

 Research Article

Kiswahili Language Assistance for Science Students Academic Achievement in a Multilingual Classroom Setting in East Africa: A Study of Government-Aided Western Ugandan Secondary Schools

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Abstract

This study investigates the impact of Kiswahili language assistance on academic achievement in science among students in a multilingual classroom setting in East Africa. The study used a quasi-experimental method to statistically evaluate the impact of Kiswahili language assistance on science students' academic achievement, utilizing a pretest-posttest non-equivalent control group research design. One hundred and eighty randomly selected senior four secondary school students from two schools in western Uganda were given a science achievement multiple-choice question with 60 multiple-choice items to gather data. Pretest and post-test scores were compared using descriptive statistics, and the hypotheses were tested using Analysis of Covariance (ANCOVA) at a significance level of 0.05. The findings reveal that male students performed better than female students when taught using Kiswahili assistance. Similarly, students who were taught science using the Kiswahili language as assistants achieved greater academic achievement in science than those who were taught science using the English Language. These results recommend that Kiswahili language assistance enhances science learning compared to English. Based on the conclusion of these findings, the researchers recommended that teachers should use Kiswahili as a language assistance in the teaching of science to improve student understanding of science concepts. Furthermore, the study also recommends further research on the utilization of language assistance and science learning in the context of multilingualism to inform educational policy and practice.

Keywords: Kiswahili, Language, Multilingual Classroom, Outcomes, Science Learning, Secondary Schools, Assistance

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1. INTRODUCTION

Education is very vital as it facilitates academic success, cognitive development, economic opportunities, and socio-emotional growth and is also the greatest force that brings about change (Obodo, Nweze, and Ani, 2023). And this is the reason why every key to making education available to all. According to UNESCO (2018), effective and quality language instruction enables students to articulate their ideas, engage with others, and develop critical thinking skills. For students from different linguistic backgrounds to learn together in a multilingual secondary school classroom setting, language is important to the teaching and learning of science. Writing, speaking, or using signs are all ways that people can convey meaning through language, a sophisticated system of communication. The field of language research in education encompasses different aspects, including language acquisition (Krashen, 1982; Long, 1996), multilingual education (Cummins, 2000; Baker, 2011), instructional methodologies (Littlewood, 1981; Ellis, 2003), assessment (Bachman, 1990), and policy planning (Cooper, 1989; Kaplan & Baldauf, 2003). This multidisciplinary domain promotes cognitive development, supports language diversity, and informs effective teaching practices, all of which facilitate, contribute, and improve educational outcomes. Language

limitations can make it difficult for students to access their lessons properly and participate in the activities of the classroom, even though science instruction is an essential part of modern education.

In East Africa, Kiswahili is a widely spoken language used as a means of communication and it serves as the official language in east African countries, and certain regions of Uganda, particularly in the western region and along some parts of Uganda that border Kenya. Now despite this, the English language is predominantly used in science teaching, which creates challenges for students who are more proficient in Kiswahili. Research done by Khaniya, in 2015 and Mwenda, in 2017 has shown that providing language assistance to students in their mother tongue can enhance their comprehension and understanding of concepts in science. In the Uganda context, students who speak Kiswahili as their mode of communication often struggle with receiving instruction in science using the English language, which often leads to difficulties in understanding complex science concepts, and results in declined performance and disinterest (Probyn, 2015). When learning is received in one's mother tongue, it can increase ambition, reduce worry, and improve overall understanding (Baker, 2017; Cummins, 2000). Also, according to Garcia (2009), language assistance enhances the elimination of barriers during the process of learning, fostering equity and inclusivity within the science teaching process. Gaining scientific knowledge is important for addressing global challenges, promoting sustainable development, and spurring innovation and economic growth (Obodo, Nweze, and Ani, 2023). Achieving equity and inclusion in science education, international initiatives, language assistance, and best practices are critically important and emphasize that science education is integral to sustainable development and the advancement of human rights (Ainscow, 2020).

Noormohamadi (2008), states that teaching that is carried out through the use of mother language is important for improving students' cognitive, emotional, social, linguistic, economic, and psychological development. The research reinforces the importance of utilizing students' native languages in educational settings, leading to improved understanding, academic success, cultural preservation, and linguistic diversity, also the use of the mother tongue approach for instruction is consistent with international standards, including UNESCO's "Mother Tongue-Based Multilingual Education" policy and the United Nations Sustainable Development Goal 4 (UNESCO, 2024). The significance of instruction in the mother tongue in education cannot be overstated and research shows that children taught using the mother tongue develop critical and literacy skills. Theories such as Cummins's Multilingual Education Theory (2000), Vygotsky's Social Constructivist Theory (1978), and Baker's Bilingual Education Theory (2011) provide a cognitive and learning foundation that assists instruction in the mother tongue. This supports bilingual education and demonstrates the critical role that language plays in knowledge production and mental growth, enabling future generations to be more adaptable and valuable contributors in an increasingly interconnected and globalized world (Cabansag, 2024). These frameworks contribute to enhanced cognitive, academic, and sociocultural outcomes. The effective implementation of instruction in the mother tongue hinges on collaborative planning, teacher training, community engagement, and careful resource allocation

This study is based on Gibbon's Language Theory (2009), which emphasizes the benefits of mother tongue instruction on linguistic development, thereby fostering multilingualism and facilitating the acquisition of new languages. This theory highlights the importance of Kiswahili in science teaching, and despite the growing recognition of the benefits of mother tongue instruction, Kiswahili language assistance remains crucial for science teaching in East Africa. However, research focused on multilingual classroom settings, particularly in government-aided secondary schools in western Uganda, is still lacking. Also, the effectiveness of language policy needs to be assessed, and the integration of indigenous knowledge into science curricula remains an area for investigation. While studies by Bunyi (2011) and Kilika (2017) demonstrate that Kiswahili can enhance comprehension of scientific concepts. Existing research by Cummins, 2000; Vygotsky, 1978; Baker, 2011 underscores the advantages of mother tongue instruction. Adesope (2012) points out that language barriers significantly hinder learning of science, while Kamwangamulu (2013) and Muthwii, (2004) identify different challenges that are encountered in multilingual education, and this is due to insufficient teacher preparation and language policies that favor English over native languages, among other factors. The potential of Kiswahili as a tool for teaching science has not been extensively investigated, and there is a notable absence of training for bilingual education (Tibategeza & du Plessis, 2018)

Examining the challenges in science teaching necessitates an exploration of Kiswahili language assistance. Students who receive language assistance are better equipped to grasp complex science concepts

and scientific terminology, which makes science learning more accessible for all students, and also for those who may struggle with the primary language of instruction (Morrison, Ardasheva, Newcomer, et.al, 2020). Student academic achievement can be facilitated through the utilization of language assistance in science teaching and learning, also it can help to cultivate a sense of belonging. Göbel et al., (2024) recognized that appreciating the background of linguistic diversity and various cultural identities is essential for developing contemporary societies. Furthermore, integrating language into science instruction can result in students understanding of science (Ardasheva & Tretter, 2017). By enhancing students' language skills, this assistance can improve their reading, writing, and ability to communicate scientific ideas, and also helps to address misconceptions and simplify scientific terminology. By enabling teachers to integrate students' linguistic and cultural backgrounds into science instruction, language assistance can also help students concentrate on scientific ideas rather than language barriers (Cory and Okhee, 2023).

The development of critical thinking, creativity, and problem-solving abilities necessary for scientific inquiry is greatly aided by language learning assistance, and it lessens bias in language-related evaluations, guaranteeing that students can appropriately exhibit their understanding of science concepts. According to Nnko and Kalokola (2023), language assistants foster an inclusive classroom setting culture that celebrates linguistic variety, which advances fairness in science instruction. By examining the importance of Kiswahili language support, this study hopes to improve science instruction and promote the use of Kiswahili, increasing accessibility and inclusivity in education. To increase accessibility and inclusivity in education, this study aims to enhance science instruction and encourage the use of Kiswahili by analyzing the significance of Kiswahili language assistance. This study highlights how important regional languages are to maintaining East Africa's linguistic diversity in the classroom. Furthermore, this study can help educators and policymakers in Uganda get past language hurdles that hinder science teaching and improve educational equity without biases. This research contributes to the global discussions on language assistance in multilingual classroom settings by offering pertinent insights into comparable contexts around the world.

This study is beneficial for a wide range of stakeholders, including educators, curriculum planners, policymakers, academics, and members of the community in general. The findings from this study are expected to improve science students' academic achievement for students from linguistically diverse backgrounds, promote inclusivity in education settings, and address disparities in science instruction. The study will further provide valuable insights for revising the science curriculum and assist teachers in developing their skills within multilingual classroom settings. The research will contribute to ongoing discussions regarding multilingual education and inform educational strategies in East Africa. It will also support cultural heritage through language preservation, foster harmony among various linguistic groups, and affirm the importance of Kiswahili in East African education. Ultimately, this research will shape language education policy and encourage linguistic diversity.

Although science education is essential for a nation's development, students usually struggle to understand scientific concepts in East African multilingual classrooms because English is usually the primary language of instruction. Despite the fact that English is widely used and can enhance scientific academic performance in a number of contexts, many students find it difficult to follow, comprehend, and participate in science classes when it is the primary language of instruction (Karlsson, Larsson & Jakobson, 2018). Investigating how Kiswahili language assistance can enhance the educational experiences of Kiswahili-speaking students in a scientific classroom setting is the goal of this study. The researchers hope to aid in the creation of evidence-based solutions that improve inclusive science teaching methods for the diverse student populations in East Africa by investigating the effects of Kiswahili language assistance on secondary school science academic achievement.

1.1. Research Objectives

1. To determine how secondary school science academic achievement for male and female students is affected by Kiswahili language assistance.
2. To compare the mean scores in science academic achievement across students who receive English-language science instruction and those who get Kiswahili language assistance.
3. To investigate how gender and teaching methods interact to impact students' academic achievement in science.

1.2. Research Questions

1. How does Kiswahili language assistance affect the secondary school science academic achievement of male and female students?
2. What are the mean differences in the scores of science academic achievement between students who receive English-language science instruction and those who receive Kiswahili language assistance?
3. How do gender and teaching methods interact to influence students' academic achievement in science?

1.3. Hypotheses

1. Kiswahili language assistance significantly affects the secondary school science academic achievement of male and female students.
2. There are significant differences in the mean scores of science academic achievement between students who receive English-language science instruction and those who receive Kiswahili language assistance, with the latter experiencing higher achievement.
3. No interaction between gender and teaching methods influences students' academic achievement in science.

2. METHODS

2.1. Research design

With a focus on government-aided secondary schools in Western Uganda, this study employs a quasi-experimental design, specifically a pretest-posttest non-equivalent control group framework, to examine the impact of Kiswahili language assistance on students' academic achievement in science in a multilingual classroom setting in East Africa. The quasi-experimental method measures the effects of Kiswahili language assistance on students' academic performance in science using quantitative methods.

2.2. Area of the Study

Western Uganda is where the study was carried out. The study's region was two government-aided secondary schools in western Uganda, and each school was assigned a group depending on the methods of teaching that was used. The study is divided into two groups: the experimental group and the control group. Western Uganda was selected as the study area by the researchers due to the region's widespread use of Kiswahili, which made it an appropriate place to look at how language assistance affects science instruction. Western Uganda has so many government-aided secondary schools which further facilitates the study's implementation.

2.3. Target Population, Sample Size, and Sampling Technique

All senior four students in Western Uganda were the study's target group. 180 students were chosen at random by the researchers from the two sampled schools. These government-aided secondary school students were selected from western Uganda using a simple method of random sampling technique. The experimental group consisted of one government-aided secondary school, while the control group was another government-aided secondary school.

2.4. Methods of Data Collections

Data for this study, which examined the effects of Kiswahili language assistance for science students' academic achievement in a multilingual classroom setting in east Africa a study of government-aided

western Ugandan secondary schools—was gathered using a Science Achievement Multiple Choice Question (SAMCQ) tool designed for students.

2.4.1. Validation

Based on the guidelines provided in the test blueprint, an 80-item scientific Achievement Multiple Choice Question (SAMCQ) instrument was face validated by language and science education specialists to guarantee content validity. The experts recommended changes after assessing the exam items' format, clarity, and applicability. This resulted in a revised instrument with just 60 items after 20 items that were judged unnecessary for the study were eliminated. Their suggestions were included in the SAMCQ's final edition.

2.4.2. Reliability

The pilot testing of the instrument was conducted at a secondary school in Eastern Uganda, which shares similar characteristics with the two government-aided secondary schools selected for this study. The 60-item Science Achievement Multiple Choice Question (SAMCQ) was evaluated for reliability using the Kuder-Richardson 20 (K-R 20) procedure, resulting in a reliability index of 0.692. Additionally, the stability of the instrument was assessed through a test-retest procedure, applying Pearson's product-moment correlation, which produced a reliability coefficient of 0.784.

2.5. Research Approach

The researchers in this study employed two different teaching methods for science instruction, the students in one of the government-aided secondary schools that were assigned the control group received science instruction in English, while the other government-aided secondary school that was assigned treatment group received science instruction in Kiswahili, and the experiment lasted for seven weeks. At the beginning of the experiment, both groups were administered a pretest that consisted of 60-item science achievement multiple-choice questions (SAMCQ). After the experiment, both the treatment and the control groups were administered a reshuffled version of the 60-item SAMCQ to assess their pretest achievement. To answer the research questions and test the hypotheses, the pretest and posttest results were collected, with the pretest results utilized as a covariate in this study. This choice was made because the pretest effectively reflects students' initial knowledge and achievement before the experiment. Employing the pretest as a covariate helps ensure that any observed effects following the experiment can be more accurately attributed to the instructional approach rather than to pre-existing differences between the two groups. Furthermore, as prior achievement is often a reliable predictor of future performance, using the pretest as a covariate aligns with best practices in educational research. To more accurately assess the impact of Kiswahili language assistance on students' science academic achievement, the ANCOVA was employed to adjust the group means for the effects of the covariate. This careful selection and justification of the covariate, alongside confirming the assumptions, enhances the validity of our findings and conclusions.

2.6. Data Analysis

The data collected from the results of the pretest and posttest scores were analyzed using descriptive statistics. Analysis of Covariance (ANCOVA) was used to evaluate the hypothesis about how Kiswahili language assistance affects the learning of science in a multilingual classroom setting at a 0.05 significant level.

3. RESULTS

Figure 1 shows the demography of the result. The treatment group has a total population of ninety-four participants (fifty-four males and forty females), and the control group has a total population of eighty-six participants (forty males and forty-six females) from the two co-government-aided secondary schools.

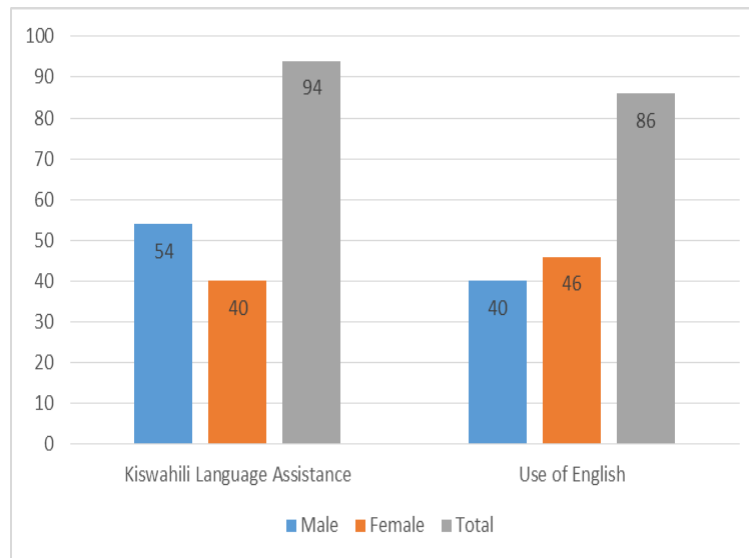


Figure 1. Participants Demography

3.1. Research Questions

Data from science multiple-choice questions on achievement from the pretest and posttest were gathered to answer the study question. A descriptive approach using adjusted means and standard deviation was used to explore this study's objectives.

Research Question 1: How does Kiswahili language assistance affect the secondary school science academic achievement of male and female students?

The summary is shown in Figure 2 below.

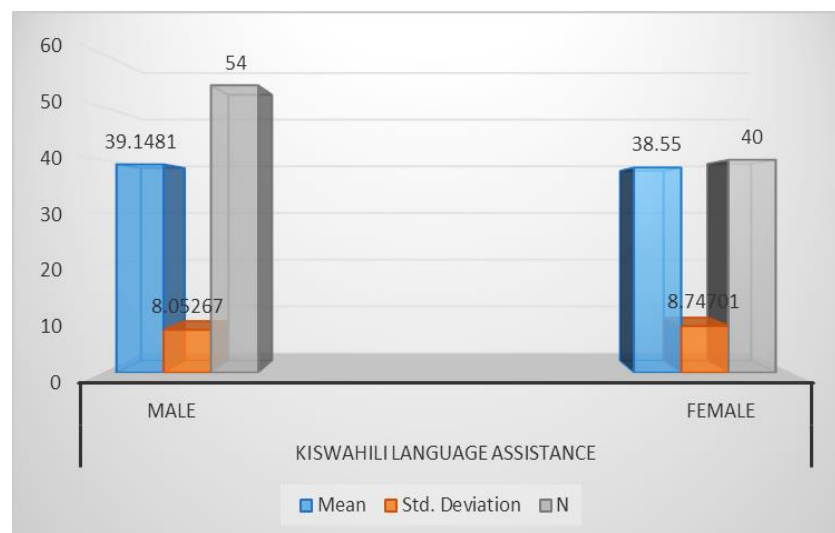


Figure 2. Impact of Kiswahili Language Assistance on Science Academic Achievement for Male and Female Students in Secondary Schools

Figure 2 shows how Kiswahili support affects secondary school students' science academic achievement. The study indicates that male students' mean score (39.1481) is higher than female students (38.5500). This finding implied that male students outperformed female students in science classes taught in Kiswahili.

Research Question 2: What are the mean differences in the scores of science academic achievement between students who receive English-language science instruction and those who receive Kiswahili language assistance?

The summary is shown in Figure 3 below.

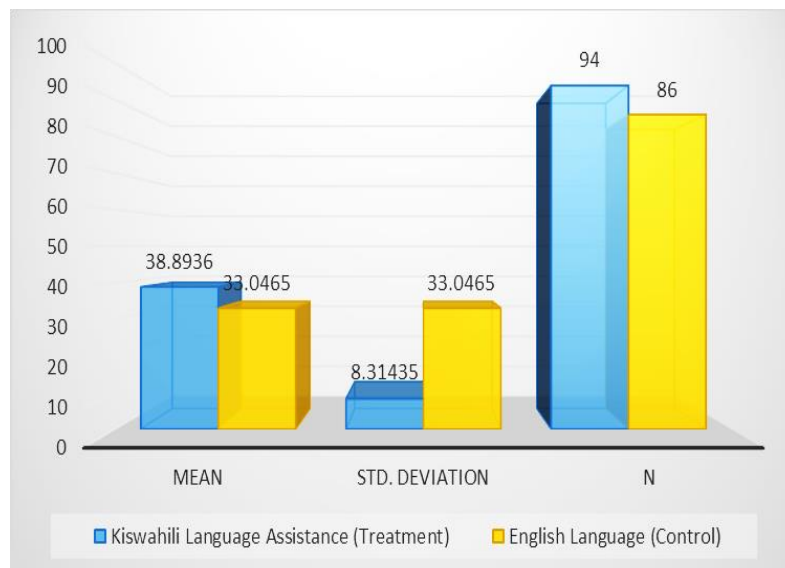


Figure 3. The Mean Scores in Science Academic Achievement between Students Receiving Kiswahili Language Assistance and Those Receiving Science Instructions in English

Figure 3 shows the average difference in science academic achievement between students who received English-language science instruction and those who received Kiswahili language assistance. According to the study's findings, students who were taught science in Kiswahili did better on average than those who were taught in English. This suggests that in terms of academic achievement, students who received science instruction in Kiswahili performed better than those who received science instruction in English.

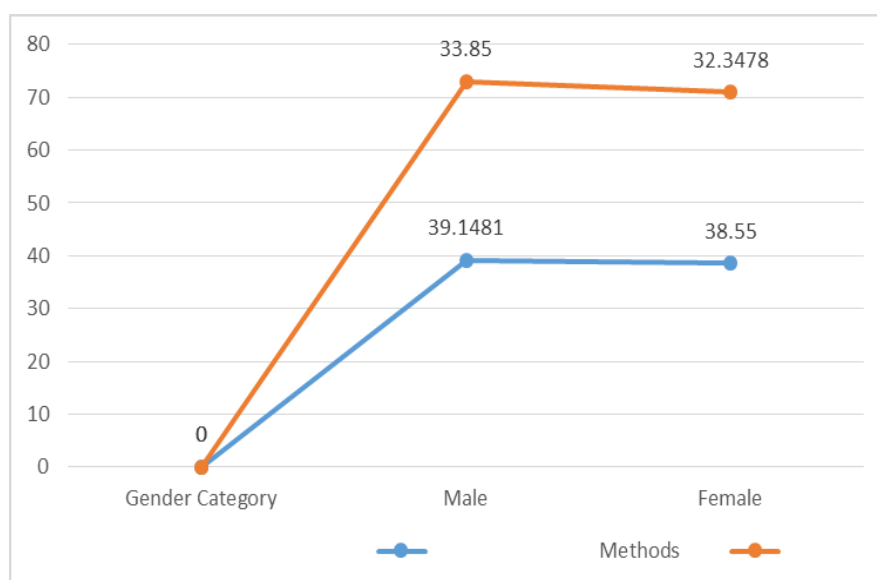


Figure 4. The Interaction Effect between Gender and Teaching Methods

Research Question 3: How do gender and teaching methods interact to influence students' academic achievement in science?

The summary is shown in Figure 4 above.

There is no interaction between method and gender on students' science achievements, as shown by the summary of results in Figure 4, which shows that Kiswahili language assistance has a better academic achievement in science compared to the usage of the English language at the two gender levels.

3.2. Hypotheses

HO₁: *Kiswahili language assistance significantly affects the secondary school science academic achievement of male and female students*

HO₃: *No interaction between gender and teaching methods influences students' academic achievement in science*

The analysis of covariance was performed on the data collected from the science achievement multiple-choice question for both the treatment and control groups to test hypotheses 1 and 3. In Table 1, an overview of the analysis is displayed.

Table 1. Kiswahili Language Assistance Significantly Affects the Secondary School Science Academic Achievement of Male and Female Students and No Interaction Between Gender and Teaching Methods Influences Students' Academic Achievement in Science

Sources of Variation	Sum of Square	Df	Mean Square	F	Sig.
Corrected model	1661.220	4	415.305	5.157	0.001
Main effect	21982.656	1	21982.656	272.970	0.000
Covariate	69.269	1	69.269	0.860	0.355
Methods	1468.603	1	1468.603	18.236	0.000
Gender	53.107	1	53.107	0.659	0.418
Interaction	8.264	1	8.264	0.103	0.749
Error	14092.980	175	80.531		
Total	250332.000	180			
Corrected total	15754.200	179			

The null hypothesis for hypothesis 1 was rejected, and the researchers concluded that there is a significant difference in the impact of Kiswahili language assistance on students' academic achievement in science in secondary schools. At an alpha level of 0.05, the data analysis summary shown in Table 1 is more significant than $F(0.001)$.

The significance of F at the (0.05) alpha level is 0.749, as indicated in Table 1, a summary of the data analysis for hypothesis 3. Because 0.05 is less than the significance of (0.749), the researchers accept the null hypothesis and conclude that there is no significant interaction between methods and gender on students' academic achievement in science.

Table 2. There Are Significant Differences in the Mean Scores of Science Academic Achievement between Students Who Receive English-Language Science Instruction and Those Who Receive Kiswahili Language Assistance, with the Latter Experiencing Higher Achievement

Sources of Variation	Sum of Square	Df	Mean Square	F	Sig.
Corrected model	21.726	2	10.863	0.154	0.857
Main effect	11123.769	1	11123.769	157.988	0.000
Covariate	13.505	1	13.505	0.192	0.662
Gender	9.479	1	9.479	0.135	0.715
Error	6407.210	91	70.409		
Total	148624.000	94			
Corrected total	6428.936	93			

HO₂: *There are significant differences in the mean scores of science academic achievement between students who receive English-language science instruction and those who receive Kiswahili language assistance, with the latter experiencing higher achievement.*

An analysis of covariance was conducted on the data gathered from the science achievement multiple-choice question for the treatment group exclusively to evaluate hypothesis 2.

A summary of the investigation is shown in Table 2.

Based on the findings compiled in Table 2, the F value is 157.988, and the significance of F is 0.000. Since the alpha level (0.05) is higher than the significance of F (0.000), the researchers conclude that there are significant differences in science academic achievement between students who receive language support in Kiswahili and those who do not. Thus, the null hypothesis is rejected.

4. DISCUSSION

The specific goals of this study were to compare the mean science scores of students who received instruction in Kiswahili versus those who received instruction in English, to examine any interaction effects between gender and the mode of instruction on students' science academic achievement, and to determine how Kiswahili language assistance impacts male and female students' performance in science. The study sought to determine the effect of Kiswahili language assistance in improving science academic achievement for secondary school students in Western Uganda.

The impact of Kiswahili language assistance on science academic achievement among male and female secondary school students was examined in this study. The results indicate that, although male students in Kiswahili-taught science classes had a higher mean score (39.1481) than female students (38.5500), the overall impact of this language assistance on students' academic achievement by gender was not significantly different, suggesting that, although male students may have benefited more, Kiswahili instruction had a positive impact on science learning for both genders. This supports the findings of Mwakalobo (2018), who discovered that male students perform better when instructed in their mother tongue, and Mwangi (2019), who emphasizes that there are differences in performance when teaching is given in English. However, the study shows that both male and female students gain from Kiswahili training, challenging the idea that gender has a significant impact on the efficacy of language aid. This result is in contrast to other studies that demonstrate gender differences in academic achievement, such as those conducted by Ssetamu (2017) and Kabagenyi (2019). This study adds to the conversation on gender equity and multilingual education by shedding light on the intricate relationships among academic accomplishment, gender, and language support. It emphasizes how essential it is to take both into account when developing educational strategies and raises the possibility that more focused interventions could be useful in resolving possible gender disparities in academic performance. To create successful pedagogical strategies for guaranteeing fair student learning experiences, future research could look more closely at these dynamics.

Students who were taught in Kiswahili had much higher mean scores than students who were taught in English, according to this study that assessed the academic achievement of science students. According to this research, a Kiswahili language assistance is essential for raising science students' academic achievement. These findings answer the research question by offering strong proof that student achievement is directly impacted by the medium of teaching. The notable disparity in scores demonstrates that science teaching in Kiswahili enhances comprehension and general performance more successfully than English-language training. With studies by Mwakalobo (2018) and Mwangi (2019) proving that teaching in local languages is associated with improved academic achievement, the results support previous research that supported the use of mother tongue education.

Additionally, because it allows individuals to relate the material to their linguistic and cultural backgrounds, research by Porter, Graham, Myles, and Holmes (2022) supports the notion that students learn better when taught in their first language. This study adds to the conversation about multilingual education by highlighting the importance of language as a crucial component of instructional practices, particularly in contexts with linguistic diversity. It implies that to improve academic achievement, local language training should be given priority in educational policy.

The study examined how gender and Kiswahili language support interacted to affect academic achievement in science, and it found no evidence of a significant interaction impact. The findings show that regardless of gender, students who received teaching in Kiswahili did better than those who received

instruction in English. This study shows that Kiswahili language assistants had consistent positive effects on science academic achievement for both male and female students. In response to the research question, these findings highlight how Kiswahili language assistants greatly enhance science comprehension and performance for all students, regardless of gender. This calls into question the presumptions that language instruction may affect male and female students differently. The results are in line with previous research supporting the use of mother tongue education, such as studies by Mwakalobo (2018) and Mwangi (2019), which claim that all pupils gain from learning in their mother tongue. Further supporting the work of Ssetamu (2017) and Kabagenyi (2019), who contend that local language instruction strengthens ties with scientific ideas, this study adds to the body of literature by emphasizing the constant benefits of Kiswahili language support for both genders. These findings are consistent with those of Phiri, Chanda, and Mwanapabu (2024), who demonstrate that when instruction is given in the student's native tongue, they perform better and engage more fully. This study makes a substantial contribution to the discussion of gender equity in learning and bilingual education by verifying the lack of an interaction effect. In a variety of circumstances, it supports policies that prioritize mother tongue education and reaffirms the value of local language instruction.

It is important to take into account opposing viewpoints in the literature, though, as one study by Milligan, Clegg, and Tikly (2016) argues that although language support is beneficial, other factors like teacher preparation and pedagogical approaches may also have a significant impact on academic achievement. This underscores the complexity of educational success and suggests that language support alone might not be enough without adequate training for teachers in multilingual settings. In conclusion, this study supports the claim that Kiswahili language assistance improves academic achievement in science in secondary schools, particularly for male students, and emphasizes the need to integrate local languages into instruction to promote equity and improve educational achievement across genders.

5. IMPLICATIONS OF FINDINGS FOR THEORY, PRACTICE, AND POLICY

The findings of this study on the impact of Kiswahili language assistance on science academic achievement have important implications for educational theory, practice, and policy, especially in multilingual contexts like western Uganda. The findings theoretically support models of language acquisition that emphasize the advantages of mother tongue training, implying that studying in one's mother tongue improves academic performance and comprehension of difficult ideas. To properly integrate the dynamics of bilingualism and cultural identity in education, it is necessary to reevaluate current frameworks. Additionally, by showing that language assistance can lessen gender-based achievement gaps, the study adds to the conversation on educational equity and highlights the need for educational theories to place a greater emphasis on the intersections of language, gender, and academic success.

Practically speaking, the results indicate that schools should incorporate Kiswahili language assistance into science curricula by creating bilingual instructional materials that would improve accessibility and understanding; teachers are encouraged to use collaborative teaching strategies that engage students in both Kiswahili and English to improve comprehension and participation, especially for those who might have trouble with English; and teacher training should focus on effective bilingual methodologies to implement language assistance in classrooms more effectively.

The study promotes educational policies that give local language instruction priority, especially in linguistically diverse locations, from a policy standpoint. To improve educational quality and equity, policymakers are advised to incorporate mother tongue instruction into national curricula. Additionally, funds must be set aside for the creation of language support initiatives, such as Kiswahili-language teaching materials and teacher training. Given that Kiswahili assistance may help close the achievement gap between male and female students, educational policies should give gender-sensitive approaches to curriculum design and assessment top priority. This will ensure that all students may benefit from these programs. All things considered, these ramifications highlight how important Kiswahili is as a teaching language for fostering fair learning results in multilingual environments.

6. LIMITATIONS AND CHALLENGES

This research admits some limitations that may impact the findings and their interpretation. First, the results generalizability may be impacted by the small sample size; a larger and more varied sample would offer a better picture of how Kiswahili language assistance affects different situations. Second, despite the adoption of strong techniques, data collection may contain biases, and results may be influenced by the assessment instruments. To improve the results, future studies could use a variety of techniques, such as mixed-method or longitudinal approaches. Furthermore, the study was carried out in western Uganda inside a particular geographic and cultural context, which would restrict the data's generalizability to other areas or educational contexts.

To improve knowledge of Kiswahili language assistance in educational settings, a number of important areas for additional research are suggested in light of the study's conclusions and limitations. To more accurately evaluate the effects of Kiswahili language support on various demographics, future studies should include larger and more varied samples from different parts of Uganda and other multilingual situations. By monitoring students' academic performance and language competency throughout their educational journeys, longitudinal studies will shed light on the long-term effects of Kiswahili language assistance. By integrating quantitative and qualitative data, mixed-method study designs can enhance findings and provide a more thorough understanding of students' experiences receiving language assistance.

To find best practices, future studies could examine how well Kiswahili language support works in various subjects or educational settings in comparison to other language interventions. To inform gender-sensitive teaching strategies, targeted research should look at gender-specific outcomes to understand how Kiswahili language assistance affects male and female students differently. Investigating the training needs of teachers implementing Kiswahili language assistance is essential for identifying effective professional development programs. Exploring how cultural identity influences the effectiveness of language assistance programs could provide valuable insights into student engagement and achievement.

Future research must focus on creating and testing thorough assessment instruments that precisely gauge how language support affects learning outcomes. Researchers can advance multilingual education and promote fairness in academic achievement by focusing on these areas and expanding our understanding of the connection between language assistance and academic success.

7. CONCLUSIONS AND RECOMMENDATION

The achievement disparity between male and female students in western Uganda may be reduced by using Kiswahili, which also boosts student motivation and academic performance. All things considered, the results demonstrate how crucial Kiswahili is as a teaching language in science education. The study argues for more research into integrating language support into curricula to promote educational equity and success. It is suggested that educational policies prioritize local language instruction to improve academic achievement for all students. The researchers concluded that students in multilingual classroom settings benefit greatly from Kiswahili language assistance. Policymakers and educators are urged to improve language assistance systems without thinking that gender will have a distinct impact. Future studies should also look at the mechanisms that underlie these impacts and additional elements that support fair academic success in multicultural and multilingual settings.

Kiswahili should be given priority in educational strategies as the language of teaching in science classes to increase understanding and achievement for all students. This calls for the development of high-quality curriculum materials, including textbooks and digital resources, in Kiswahili. Investing in teacher training programs is essential to increase educators' proficiency in Kiswahili and to provide them with effective pedagogical techniques that foster meaningful scientific inquiry. Additionally, using mixed-method instructional strategies that include hands-on activities can deepen students' understanding of scientific concepts through the use of scientific concepts.

Further research should focus on finding ways to increase engagement and achievement for both male and female students in Kiswahili-taught classes. Involving parents and the community is essential for promoting the value of Kiswahili language support, as involvement from stakeholders enhances support for bilingual education. Creating a continuous assessment system will make it easier to evaluate the impact

of Kiswahili language assistance and allow for regular feedback to improve teaching practices. Additionally, recognizing the link between teacher readiness and student results helps direct future professional development programs. Lastly, in order to acknowledge Kiswahili as a useful teaching medium, support for laws that improve its standing in the educational system is important. By putting these suggestions into practice, Kiswahili language assistance will be incorporated into the curriculum, fostering equity and enhancing science learning results for all students.

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Research Ethics. Participants in the study gave their verbal consent after being fully informed verbally about the study's objectives related to Kiswahili Language Assistance for Science Students Academic Achievement in a Multilingual Classroom Setting in East Africa: A Study of Government-Aided Western Ugandan Secondary Schools was conducted, as well as the measures taken to safeguard their verbal privacy. Every student who participated provided their consent and was not forced into it. The study did not have a negative effect on the students or the schools involved.

Data Availability Statement. The authors declared the availability of the data used in the research based on request on Kiswahili Language Assistance for Science Students Academic Achievement in a Multilingual Classroom Setting in East Africa: A Study of Government-Aided Western Ugandan Secondary Schools.

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