Five years of Leaders in Teaching: A learning synthesis

September 2024

In partnership with

mastercard foundation

Leaders in Teaching

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Acknowledgements

This report summarises research carried out by Laterite and the Research for Equitable Access and Learning (REAL) Centre at the University of Cambridge in partnership with the Mastercard Foundation as part of the Leaders in Teaching initiative.

The learning partners would like to thank the teachers, school leaders and students, as well as the Mastercard Foundation and the Leaders in Teaching implementing partners, who contributed their insights to this study.

About Leaders in Teaching

Leaders in Teaching is a five-year Mastercard Foundation initiative established in 2018 to improve the quality of teaching and learning in Rwandan secondary schools, with a focus on science, technology, engineering and mathematics (STEM) subjects. The initiative aligns with the Government of Rwanda's goals outlined in Vision 2050 to become a knowledge economy. More specifically, Leaders in Teaching responds to strategic priorities outlined in Rwanda's Education Sector Strategic Plan 2018/19 to 2023/24, aiming to enhance the quality of learning outcomes, as well as teacher professional development and management, with a focus on STEM and ICT teaching and learning in 14 districts of Rwanda.

Leaders in Teaching consists of programmes led by six implementing partners - the African Institute for Mathematical Sciences (AIMS); Carnegie Mellon University Africa; Inspire, Educate and Empower Rwanda; UNICEF Rwanda; University of Rwanda College of Education; and VVOB Rwanda - in partnership with the Mastercard Foundation. Laterite and the REAL Centre are the learning partners for the initiative, responsible for generating evidence of improved teaching and learning.

About Laterite and the REAL Centre

Laterite is a data, research and analytics firm founded in East Africa. The firm strives to carry out impactful research that helps decision-makers find solutions to complex development problems.

The REAL Centre at the University of Cambridge pioneers research into overcoming barriers to education, such as poverty, gender, ethnicity, language and disability, and promotes education as an engine for inclusive growth and sustainable development.

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Introduction

Leaders in Teaching research

Research by Laterite and the Research for Equitable Access and Learning (REAL) Centre at the University of Cambridge for the Mastercard Foundation's Leaders in Teaching programme revealed important insights about secondary teaching and learning in Rwanda. The research has taken place at multiple time points:

- In late 2019 and early 2020, before the outbreak of the COVID-19 pandemic and associated school closures
- In August 2020, during school closures
- In February/March 2021, after schools had reopened
- At the beginning and end of the 2022-23 school year (October/November 2022, February 2023, and May/June 2023).

This brief summarises insights from data collected throughout the research programme, covering the period from 2020 to 2023. It focuses on research covering three themes:

1. Teaching quality and its relationship with student learning outcomes
2. Motivation for STEM and teacher continuous professional development
3. Stakeholder perspectives on changes in teaching quality over the five years of the initiative.

We also share implications for policy and future research based on the findings.

Our previous Leaders in Teaching learning syntheses share lessons learned about:

- Understanding the impact on teachers in Rwandan secondary schools since COVID-19 school closures (in English[1] and Kinyarwanda[2])
- Teaching and learning in Rwandan secondary schools before schools closed in early 2020 (in English[3]).

1. https://bit.ly/LITsynthesis2023-RW
2. https://bit.ly/LITsynthesis2023-EN
3. https://bit.ly/LITsummary2020

Understanding the changing context for STEM teaching and learning in Rwandan secondary education

The analysis in this section is a comparison of data from 2017 and 2022 that refers to all secondary schools in Rwanda except those in Huye, Karongi, Nyamagabe and Ruhango, and private schools.[1]

Secondary education in Rwanda is in a period of transition. Between 2017 and 2022, the number of students enrolled in lower secondary increased by 46%. This increase builds on the country's high enrolment rates in primary education, with large numbers of students transitioning to secondary school. The pupil-to-teacher ratio also increased, with growth in student enrolment outstripping the growth in the number of schools.

At the same time, the number of lower secondary STEM teachers in Rwanda increased by 57%. The proportion of female STEM teachers increased from a quarter to more than a third of all STEM teachers.

In 2022, compared to 2017:

41%
more **schools** offered lower secondary education

46%
more **students** were enrolled in secondary education

57%
more **lower secondary STEM teachers** were in service

The number of STEM teachers per school increased from

5.8 in 2017 to

6.2 in 2022

The number of female STEM teachers also increased over this period.

The majority of lower secondary schools in Rwanda are in rural areas, but rural schools are not as equipped to provide STEM education as those in urban areas. Urban schools have more STEM teachers, as well as more teachers specialised in STEM. 30% of rural schools have fewer than 5 STEM teachers, compared to 12% in urban areas. A minimum of 5 STEM teachers is an important threshold since the competency-based curriculum involves five different STEM subjects in lower secondary education.

	Number of lower secondary schools	Mean number of STEM teachers per school	Rate of STEM teachers with a STEM specialisation	Student to STEM teacher ratio	Rate of schools with less than 5 STEM teachers
Urban	161	8.5	77%	50.2	12%
Rural	1,358	6.2	72%	46.0	30%

1. This section draws on the Teacher Management Information System (TMIS) dataset from 2022 and a census of all STEM teachers in Rwanda carried out by Laterite in 2017. The TMIS is a national dataset, but excludes data on lower secondary schools in 4 districts – Huye, Karongi, Nyamagabe, and Ruhango – and private schools (9% of total schools in Rwanda). To enable comparison of datasets, these schools were also removed from the 2017 dataset for the purposes of this analysis. The full analysis is available in Muttai et al. (2024) (see reference list).

Schools involved in the Leaders in Teaching research

The rest of this brief draws on data collected as part of the Leaders in Teaching research programme, from schools in 14 districts of Rwanda as shown below.

358 schools in our sample

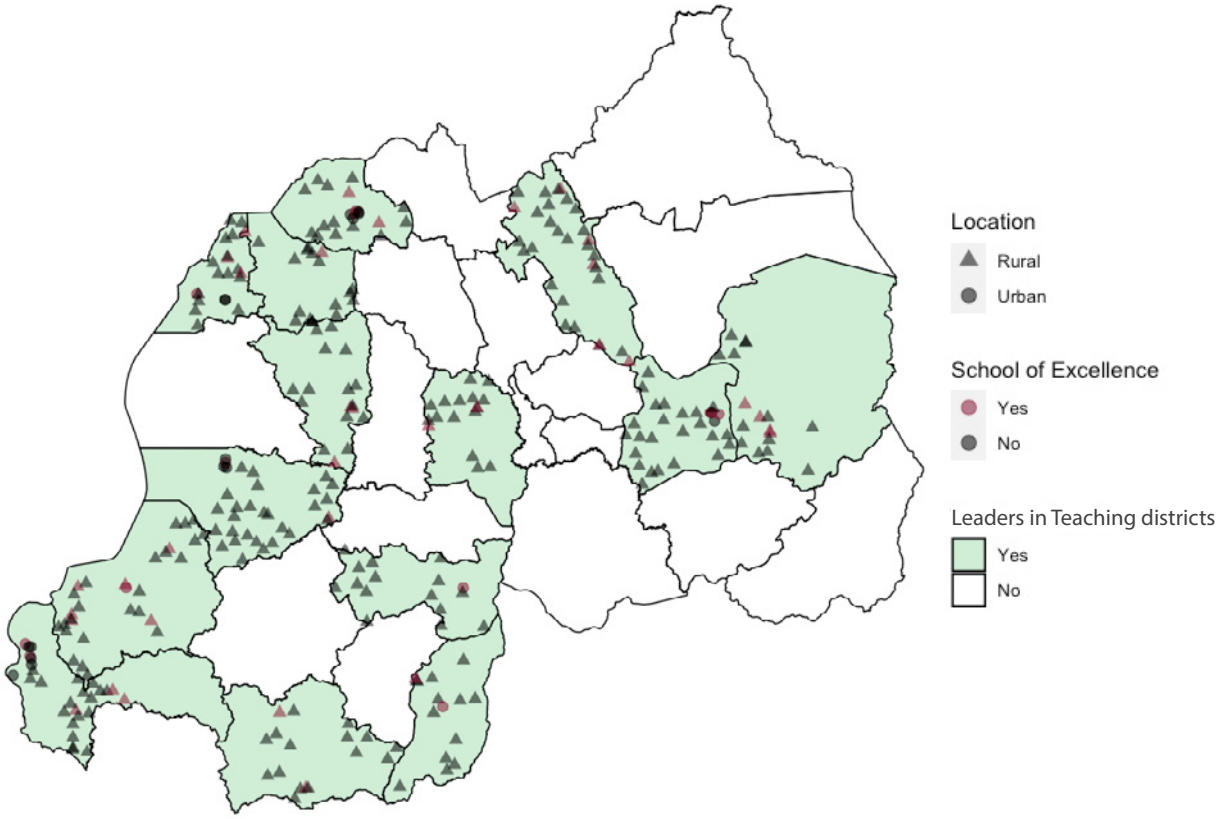
14 districts of Rwanda
(does not include Kigali)

355 school leaders & 2,000 + STEM teachers

4,000+ Secondary 3 students

91% of schools are in rural areas

13% are Schools of Excellence[2]



2. Note: While the term "Schools of Excellence" is no longer used, it refers to schools established by the Minister of Education in 2011 to promote sciences with a focus on practical classes, serving as models for other schools. In this synthesis we refer to less selective "regular schools" and highly selective "Schools of Excellence" to outline this distinction.

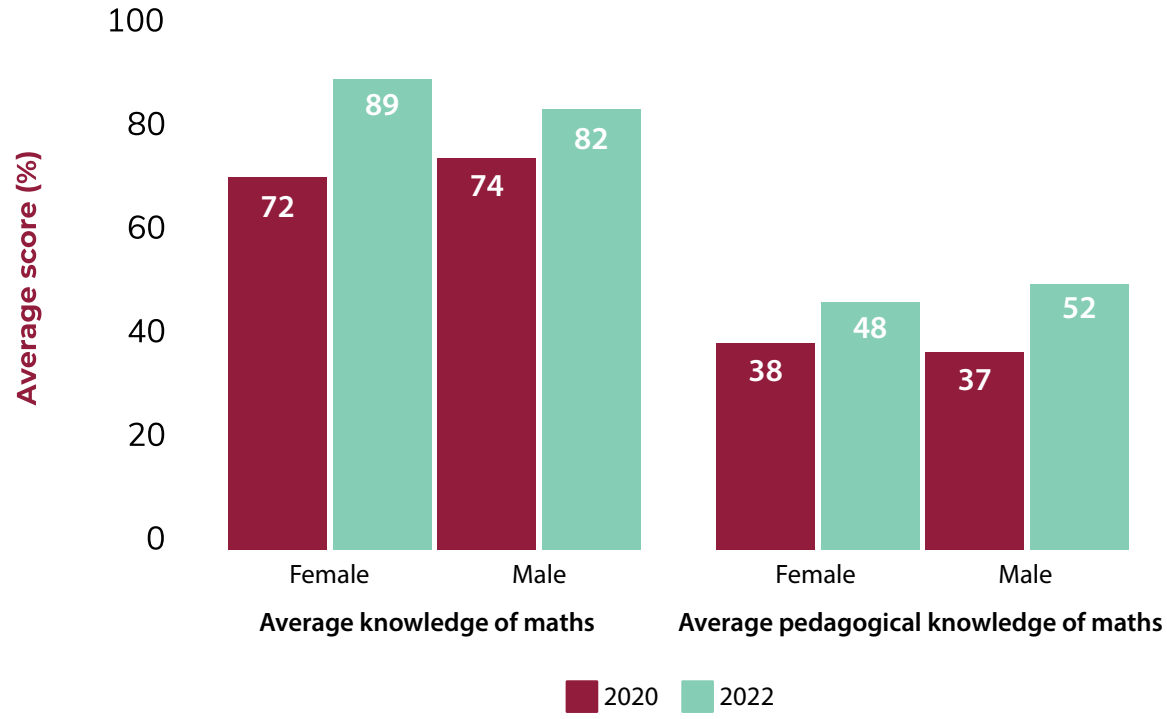
Summary of research findings

Theme 1: Teaching quality and its relationship with student learning outcomes

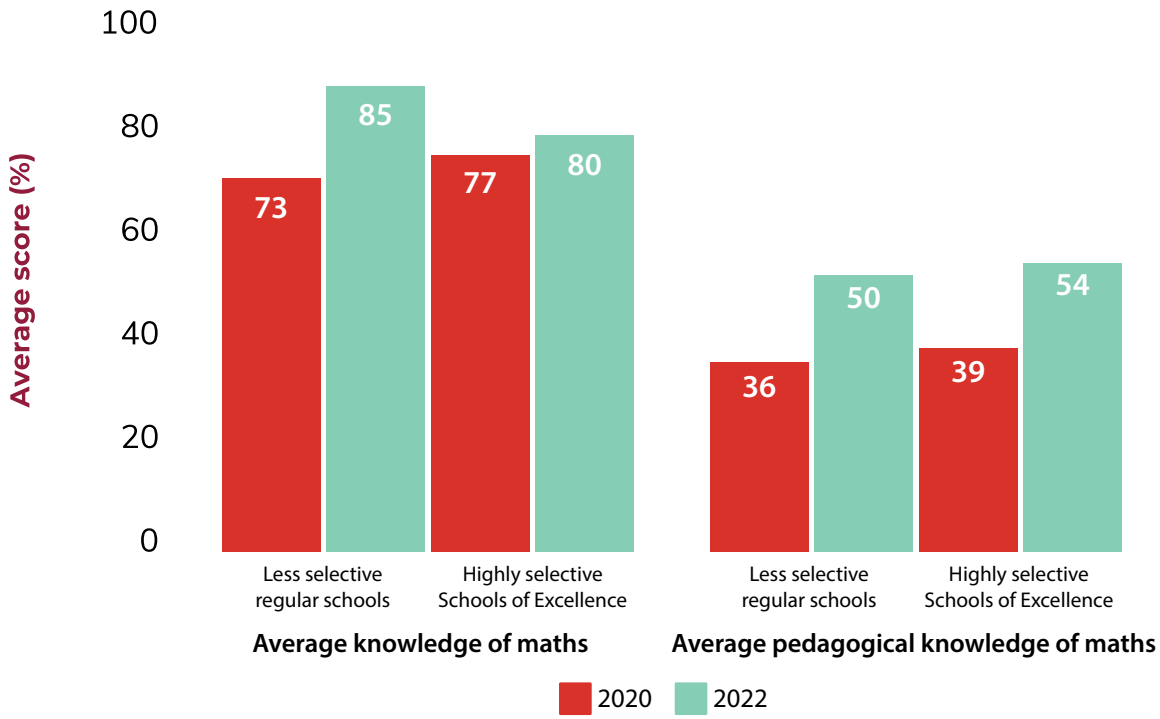
Teaching quality

Mathematics teachers made statistically significant improvements in their knowledge of mathematics (how to *do* maths) and pedagogical knowledge (how to *teach* maths) between 2020 and 2022.

Female teachers improved twice as much as male teachers in their knowledge of mathematics.



Improvement in knowledge of mathematics was larger for teachers in less selective regular schools compared to those in the highly selective Schools of Excellence.

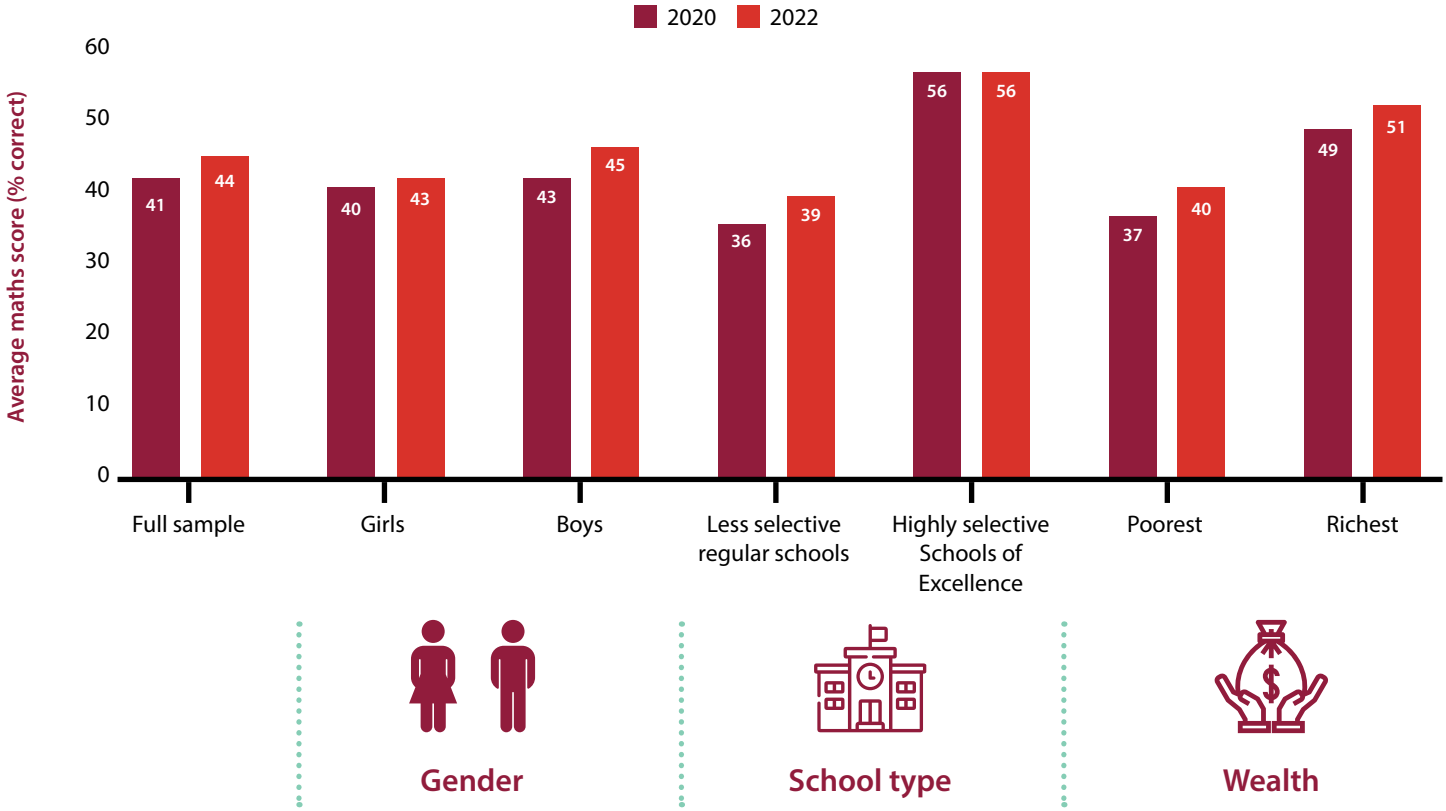


Student learning

Rwandan Secondary 3 students' mathematics learning outcomes significantly improved between 2020 and 2022 on average - despite school closures due to the COVID-19 pandemic.

Students from relatively more disadvantaged backgrounds - girls, students from the poorest households, and students in regular schools - showed greater improvement in mathematics learning outcomes over the two-year period of Leaders in Teaching implementation. These students started from a lower baseline score than their peers. **The improvement therefore resulted in narrowing of the achievement gap in mathematics learning outcomes.**

Despite this narrowing, mathematics learning outcomes remained persistently lower for girls, overage students, and those from less selective regular schools.



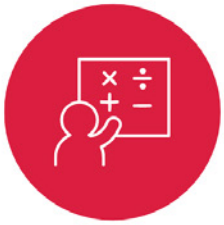
Note: To determine household wealth, we asked students questions on ownership of some household assets and services such as a bed, chair, television, and access to electricity. Based on their responses we created a wealth index as a proxy for household wealth.

Schools with a higher proportion of female teachers, as part of the general secondary education teaching staff, showed smaller gaps between girls and boys in STEM learning outcomes. This might relate to a 'role model effect'. Additionally, our qualitative research revealed that female teachers were more likely than male teachers to report that girls can perform better than boys in STEM, and to acknowledge girls' strengths in learning and STEM achievement compared to boys. This suggests that continued efforts to attract more female teachers to the profession might help narrow the learning gap between boys and girls.

Association between student learning outcomes and teaching quality

We looked at the association between student learning and three measures of teaching quality:

Teacher knowledge of mathematics (how to *do* maths)



Teacher pedagogical knowledge of mathematics (how to *teach* maths)

Classroom instructional practices

Higher teacher knowledge of mathematics (how to *do* maths) is associated with improved student mathematics learning outcomes over the period of Leaders in Teaching implementation (2020-2022), particularly for students in less-selective regular schools. **This shows that improvement in teachers' knowledge of the subjects they teach is likely to close the achievement gap in the long term in Rwandan secondary schools.**

We did not find associations between student mathematics learning outcomes and the other two indicators of teaching quality. This does not mean that these two teaching quality indicators are poor predictors of student mathematics learning outcomes. Rather, it suggests the need to re-evaluate the content and delivery of future teacher professional development programmes in secondary schools in Rwanda so that teachers can get the most benefit from these programmes.

Students from relatively disadvantaged backgrounds, including girls, overage students, and those enrolled in less selective regular schools scored lower in mathematics compared to their relatively advantaged peers. **This implies the need for targeted and continuous support for students from disadvantaged backgrounds so that the achievement gaps are narrowed.**

Mathematics teachers with varying knowledge of mathematics were assigned to teach students from a range of diverse backgrounds: low- or high- prior knowledge of mathematics and from poorer or wealthier households. **This means that students from disadvantaged backgrounds have equal opportunities to benefit from high-performing teachers.** This is an important step towards raising students' learning outcomes equitably.

Recommendations:

- **Teachers' mastery of the content they teach should be a focus of teacher training in Rwanda. The content and delivery of future teacher professional development programmes in Rwanda must cater to teachers' needs and working conditions.**
- **A continued and concerted effort is needed to support students from more disadvantaged backgrounds. Initiatives in Rwandan secondary schools could benefit from adopting targeted teaching approaches for these groups in pre-service and in-service teacher professional development programmes designed to improve learning outcomes equitably. For example, incorporating more female teachers into the teaching profession and providing professional development opportunities for all teachers to effectively implement gender-responsive pedagogies could help to further narrow the achievement gap.**
- **Similarly, targeted support is needed for overaged students who may have missed grades or repeated school years due to the increased pressures they can face socially, emotionally, and economically.**

Theme 2: Motivation for STEM and teacher continuous professional development

Factors affecting STEM learning and motivation among students

This section draws on qualitative research with 409 students at 12 secondary schools participating in Leaders in Teaching.

Students highly value learning about STEM, and see learning STEM subjects as a path to their own professional and vocational career success and to Rwanda's development as a country.
Students reported that their learning and motivation in STEM is improved by positive teacher-student relationships, and the availability of classroom resources such as library and reading materials, ICT facilities, stationery, and laboratory materials.

Recommendations:

- **Teacher training should focus on supporting educators to develop positive learning relationships with students, especially in the context of large class sizes.**
- **Investing in enriching educational environments, in which students have comprehensive access to resources including laboratories and ICT equipment as well as support for extracurricular activities and collaborative learning, will support student motivation.**
- **Students have important feedback and ideas for improving learning and teaching in STEM, and should be provided with more opportunities to share their views.**

Factors affecting STEM learning and motivation among teachers

Teacher motivation plays a critical role in educational achievement. Teachers reporting higher intrinsic motivation for teaching – a genuine interest in and enjoyment of being a teacher - were more likely to have students with higher mathematics achievement. Teachers whose motivation was negatively affected by systemic factors - such as a lack of resources in the classroom, a lack of preparation time, and large class sizes - were more likely to have students with lower achievement in mathematics.

These findings highlight the complex dynamics of teacher motivation and its critical role in educational achievement, suggesting that **enhancing teacher motivation and alleviating systemic constraints might improve student learning outcomes in Rwanda.**

Recommendations:

- **There is a need for policies that nurture teachers' intrinsic motivation for the profession, potentially through professional development and support systems that enhance autonomy and competence.**
- **Teacher motivation could be further supported by addressing environmental constraints through better resource allocation, smaller class sizes, and more manageable curricula to remove barriers to effective teaching.**

Theme 3: Stakeholder perspectives on changes in teaching quality over the five years of the initiative

This section draws on findings from qualitative research with government stakeholders, Leaders in Teaching implementing partners, funders, and stakeholders not directly involved in the Leaders in Teaching programme such as development partners.

Stakeholders attributed a range of improvements in the Rwandan education system to the Leaders in Teaching initiative, including:

- teachers' increased access to resources
- greater representation of females in STEM
- more positive attitudes towards the teaching profession, notably increased motivation
- increased use of gender responsive and inclusive classroom practices
- improved school management approaches, teacher mentoring and coaching skills
- enhanced learning engagement and better outcomes in STEM subjects
- greater encouragement of girls in STEM.

The stakeholders acknowledged that Leaders in Teaching had an influence on key educational developments in Rwanda such as the institutionalisation of continuous professional development, the establishment of the African Centre for School Leadership, and changes to national assessment and evaluation approaches.

Challenges experienced during stakeholders' involvement with the intervention included:

- difficulties faced during the COVID-19 pandemic such as disruptions to programming, changes to hybrid and digital learning and a loss of student learning and motivation
- the high demand for the initiative, which presented challenges for implementing partners in training the large number of teachers who expressed interest
- challenges arising from a lack of coordination among partners.

Recommendations:

- **Future initiatives would benefit from involving all programme actors and key stakeholders such as government in the coordination of continuous professional development programmes; greater scale-up of programmes; increased government involvement; and a stronger understanding of the sustainability of training programmes within the local context.**
- **It is also important to ensure appropriate infrastructure and resources are in place to support the interventions.**

Resources

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All Leaders in Teaching publications are available at https://bit.ly/LIT-pubs.

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