much like a treatment, especially in disciplines where the student received a zero or almost a zero. The study seeks to investigate the influence of remedial practices on students' competences in mathematics subject in Rwanda, in Gicumbi district.

Problem Statement

According to Morris and Arore (2014), student performance in mathematics is global rather than national. As a result of this worldwide problem, academicians from all over the world examined its fundamental causes. In Rwanda, mathematics and scientific education confront various problems, including student misunderstandings and unfavourable attitudes (Muyombana, 2019). Despite government initiatives such as education for all school dropout, lack of competency, and enrollment retention are common concerns that impair the morale and quality of educational achievements in secondary schools (Paulin, 2023). According to REB (2020), the government has prompted an examination into the use of remedial activities to assist students in comprehending and building their competences in these disciplines. However, early diagnosis and intervention from teachers are required for these students to realise their full potential (Emmanuel, 2019).

Observations suggest that the difficulties that some instructors confront while conducting remedial exercises have gradually increased (REB, 2020). School administrators worry about instructors' lack of knowledge and a lack of resources to help students with remedial classes (Fidel, 2021). Paulin (2017) claims that some educators have a bad opinion of the use of remedial techniques in the classroom. Remedial programmes are still being implemented by parents, educators, and other relevant parties to help secondary school students get better at arithmetic. Paulin (2023) asserts that it is uncertain how effective these initiatives actually are, especially when it comes to secondary schools in Gicumbi District. Because there is insufficient knowledge about the significance of restorative actions, the government recognises their usefulness but opposes their commercialization. It was for these reasons that the current study examines to what extent remedial practices influence the students' competences in mathematics in Gicumbi district, Rwanda.

Research purpose

This study was conducted under general objective and specific objectives

Material and Methods:-

Research Design

Bhat (2017) defines research design as the framework of procedures and research methodologies that a researcher selects to conduct a study. The layout makes it possible for researchers to focus on the most successful research techniques for the subject at hand and to plan their investigations to be successful. The deliberate gathering, analysis, classification, and tabulation of data about current circumstances, practices, and processes, as well as patterns and cause-and-effect relationships, is known as descriptive research. Appropriate and precise statistical methods are then applied, depending on whether the data is correctly interpreted or not. Moreover, this methodology ascertains the present status of facts inside an examined group and offers conclusions that can be qualitative, quantitative, or both in terms of characterising the group's general characteristics (Roberston, 2018). Both quantitative and qualitative methods were used in this study, which used a descriptive survey research design. Throughout the project, questionnaires were distributed to teachers and a sample of students as part of a survey utilising the quantitative technique.

Target Population

A research population is an extensive set of individuals or items that are the subject of a scientific study. Research is conducted to benefit the public, according to Hassan (2019). This survey included 105 maths instructors (n = 65 respondents), 50 maths school subject leaders (n = 25 respondents), 35 head teachers (n = 17 respondents) and 110 pupils (n = 64 respondents) which made up the population. With a sample size of 171 respondents from thirty-two secondary schools in the Gicumbi District, the total population surveyed through this method was 300. The students

who performed at the highest levels were identified as the targeted group, with the aim of obtaining students who are exclusively associated with mathematics performance.

Data Collection Techniques and Data Sources

The study utilized a descriptive survey technique. Descriptive statistics such as frequency, percentage, mean, and standard deviation were calculated using the statistical product and service solution version 21.0, and inferential statistics such as correlation and regression coefficients were also obtained. The study's participants included 105 mathematics instructors (65 responses), 50 mathematics school subject leaders (25 respondents), 35 headteachers (17 respondents), and 110 students (64 respondents), yielding a total population of 300 respondents with a sample size of 171 from thirty-two secondary schools in Gicumbi District. Respondents and key informants were chosen at random using Sloven's method to create the study sample

Ethical Considerations

There were certain moral issues during the research. Adherence to ethical principles facilitated data gathering. The researcher examined ethical issues to develop rapport with participants. Permission was obtained from the mayor of Gicumbi district, the headteachers of the schools where data was collected, and the students who agreed to participate. The researcher requested permission from school staff management to allow their members to engage in data gathering. Ethical norms, including voluntary participation and the protection of participants' rights, were observed. No attempt was made to harm respondents, and participants experiencing any form of harm were informed they could withdraw from the study. Confidentiality and anonymity were ensured, with all participant information kept fully confidential and responses remaining anonymous. Participants were informed of these measures in a cover letter.

Results and Discussions:-

The study analyzed data from 171 respondents to examine remedial practices influencing students' mathematics competencies in Gicumbi district, Rwanda. It aimed to identify effective remedial practices, analyze their impact on students' performance, and determine the relationship between these practices and students' competencies in mathematics.

The remedial practices that influence students' competences in mathematics in Gicumbi district, Rwanda

The study found remedial techniques that impact pupils' mathematical abilities in Rwanda's Gicumbi area. The tables below indicate how participants responded to the following statements.

Table 1:- Mathematics school subject leaders perception on remedial practices That influence students' competences in mathematics in Gicumbi district, Rwanda.

Statements	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	Std
	N	%	N	%	N	%	N	%	N	%		
Developing lessons that take into account students' interests, needs, and experiences	1	4.0	2	8.0	2	8.0	4	16.0	16	64.0	1.72	1.173
Modifying instructional methods.	0	0.0	1	4.0	2	8.0	2	8.0	20	80.0	1.36	.810
Using individualised learning materials helps students	1	4.0	1	4.0	2	8.0	5	20.0	15	63.1	1.64	1.075
Incorporating visual and audio resources helps students	1	4.0	2	8.0	3	12.0	4	16.0	15	60.0	1.12	1.201
Creating unique worksheets and exercises can help students'	0	0.0	0	0.0	2	8.0	6	24.0	17	68.0	1.92	1.288

Source: Primary Data (2024)

Results in Table 1 evidence responses on mathematics school subject leaders' perceptions the remedial practices that influence students' competences in mathematics in Gicumbi district, Rwanda. Accordingly, 64.0% strongly agreed that developing lessons that take into account students' interests, needs, and experiences boosts students' competences in mathematics. 80.0% strongly agreed that modifying instructional methods improves students' competences in mathematics. 63.1% strongly agreed that using individualised learning materials helps students improve their mathematical competence. 60.0% strongly agreed that incorporating visual and audio resources helps students improve their mathematical competence. 68.0% strongly agreed that creating unique worksheets and exercises can help students improve their competence in mathematics. The study found that incorporating students' interests, needs, and experiences into lessons, modifying instructional methods, using individualized learning materials, incorporating visual and audio resources, and creating unique worksheets and exercises can significantly improve students' mathematical competence in Gicumbi district, Rwanda. (Schemer, 2021) analyses how remedial interventions affect students' mathematical abilities in public secondary educational institutions in Rwanda's Ngororero District. The research had 117 participants and employed methods that were qualitative as well as quantitative. The results indicate that the most popular remedial activity is digital numeracy, which focuses on developing competencies like critical thinking. The study also identifies the competencies that students must possess, such as creativity, innovation, critical thinking, problem-solving, and cooperation. The researcher suggests that remedial activities be customised to the needs of the learners. Jackson (2016) discovered that remedial instructors employed teaching strategies that corresponded with successful approaches discovered in the literature currently under investigation. Everyone chooses for professors to provide remediation until students are able to resume their normal course of study. According to Capuyan et al. (2019), students taking remedial lessons have grades that are positively correlated with their prior and current grade levels.

Table 2:- Mathematics Teachers perception on remedial practices That influence students' competences in mathematics in Gicumbi district, Rwanda.

Statements	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	Std
	N	%	N	%	N	%	N	%	N	%		
Developing lessons that take into account students' interests, needs, and experiences	0	0.0	2	3.1	22	33.8	41	63.1	16	64.0	1.88	1.193
Modifying instructional methods.	1	1.5	7	10.8	6	9.2	8	12.3	43	66.2	1.32	.668
Using individualised learning materials helps students	3	4.1	3	4.1	6	9.2	13	20.0	40	61.5	1.71	1.114
Incorporating visual and audio resources helps students	1	4.0	6	9.2	6	9.2	15	23.1	35	53.8	2.08	.989
Creating unique worksheets and exercises can help students'	0	0.0	1	1.5	4	6.2	5	7.7	55	84.6	1.72	1.139

Source: Primary Data (2023)

Data presented in Table 2, evidence responses on mathematics teachers perceptions the remedial practices that influence students' competences in mathematics in Gicumbi district, Rwanda. Accordingly, 64.0% strongly agreed that developing lessons that take into account students' interests, needs, and experiences boosts students' competences in mathematics. 66.2% strongly agreed that modifying instructional methods improves students' competences in mathematics. 61.5% strongly agreed that using individualised learning materials helps students improve their mathematical competence. 53.8% strongly agreed that incorporating visual and audio resources helps students improve their mathematical competence. 84.6% strongly agreed that creating unique worksheets and exercises can help students improve their competence in mathematics. Etcuban (2019) evaluated the influence of

remedial instruction on low-SES and low-math first graders' fundamental arithmetic ability, interest, and confidence in mathematicians study. Fourteen low-SES and low-math pupils were selected from two classes of fifty-seven first graders at an elementary school run by the government in Central Taiwan. The study discovered that remedial classes enhanced the mathematical ability of low-SES and low-math students, resulting in greater inspiration and trust in themselves. Rehabilitation programmes employing narrative settings and manipulatives in small groups increased maths learning for low-income and low-math students.

The level of the students' performance in mathematics in secondary schools in Gicumbi district

This analyses the students' performance in mathematics in secondary schools in Gicumbi district that is due to remedial practices, as presented in the following tables.

Table 3:- Mathematics teachers perception on analyse the students' performance in mathematics in secondary schools in Gicumbi district that is due to remedial practices.

Statements	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	Std
	N	%	N	%	N	%	N	%	N	%		
Student's problem-solving ability shows is mathematical competences.	0	0.0	2	3.1	2	3.1	19	29.1	42	64.6	1.22	.780
The student's ability to reason shows the competences in mathematics.	0	0.0	1	1.5	1	1.5	3	4.6	60	92.3	1.05	.276
The ability to apply methods by students demonstrates their mathematical competences.	0	0.0	0	0.0	1	1.5	1	1.5	63	96.9	1.12	.484
Capacity for Representing mathematical structures indicates the student's competences in mathematics	0	0.0	1	1.5	2	3.1	2	3.1	60	92.3	1.48	.831

Source: Primary Data (2024)

Information depicted in Table 3, 64.3% strongly agreed that Student's problem-solving ability shows is mathematical competences, 92.3.8% Strongly agreed that the student's ability to reason shows the competences in mathematics. Additionally, 96.6% Strongly agreed that apply methods by students demonstrates their mathematical competences and 92.3% Strongly agreed that Capacity for Representing mathematical structures indicates the student's competences in mathematics. According to Ganyaupfu (2014), instructional approaches have a significant favourable impact on student performance (Ganyaupfu, July 2014). Nomsa Mabena, Patricia Namayammu Mokgosi, and Selina Serole Ramapela's (2021) study found that inadequate teaching and learning materials resulted in worse academic achievement in mathematics. According to Maria de Lourdes et al. (2020), learners' confidence in maths is influenced by negative or favourable views towards the subject from teachers, peers, and families. A study by Maria de Lourdes Mata, Vera Monteiro, and Francisco Peixoto (2020) found that students who have a favourable attitude towards their instructors do better than those who have a negative attitude.

Table 4:- Students' perception on the level of the students' performance in mathematics in secondary schools in Gicumbi district.

Statements	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	Std
	N	%	N	%	N	%	N	%	N	%		

The change of teaching methods by the teacher helps me to improve my mathematical competences.	1	1.6	1	1.6	2	3.1	3	4.7	57	89.1	1.28	.863
The use of individualized learning by the teacher improves my competences as well as my performance in mathematics.	0	0.0	1	1.6	1	1.6	2	3.1	60	93.8	1.14	.587
Being given a peer tutor can help me to develop mathematical competences	0	0.0	1	1.6	3	4.7	4	6.3	56	87.5	1.22	.629
I find useful to utilize visual and audio resources while learning as it helps me to develop mathematical competences.	0	0.0	2	3.1	2	3.1	21	32.8	39	60.9	1.54	.836

Source: Primary Data (2024)

Results presented in Table 4: 89.1% Students strongly agreed that the change in teaching methods by the teacher helps me to improve students mathematical competences. 93.8% strongly agreed that the use of individualised learning by the teacher improves students competences as well as my performance in n mathematics. Additionally 87.5% strongly agreed that Being given a peer tutor can help students to develop mathematical competences, 60.9% strongly agreed that utilization of visual and audio resources while learning as student it helps them to develop mathematical competences. The students view shows that 89.1% of students believe that teacher changes, individualised learning, peer tutoring, and the use of visual and audio resources improve mathematical competence, while 93.8% and 87.5% also agree. Capuyan et al. (2019) found a favourable correlation between prior and present grade levels for students attending remedial classes. According to Tseng et al. (2016), remedial interventions provided by teaching advisers significantly improved students' final grades. Schools provide opportunities for both instructors and students to gain knowledge and experience. Every student attends school daily to maximise learning opportunities..

Conclusions:-

The study revealed that customizing mathematics lessons to student's interests, needs, and experiences is widely endorsed by 64.0% of school leaders as enhancing mathematical skills. Effective strategies such as adjusting instructional methods, providing personalized learning materials, and integrating visual and auditory aids were identified. The research underscored that students' math competence, encompassing problem-solving, reasoning, and mathematical representation, is significantly bolstered through diversified teaching approaches and peer tutoring. Importantly, there is a strong correlation between literacy-focused instruction utilizing personalized materials, visual and auditory aids, and tailored exercises and critical skills like problem-solving and communication. Statistical analysis consistently showed a positive relationship between these practices and students' math competencies in Gicumbi, Rwanda, with Pearson's p-values consistently below 0.05, affirming the efficacy of these approaches.

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