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Impact of the African Institute for Mathematical Science Teacher Training Program on Students' Interest to Learn Mathematics and Science, Rwanda

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Abstract: This study examined the impact of the Rwanda African Institute for Mathematical Science, Teacher Training Program (AIMS-TTP) on 228 secondary school students' interest to learn Mathematics and science taught by 7058-trained teachers over 5-years across 14 districts. Students were exposed to various AIMS-TTP interventions, including industrial visits, science hours, and international day for women and girls in science, mathematics competition, robotics and mathematics challenge, and the Pan African Mathematics Olympiad (PAMO). A survey research design was employed to collect data about students' interest to learn Mathematics and science, and data on students' choices of combinations were obtained from the National Examination and School Inspection Authority (NESA) for the academic years 2017 to 2022. Data analysis using bivariate correlation and regression analyses revealed a positive and significant relationship ($p<.05$) between AIMS-TTP interventions and students' interest to learn Mathematics and science. Besides, linear regression model indicated that hands-on activities, exposure to mathematics and science role models, science hour and smart classroom were the best predictors of students' interest to learn mathematics and science ($\beta=.197$, $p< .05$; $\beta=.217$, $p<.05$; $\beta=.234$, $p< .05$; and $\beta=.218$, $p<.05$ respectively). They contributed 66.7 % (Adjusted, $R2 = .667$, $p < .05$) of the variance in students' interest in learning mathematics and science. The AIMS-TTP interventions significantly improved students' interest to learning mathematics and science. Recommendations include comprehensive training programs with direct student engagement, diverse competitions, and ongoing teacher support through professional development. Future research should focus on students' STEM interest in Technical, Vocational Education, and Training schools.

Keywords: *Continuous professional development, innovative methodologies, mathematics and science-education, peer learning, students' industry visits.*

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Introduction

What a child prefers to learn is very crucial in its day today life. This is due to the fact that its way of information processing is exceptional (Arikpo & Domike, 2015). For decades, in circles of educators, the notion of enabling learners to manage fundamentals of what they achieve from their instructors and other sources has been widespread. Learners are very much aware of their learning requirements and consequently adapt independently to instructions (Riley et al., 2017). Given such circumstances, learners can be assisted to become self-reliant which may yield positive results (Asmira et al., 2021).

Mathematics and science teachers who support the approach of learning preferences approach in schools, are of the view that serious teaching can only take place if the preferences of learners are taken into account and designed to motivate learners in subjects they follow, thus enabling material retention (Sibomana et al., 2023). Thus, learning turns out to be an exercise that socially puts both the teacher and students in the same boat through interaction (Mariano & Bolsoni-Silva, 2018). Good results from learning emanate from different components namely motivation, maturity, abilities, talents, interests, suitable psychological factors, attitudes just but to mention a few (Herpratiwi & Tohir, 2022).

Interest serves as a strong driving force that stimulates the process of motivation, directing one's educational and professional journey, and playing a fundamental role in achieving academic excellence (Herpratiwi & Tohir, 2022). It is

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characterized by focused attention and emotional attachment to a specific learning subject, along with a permanent feeling to engage with it continually (Salifu & Bakari, 2022)

When it comes to learning, interest can be described as an experiential state characterized by focused attention, involvement and a sense of satisfaction (Anigbo, 2016). Thus, choosing a combination at the advanced level of secondary school depending on students' interest to learn a particular lesson or lessons that made a combination of study, for example Mathematics-Chemistry and Biology (Ndihokubwayo et al., 2022).

Learning motivation is backed by the interest one has in learning as well as the subject one chooses. Thus, boosting students' learning motivation can be achieved through effective engagement in a specific academic area (Ahmed et al., 2021).

Increasing students' interest in mathematics and science is critically important in Rwanda for several reasons. Rwanda is actively striving to transform its economy to a knowledge-based one with a strong focus in science, technology, engineering, mathematics (STEM) and innovation. To achieve this, a well-educated workforce in Mathematics and science is essential, as these fields are at the core of technological advancements and innovation. Additionally, a strong foundation in Mathematics and science opens up opportunities for students to pursue careers in STEM fields, which are in high demand globally and can lead to better job prospects and economic growth (Asmira et al., 2021). Ultimately, increasing interest in Mathematics and science among students in Rwanda is crucial for the nation's development and its ability to compete in the increasing technology-driven global landscape.

The government of Rwanda is promoting science and technology and in partnership with different organizations, teachers are supported through continuous professional development sessions to develop their skills and empower them to stimulate learners' interest to learn mathematics and science at the advanced level of secondary schools (Nkundabakura et al., 2023).

The same government has put more emphasis on seeing to it that the economy is a knowledge-based one through promoting STEM as an engine for socio-economic development (Ukobizaba et al., 2019). The achievement of this goal requires the country to ensure the improved quality of education through an updated STEM Curriculum aiming at improving teaching and learning techniques and availability of teaching materials (Ryan et al., 2022). This is why, in 2015, Rwanda shifted from a knowledge-based curriculum to a competence-based curriculum (CBC). The newly adopted curriculum by the Rwanda Basic Education Board (REB) prioritizes learner-centered pedagogy (REB, 2015). The CBC also emphasizes active instructional approaches that involve practical work or hands-on and mind-on activities that involve delivering and acquiring knowledge in mathematics and sciences (Nsengimana, 2021; REB, 2017).

To support the above-mentioned government's initiative, the AIMS Rwanda has trained more than 7000 mathematics and science teachers from 14 Districts in Rwanda. The African Institute for Mathematical Science-Teacher Training Program is a comprehensive five-year training program that combined in-person and online modes. Its Primary goal is to strengthen the competences of in-service and pre-service teachers in the field of biology, chemistry, mathematics, and physics. Essential elements of this program are trainings on innovative teaching approaches to speed the implementation of the competence-based curriculum and the integration of ICT in the process of teaching and learning. This is in line with the innovation need in now-days teaching and learning process (Ramos-Rodríguez et al., 2022; Salifu & Bakari, 2022).

AIMS-TTP is committed to enhance Mathematics and science teacher expertise and expanding the number of male and female students who continue their studies learning the subjects at the advanced level of secondary schools and at tertiary level as well as reducing the dropout rates. Working in 14 districts over 30 of Rwanda, the teacher-training program adopted a transformative approach of pulling teachers at the core of the program implementation. This would enable teachers to help students understand deeply the content and improve their interest towards learning the subjects (Brand, 2020; Lessing & De Witt, 2007).

In addition, the AIMS-TTP encouraged peer facilitation in workshops to give trainees opportunities to learn from each other and apply the same while facilitating students at their respective schools. This technique enhances employability skills, provides practice in leadership, communication, time management, and demonstrates appropriate social interaction skills (Ashwin, 2003). By incorporating real-life situation, using improvisations, encouraging collaboration and completion, using technology, incorporating real-word examples, meeting different mathematics and science role models, participating in different industrial visits, students were helped to understand and enjoy mathematics and science. Thus, students' exposure to hands-on activities and real life situation can stimulate their interest to learn Mathematics and science (Anigbo, 2016; Kihwele & Mkomwa, 2023; Ndihokubwayo et al., 2022).

In science teaching and learning, the practical activities are fundamental as they help learners deepen their understanding, construct their knowledge and develop creativity, critical thinking skills, investigation skills, intellectual development, practical skills, interest, and positive attitudes, including scientific curiosity (Azmidar et al., 2017; Lessing & De Witt, 2007). Furthermore, with practical work, students are well prepared for employment, where they face and address challenges that they meet in their daily life (Nkundabakura et al., 2023).

Enactment of practical activities in science necessitates teachers' knowledge, skills and attitudes and values to enhance significantly the students' learning outcomes and effectively contribute to their school achievement (Brand, 2020; Karalı, 2022). However, studies conducted indicate that students' poor performance in mathematics and science in developing countries, including Rwanda, is connected to poor teaching and learning approaches used added to class size and un-availability of lab material and equipment in some schools (Sibomana, Nicol, et al., 2021).

To overcome the above gaps, the Rwandan Ministry of Education through Rwanda Basic Education Board, has developed different strategies to improve mathematics and science instruction including in-service teacher training development, the distribution of different science teaching materials, improved science textbooks and experiment user guides, and I-CT-enabled education system in order to generate sustainable knowledge, competence, skills, innovation and creativity for Rwanda's sustainable socio-economic development (Ministry of Education, 2018; Taremwa et al., 2015).

In that regard, since 2017 the AIMS-Rwanda, through its teacher training program, in partnership with MasterCard Foundation, Rwanda Basic Education Board and the National Examination and School Inspection Authority (NESA), have trained mathematics and science teachers on ICT, pedagogy and hands-on activities from 14 districts of Rwanda. It was expected that the AIMS-TTP interventions would improve mathematics and science teachers' teaching activities, and thus, stimulate Mathematics and Science interest among students. Therefore, this study was set to investigate the impact of AIMS-TTP interventions on students' interest to learn mathematics and science. To achieve its main objective, the study was guided by the following research questions:

1. What is the level of students' first choice of Mathematics and Science combinations as results of AIMS-TTP interventions?
2. To what extent do AIMS-TTP interventions stimulate Mathematics and science interest among students?
3. What relationship exists between AIMS-TTP interventions and the interest of students to learn Mathematics as well as science?
4. What is the relative contribution of AIMS-TTP interventions to students' interest to learn mathematics and science?
5. Which of the AIMS-TTP interventions best predict the interest students have in learning mathematics leave alone other science subjects?

Literature Review

Students' Interest to Learn Mathematics and Science Subjects

Students' interest in learning Mathematics and science is a critical factor in their educational journey. Firstly, fostering a genuine interest in these subjects can lead to improved academic performance (Azmidar et al., 2017). When students are curious and engaged in Math and science, they are more likely to invest time and effort in their studies, leading to better comprehension and retention of the complex concepts. This not only boosts their academic performance but also equips them with essential problem-solving skills that can be applied in various aspects of life (Roche et al., 2023).

Moreover, nurturing a passion for Mathematics and science can have far-reaching implications for a student's future career prospects. Many high-demand and lucrative careers, such as engineering, data science, and medicine, rely heavily on a strong foundation in these subjects. When students develop an interest in Mathematics and science early on, they are more likely to pursue careers in these fields, contributing to innovation and progress in society (Brand, 2020). Encouraging students to explore the practical applications of these subjects and highlighting their real-world relevance can inspire a sense of purpose in their learning (Lessing & De Witt, 2007).

Furthermore, cultivating a positive attitude towards Mathematics and science can enhance students' overall problem-solving abilities and critical thinking skills (Alam et al., 2022). These subjects provide a structured framework for analyzing complex issues and finding solutions. When students are motivated to delve into these subjects, they become more skillful at approaching challenges systematically, which is a valuable skill in both academic and everyday life (Foley et al., 2013). Therefore, it is crucial for educators to create engaging, hands-on learning experiences that ignite students' curiosity and passion for Mathematics and science, fostering a lifelong learning eagerness for these disciplines.

In addition to the above, regular trainings and cooperation between parents and educators improve students' interest to learn the subjects since with efforts of both teacher and parents; students' behaviors are effectively controlled (Savaş, 2012). Engaging Mathematics and science instructors who adopt an approachable behavior have the potential to inspire students and stimulate their interest for these subjects (Ukobizaba et al., 2020).

Teachers' Continuous Professional Development and Students Interest towards the Subjects

Continuous Professional Development (CPD) for Mathematics and science teachers ensures that they stay updated with the latest pedagogical skills and master the content; it plays a pivotal role in shaping students' interest to learn the subjects. In an ever-evolving field like Mathematics and science, it is crucial for educators to be well informed and

equipped to deliver engaging and relevant lessons (Nkundabakura et al., 2023). When teachers are confident in their own understanding and teaching abilities, they can convey the excitement and practical applications of these subjects to their students, making the learning experience more enjoyable and inspiring (Umugiraneza et al., 2016).

Furthermore, CPD allows teachers to explore innovative teaching approaches and resources that can capture students' interest, incorporating technology, interactive simulations, and hands-on experiments into the curriculum can make Mathematics and science come alive in the classroom (Hagenimana & Niyobuhungiro, 2023). Teachers who participate in their professional development are more likely to experiment with creative teaching strategies that can pique students' curiosity and encourage them to explore these subjects further (Srinivasacharlu, 2019). This not only enhances students' understanding but also fosters a sense of curiosity and interest for Mathematics and science.

Moreover, CPD helps teachers address individual students' needs and challenges more effectively. Through ongoing training, educators can learn how to identify and support students, adapt their teaching methods to cater to diverse learning styles, provide additional resources for those who show a keen interest in Mathematics and science (Mbwile & Ntivuguruzwa, 2023). Tailoring instruction to students' abilities and interests can make a significant difference in how they perceive these subjects. When students feel that their teachers are invested in their success and well-being, they are more likely to develop a positive attitude towards Mathematics and science, fostering a lasting interest in these critical fields.

Teachers' Techno-Pedagogical Skills and Students' Interest to Learn STEM Subjects

Teachers' techno-pedagogical skills have a profound impact on students' interest in learning STEM subjects. Teachers who are proficient at integrating technology into their teaching can create dynamic and interactive learning experiences (Hagenimana & Niyobuhungiro, 2023). By using tools like virtual simulations, online resources, and educational software, they can make STEM subjects more engaging and relevant to students. This active and immersive learning environment can stimulate students' curiosity and enhance their interest in these disciplines which are considered by some learners as difficult to learn (Sibomana et al., 2020).

Techno-pedagogical skilled teachers can provide students with practical exposure to STEM concepts. They can organize virtual field trips, facilitate collaborative online projects, and leverage digital tools to display real-world applications of STEM subjects. When students see how these subjects are applied in exciting and meaningful ways, they are more likely to develop a passion for them and understand their relevance in solving complex problems. (Kihwele & Mkomwa, 2023). Furthermore, teachers with strong techno-pedagogical skills can tailor their instruction to individual students' needs and learning styles (Hota, 2023). Personalized learning experiences, made possible through technology, allow students to progress at their own pace and explore STEM topics that align with their interests. This customization can foster a sense of ownership and autonomy in their learning, ultimately leading to increased interest and motivation to excel in STEM subjects.

Generally, students' interest in learning mathematics and science subjects plays a crucial role in Africa's transformation through innovative scientific training, technical advancements, and groundbreaking discoveries. When they are engaged and interested in learning these subjects, they are more likely to excel academically and pursue careers in STEM fields. To foster this interest, teachers must undergo continuous professional development to stay updated with the latest teaching methodologies and technological tools that align with the demands of the 21st century. By enhancing their techno-pedagogical skills, educators can effectively integrate technology into their teaching, making the learning process more interactive and engaging for students. This not only prepares students for the international labor market but also ensures that Africa's future workforce is equipped with the skills and knowledge needed to contribute to scientific and technological advancements, driving the continent's growth and development.

Theoretical Framework

In this study, the research drew upon constructivism learning theory by emphasizing active participation and hands-on activities and improvisation practices. Instead of passively receiving information, participants were encouraged to engage in problem-solving activities, group discussions, and peer facilitation (Ashwin, 2003). Facilitators were acting as coach helping trainees construct their own understanding, fostering critical thinking, and encouraging them to draw connection between existing knowledge and the new information being presented. Cooperate, learning from peers and acquire fresh knowledge and significance based on the one they had before were focused on during the trainings as a strategy to be also applied by trained teachers while facilitating learners to give them opportunities to learn and discover new things on their own (Sibomana, Karegeya, et al., 2021).

Constructivism favors teachers in their approach when they implement their activities in a specific training setting to improve their knowledge. This work is based on the theoretical foundation of Dewey and Vygotsky thoughts. That is to say, it considers the necessity of social contact in the process of learning (Bodner, 1986). The teachers of these disciplines built their knowledge during techno-pedagogical trainings, different outreach activities and industrial visits, teacher award ceremonies to list but a few. The trainers planned engaging activities to develop trainees' critical thinking skills

and stimulate their lifelong learning to continue searching and learning how to innovate while implementing the competence based curriculum.

Methodology

The study aimed at exploring the impact of AIMS-TTP on students' interest to learn mathematics and science. It employed an ex post facto research design as well as using a quantitative research approach. This is because the study variables were already in existence and had already been manifested (Creswell, 2012). The study used the inclusion criteria of ordinary level students from 14 districts who participated in different AIMS-TTP activities plus the industrial visits, these were 4137 and constituted the study population, from which we purposively sampled 228 students. Thus, 16 students from each of 10 districts and 17 from each of 4 districts with many schools (one per province) and that has a big number of students. Also, students were from boarding, Nine and Twelve-Year Basic Education schools (12YBE and 9YBE known as day schools) as follow: 5 students from boarding schools (3 and 2 disaggregated by gender); 5 students from 9YBE schools (3 and 2 disaggregated by gender); 6 students from 12YBE being the category having many teachers in the program (3 and 3 disaggregated by gender) from one district. A district with many students (one in each province); respondents were 5 from boarding schools and 6 from 9YBE and 6 from 12YBE schools.

Survey questionnaires were used to collect the data. They were developed by post-doctoral researchers at AIMS-Rwanda Teacher Trainings Program based on its interventional indicators. The students' attitude questionnaire was composed of 18 items gathering data about their interest to learn mathematics and science subjects. Before questionnaire development, post-doc researchers took time to sit with AIMS-TTP experts to document on all covered activities related to the topic, conducted a desk documentation by reading all TTP related activities to extract all possible training indicators; then items were developed accordingly before being checked by TTP subject specialists and pedagogical leads. The questionnaire was updated by addressing comments by TTP team then submitted to experts from the University of Rwanda, College of Education (UR-CE) who reviewed it before its approval by AIMS Rwanda. The questionnaire about the interest students has in science as well as Mathematics was scaled rating from strongly disagree =1, Disagree=2, Neutral=3, Agree=4 and Strongly Agree =5, and yielded a Cronbach alpha reliability of .91. Thus, the Cronbach's alpha values exceed 0.7 which indicates appropriate reliability (Creswell, 2012).

Before the administration of the questionnaire to students, school administrators were requested to facilitate learners to use smart classrooms or another facility that allow them to attend an online meeting which was conducted to explain the purpose of the survey to them, confidentiality of their responses, and that they might voluntarily participate or not.

The survey questionnaire was composed of 18 items classified into 12 categories (Dislike mathematics, item 1 and 5; effect of the Pan African Mathematics Olympiad (PAMO), item2; effect of teaching methods, item 3; Math competition, item 4; confidence in Math, item 6; industrial visits, item 7 and 8; hands-on activities, item 9; exposure to Mathematics and science role models, item 10 and 11; science hour, item 12; smart classrooms, item 13; confidence in science, item 14, 16 and 17; dislike science, item 15; and interest to learn Math and science, item 18).

Data Analysis

The collected data were analyzed using bivariate correlation and regression analyses as the most commonly used method to answer questions regarding relationships between variables. A multiple regression analysis was conducted to evaluate the extent to which the students' interest in learning mathematics and science can be predicted from different AIMS-TTP interventions. Prior to performing the regression analysis, it was essential to confirm that the underlying assumptions for using both correlation and multiple regression analyses were met. This involved evaluating whether the data for the predictor and independent variables exhibited normal distribution and assessing if there was a statistically significant relationship between the independent and dependent variables. In this context, all correlation coefficient exceeded the threshold of 0.3 (Pallant, 2001). This indicates a meaningful association between the independent variables and students' interest to learn mathematics and science combinations at the advanced level of secondary schools. Furthermore, the correlation and regression analyses were suitable for data analysis because the study described the implications of predictor variables for criterion variables (Creswell, 2012).

Findings

The provided figure illustrates the primary preferences of students regarding their chosen combinations of mathematics and science subjects at the advanced secondary school level. In this chart, the data highlights the most students' favored subject combinations.

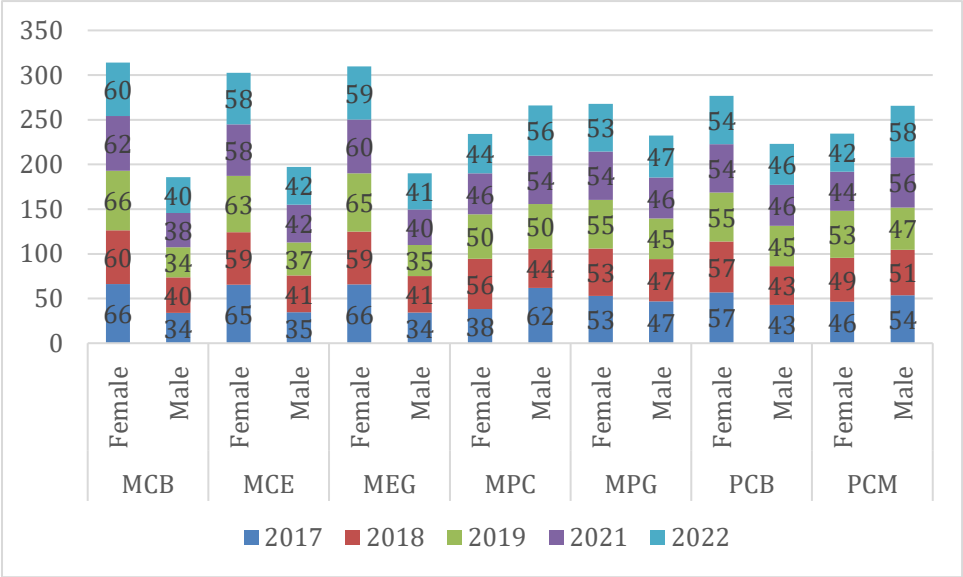

Figure 1. Percentages of First Choices from 2017 to 2022

From Figure 1, students' choices of Mathematics and science combinations indicate that for Mathematics-Chemistry-Biology (MCB) combination, a greater number of females chose the combination than males as their first choice from the academic year 2017, 2018, 2019, 2021 to 2022 was 66%; 60%, 66%; 62% and 60% for females respectively and 34%; 40% 34%; 38% and 40% for males; for the combination of Mathematics-Computer- Economics (MCE), the findings are the same where a greater number of females prefer the combination compared to males as students' first choices were 65%; 59%; 63%; 58% and 58% for females from 2017 to 2022 respectively and 35%; 41% 37% 42% and 42% for males. The same findings were for the combinations of Mathematics-Economics-Geography (MEG); Mathematics-Physics-Geography (MPG), and Physics-Chemistry-Biology (PCB).

Figure 1 also shows that a greater number of males than females students chose the combinations of Mathematics-Physics-Computer (MPC) and Physics-Chemistry-Mathematics (PCM) in some academic years from 2017 to 2022; for example 62%; 56% and 54% over 38%; 44% and 46% of females for the academic years 2017, 2021 and 2022 respectively. In addition, both males and females chose the same combination equally in the academic year 2019 (50%) and in the academic year 2018, females showed interest towards learning the combination than males (56% over 44%). Furthermore, males indicated great interest to learn PCM than females apart in the academic year 2019 where their first choices indicated 53% of females over 47%. For the academic years 2017, 2018, 2021 and 2022, the percentages of the first choices were 54%, 51%, 56% and 58% of males over 46%, 49%, 44% and 42% of females respectively.

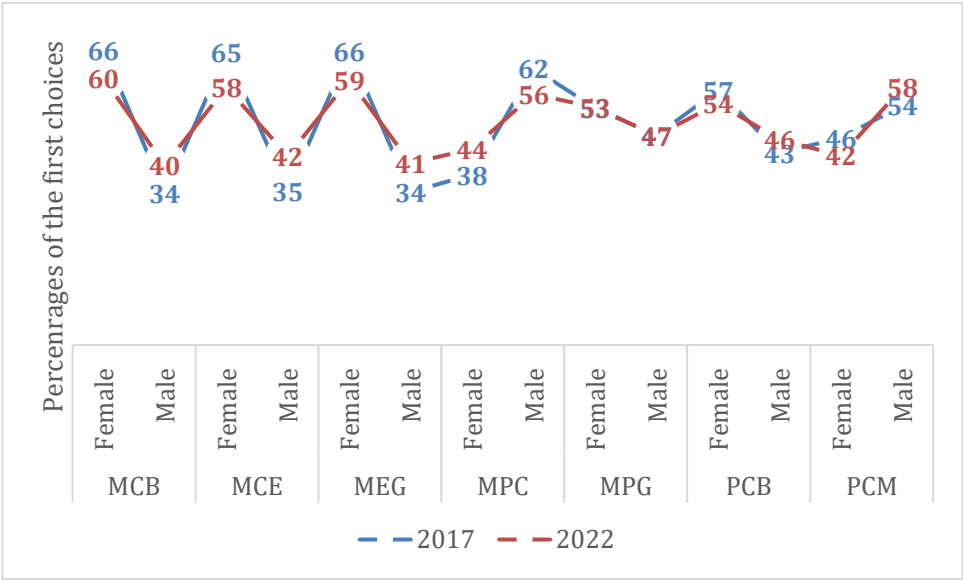

Figure 2. Comparison of Students' First Choices of Combinations to Learn for the Advanced Level of Secondary Schools between the Academic Year 2017 and 2022

Comparing the percentages of students' choice of Mathematics and science combinations in the academic year 2017 and 2022 as indicated by Figure 2; it has found that though the number of female students outweigh males, for MCB

combination the number of males increased from 34% in 2017 to 40% in 2022 and that the number of females decreased from 66% to 60%. It was the same for MCE and MEG combinations where the number of males increased from 35% to 42% and 34% to 41% respectively and females decreased from 66% to 59% in both MCE and MEG combinations. Finally, students' first choice of Mathematics and science combinations remained the same (47% for males and 53% for females) in the academic year 2017 and 2022 for MPG.

Students' Interest towards Mathematics and Science

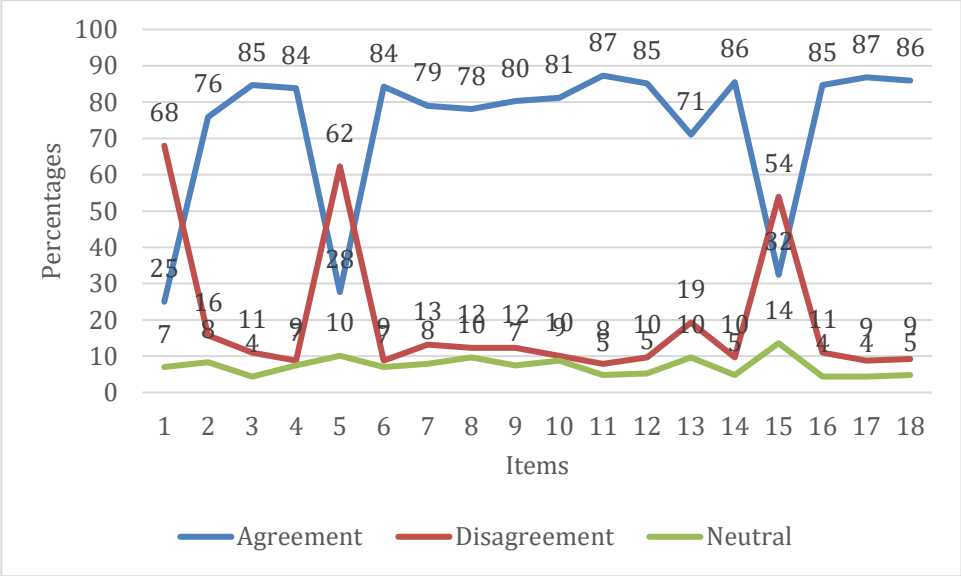

Figure 3. Summarized Students' Agreement Levels on their Interest towards Learning Mathematics and Science

In figure 3, Item one and five about dislike mathematics, show that the agreement was 26.5%, neutral 8.5% and 65% disagreed with the statement while 76% of respondents confirmed that PAMO stimulated their interest to learn Mathematics and science subject combinations; while 85% and 84% confirmed the same for the teaching methods and Math competitions respectively as shown by items 3 and 4.

Item six shows students' confidence of learning Mathematics (84%) while the effect of the industrial visits (items 7 and 8) on students' interest to learn Math and science-related subjects was 78.5% and 80% for hands-on activities (item 9). Furthermore, the agreement of the stimulus by role models (item 10 &11) to learn Math and science was 84%; 85% for the effect of science hour (item 12) and 71% by the smart classroom at school (item 13). In addition, students indicated their confidence of learning science (items 14, 16 & 17) at the percentage of 86% and only 32% confirmed that they can handle most subjects well but cannot do good jobs with science (item15). Generally, students demonstrated by item 18 to improve their interest to learn Mathematics and science at a percentage of 86%.

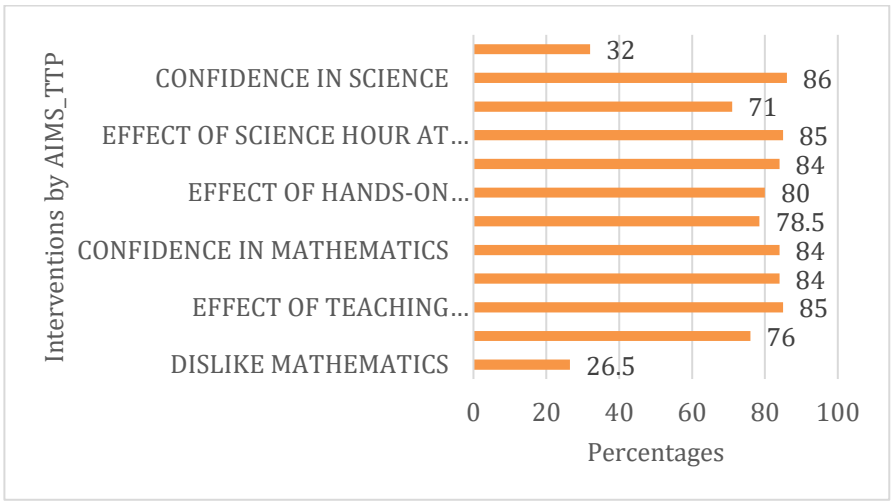

Figure 4. Levels of Students' Agreement on Items Related to How AIMS-TTP Interventions Stimulated Their Interest to Learn Math and Science

Figure 4 indicates that AIMS-TTP interventions stimulated students' interest to learn Mathematics and science at 81% and above. Specifically, the teaching methods and science hour stimulated students' interest to learn Mathematics and science at the percentage of 85%; Mathematics competitions and exposure to role models in Mathematics and science areas at 84%, and hands-on activities at the percentage of 80%; while students' industrial visits stimulated learners at 78.5%. The Pan African Mathematics Olympiad at 76%, and the construction, equipment and use of the smart classroom at the percentage of 71%.

Table 1. Correlation and Regression analysis between AIMS-TTP Interventions and Students' Interest to Learn Mathematics and Science

Independent Variable	r	p-value
PAMO	.379**	0.000
Teaching Methods	.550**	0.000
Math Competitions	.535**	0.000
Industrial Visits	.496**	0.000
Hands-on Activities	.690**	0.000
Math and Science Role models	.737**	0.000
Science Hour	.729**	0.000
Smart Classroom	.663**	0.000
Multiple Regression (R^2)	.667**	0.000
F	54.84	0.000

*** Correlation is significant at the 0.01 level (2-tailed)*

The results of the bivariate regression analysis indicated that PAMO, teaching methods, Mathematics competitions, industrial visits, hands-on activities, exposure to Mathematics and science role models, science hour and smart classroom had a positive correlation with students' interest towards learning Mathematics and science (r=.379**; r=.550**; r=.535**; r=. 496**; r= .690**; r=.737**; and r= .729**; and r= .663** respectively). The results imply that the mentioned interventions by AIMS-TTP improved students' interest to learn Mathematics and science subjects. To fully show evidence of the relationship between interventions by AIMS-TTP, multiple regression analysis was computed, (Adjusted, R^2 = .667, F (8, 219) =54.838, p=0.000<.05).

These above findings indicate that 66.7% of the variance in students' interest to learn Mathematics and science is as a result of the linear combination of the PAMO, teaching methods, Mathematics competitions, industrial visits, hands-on activities, exposure to Math and science role models, science hour and smart classroom, and that the remaining 33.3% might be a consequent of factors or errors not considered in the study.

Table 2. Predictors of Students' Interest to Learn Mathematics and Science Subjects

Model	Unstandardized Coefficients		Standardized Coefficients		
1	B	Std. Error	Beta	t	Sig.
Constant	.450	.211		2.13	0.03
PAMO	.044	.045	.045	.981	.328
Teaching Methods	.097	.061	.097	1.580	.116
Math competitions	-.006	.066	-.006	-.095	.924
Industrial visits	-.019	.045	-.022	-.421	.674
Hands-on activities	.184	.057	.197	3.217	.001
Role models	.220	.076	.217	2.890	.001
Science hour	.233	.072	.234	3.246	.001
Smart classroom	.179	.045	.218	3.991	.000

Table two shows that hands-on activities (β=.197, p<0.05); Mathematics and science role models (β=.217, p<0.05); science hour (β=.234, p<0.05); smart classroom (β=.218, p<0.05) are the best predictors of students' interest to learn Mathematics and science.

Discussions

The study aimed at investigating the impact of the Rwanda African Institute for Mathematical Science, Teacher Training Program (AIMS-TTP) on students' interest to learn mathematics and science found that female students were interested to choose MCB, MCE, MEG, MPG, and PCB combinations than males while males indicated great interest to learn PCM than females apart in the academic year 2019 where their first choices indicated 53% of females over 47%. The results corroborate the findings of Shafina (2020) who found that female choices of science subject outperformed males. This contradicts the findings of a study conducted in China by Jia et al., 2020 that boys had significantly greater variabilities in science achievement and interest.

Female students were less interested to learn Physics, Chemistry and Mathematics combination than males. This might be due to the fact that all the three subjects are more formulae based than words that can be memorized (González-Pérez et al., 2020). Generally, the findings revealed that both males and females have improved their interest to learn Mathematics and science subjects, which contradicts the myths that females could do better only in social and humanities related subjects (García-Holgado & García-Peñalvo, 2022).

The levels of students' agreement on items related to their interest to learn Mathematics and science was 81% and the disagreement at 29% which implies that effective Continuous Professional Development (CPD) of Math and science teachers empower them to implement innovative teaching approaches with an improved understanding of the content following by well-planned hands-on activities that stimulate their learners for further learning, a finding which validate the findings of Nkundabakura et al., (2023) that trained teachers enhance their teaching and learning process, hence the positively change of their students' attitude towards the subject. It was also reported that when the environment of teaching and learning is conducive with innovative teaching methods, students' improve their interest towards learning the subjects (Musengimana et al., 2021; Sibomana, Karegeya et al., 2021).

The results of the bivariate regression analysis indicated that 66.7% of the variance in students' interest to learn Mathematics and science is a representation of the linear combination of the Pan African Mathematics Olympiad (PAMO), teaching methods, Mathematics competitions, industrial visits, hands-on activities, exposure to Math and science role models, science hour and smart classroom, and that the remaining 33.3% might be a result of factors or errors not considered in the study. Furthermore, hands-on activities (β=.197, $p<0.05$); Mathematics and science role models (β=.217, $p<0.05$); science hour (β=.234, $p<0.05$); smart classroom (β=.218, $p<0.05$) are the best predictors of students' interest to learn Mathematics and science. In their studies, Nkundabakura et al., 2023 report the modernized teaching methods as predictors of students' interest in science and Mathematics teaching careers, thus, these findings corroborate their findings.

Furthermore, AIMS-TTP training model was focusing on peer facilitation that allowed trainees (Mathematics and science teachers) to learn from peers; develop cooperation skills and hence apply the same at their respective schools. This might have contributed to their teaching methods and improved their students' interest since the teaching methods have also been found to be among the causes that stimulate interest and commitment to learn Mathematics and science (Roche et al., 2023). The results also corroborate the findings of Lessing and De Witt (2007); Nsengimana (2021) and Srinivasacharlu (2019) that teachers' workshops improves their teaching approaches and bring innovations in their manner of delivering to cater for students' diversity.

Conclusion

The aim of the study was to investigate the impact of the AIMS Rwanda-TTP interventions on the interest of students to learn Mathematics and Science. Considering the findings, it was resolved that AIMS-TTP interventions have increased students' first choice of Mathematics and Science combinations. Besides, it was found that the AIMS Rwanda-TTP interventions are positively and significantly related to students' interest to learn Mathematics and Science. Additionally, it was discovered that the AIMS Rwanda-TTP interventions, such as hands-on learning opportunities, role models, science hour, and smart classrooms, are the most accurate predictors of students' interest in learning mathematics and science. According to the study results, science hour, exposure to Mathematics and science role models, hands-on learning opportunities, and smart classrooms are the main teaching and learning strategies that, when used during the teaching and learning process, increase students' interest in learning mathematics and science while industrial visits, Mathematics competitions, teaching methods and the Pan African Mathematics Olympiads contributed with no statistical significance.

Recommendations

From the findings of this research, it is suggested that mathematics and science teachers apply a variety of innovative teaching strategies, engage students in hands-on activities, give them opportunities to interact with Mathematics and science role models, and expose them to the practical application of science and mathematics concepts by organizing field trips to industrial settings. They should establish a welcoming and nurturing environment by creating a warm and inclusive classroom atmosphere that encourages children to feel safe, valued and eager to learn.

Education policy makers and curriculum developers should plan regular training sessions for mathematics and science teachers to equip them with innovative teaching methods that enable them to design engaging and developmentally appropriate lessons, tailored to the specific needs and abilities of their students, while also keeping them engaged and interested about learning.

Limitations

The study used an ex post facto research design because not all initial baseline data was gathered. Further study should use data for students in AIMS-TTP intervention districts who have progressed to tertiary education in STEM fields.

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Conflicts of interest

The authors wish to maintain that there are no potential conflicts of interest to disclose.

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