# The effectiveness of Peer-led and Trainer-led e-Learning Leadership Training for School Leaders: A Randomized Experiment in Rwanda

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## Abstract

This paper studies the effectiveness of two different conditions of offering an e-learning leadership training for school leaders in Rwanda in a randomised controlled trial. We distinguish a trainer-led condition in which a trainer guides the school leader, and a peer-led condition that includes peer discussions among school leaders to facilitate the learning process. We look at multiple outcomes, such as participation rates and exam scores, as well as leadership skills, motivation and satisfaction of school leaders. Results indicate no significant difference between the two groups for most outcomes. For two modules, we find that peer-led school leaders perform significantly higher on both formative and summative assessments. Furthermore, it is observed that trainer-led school leaders self-report fewer e-learning barriers, and higher overall leadership skills. However, this self-reported observation was not confirmed by the teachers from their schools, who also assessed their school leader's leadership skills. The results imply that that the peer-led condition outperformed the trainer-led condition, on all objective outcome measures. Given the much lower costs for organising an online leadership training in a peer-led condition, we can conclude that it does not seem to be worth it to make this e-learning training trainer-led.

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## 1. Introduction

A school's success is largely accountable of school leaders' proper leadership and management skills. School leaders, for example, hold the key for motivating teachers, improving the school's capacity and building favourable climate within schools - all of which contributes to improving educational quality (Pont et al., 2008). Given that in African countries, more than one out of every four children entering compulsory education leaves school early without a secondary diploma (UNICEF, 2021), good school leadership is very important. The most important factors hindering educational completion include inferior educational quality stemming from overcrowded classrooms, presence of underqualified teachers, insufficient learning materials and inappropriate language of instruction (Sabates et al., 2010). Mzuza et al. (2014) confirm that the absence of quality education in presence of overcrowded classrooms, a high pupil-teacher ratio and lack of access to proper learning materials are factors increasing the dropout rates in Malawi. Overall in Africa, children are increasingly obtaining primary education, however, still a substantial number of students drop out of secondary education (United Nations, 2014). In Rwanda, these numbers are worrisome, too, as graduation rates in lower secondary education are only 45.2% of the student population (UNESCO Institute for Statistics, 2021). This is less than half of the students (98%) that are enrolled in primary education (MINEDUC, 2022). Rwanda has been struggling with offering qualitative education as the quantity of schools and students increased whilst the quantity of teachers declined (Karareba and Clarke, 2019; Mukamusoni, 2006). This calls for action at the school level.

There is a particularly important role for school leaders in encompassing school-based problems with the ambition to underpin the whole school approach (Leithwood et al., 2008; Robinson et al., 2008). Ideally, school leaders support teaching and learning of their staff (Leidwooth et al., 2008). An example is that school leaders promote the school as a learning organisation and engage teachers in continuous professional development in general and in induction of new teachers in particular (Robinson et al, 2008). A school's success is largely accountable from school leaders' proper leadership and management skills. School leaders, for example, hold the key for motivating teachers, improving the school's capacity and building favourable climate within schools - all of which contributes to improving educational quality (Pont et al., 2008). This highlights the importance of the leadership training programmes that hold the potential of improving the leadership skills of (aspiring) school leaders through training in administrative and management tasks.

Furthermore, training programmes enable leaders to incorporate leadership dimensions that include creating a vision for learning, instructional programme, curriculum programme, assessment programme, communities of learning, resource acquisition and use, organisational culture and advocacy. Often these dimensions are inspired by different leadership patterns such as instructional leadership, transformational leadership, distributed leadership, transactional leadership and situational leadership (Daniëls et al., 2019). Transactional leadership mostly follows an incentive-based approach to promote extrinsic motivation among the school members (Nguni et al., 2006). Instructional leadership mostly focuses on setting school goals, curriculum implementation, inclusivity, quality of instruction and school environment; transformational leadership aims at promoting intrinsic motivation among the school members (particularly teachers); distributed leadership focuses on sharing responsibilities among teachers, parents and students instead of concentrating it only within the head teacher. Situational leadership refers to the ability of the school leader to adopt to a particular leadership pattern, depending on the context or problem experienced by the school (UR-CE, 2019).

There is not much literature available that shows the effectiveness of professional training programmes for school leaders measured in a quantitative, preferably (quasi-) experimental, way. The few qualitative studies available show that professional leadership training programmes can improve leadership skills of school leaders. An extensive review of 70 studies concerning school leadership in the Global South shows that school leaders have minimal opportunities to attend pre-training, which means they often are unprepared to carry out their tasks (Global School Leaders, 2020). This study also found a positive correlation between leadership training and students' educational performance of programs focus. However, success depends on the design of the training and the quality of the implementation (Global School Leaders, 2020). Bush et al. (2006) evaluated the effectiveness of the 'New Visions: Induction to Headship' programme. They interviewed participants and found that over 80 percent of the cohorts were satisfied with the training programme in the sense that they got the opportunity to work with other school heads, solve problems with others and also received support from facilitators and consultant school heads. Additionally, about half of the participants in the survey reported that the programme helped them build leadership skills. The positive effects of the programme like clearer vision and increased confidence, were discernible even among teachers and governing bodies (Bush et al., 2006). Furthermore, Brundett (2006) found that among the 710 participants of his questionnaire, the "Leading from the Middle" (LftM) programme in England had boosted

the confidence of leaders which enabled them to take charge of the improvement areas within school more efficiently. This further improved the teaching practices in school, particularly in maths teaching, ICT integration and web development. Ng (2017) interviewed school principals, educational ministers and officers from the National Institute for Education and Management (IAB) to gain insights into the mandatory training programmes offered in Malaysia. The study showed that the training programmes in Malaysia were of too short duration and did not emphasise much on incorporating instructional leadership dimension within the school leaders. Furthermore, the training programmes often lacked focus on the educational challenges of 21$^{st}$ century, i.e. often the programme duration is too short for the leaders to learn about the practical implementation of the strategies in real life classroom practices. Woods et al. (2009) conducted a qualitative study using data from online surveys and interviews from the school leaders in Scotland to study their perception regarding the Continuing Professional Development (CPD) programme. Most of the school leaders (over 80 percent) shared positive perceptions about the collaboration and interaction opportunities the CPD programme brings them. However, some of the school leaders found it difficult to participate in the programme owing to heightened expectation from their role as instructional leaders, lack of support or resources, or the distance to the training centres. Nevertheless, around three-quarters of the participants find CPD beneficial to enhance their management skills (Woods et al., 2009).

There are also some formal leadership training programmes available in Africa that are targeted to school leaders that are already appointed. In South Africa, the Advanced Certificate in Education (ACE) was provided by South African universities to improve school leadership skills, and mostly targeted towards the already appointed school leaders (Bush et al., 2006). However, the participants often expressed mixed responses regarding the course content of the material. While some found the course materials useful, others negatively evaluated the programme. Firstly, the programme was found to be too elaborate and detailed whilst often not focusing on the main leadership aspects. Secondly, some considered it less applicable to the main problems of the South African schools. Thirdly, the contact sessions between the mentors and participants were used for the content delivery of the course rather than interactive sessions. Fourthly, it was costly to provide one-to-one mentoring. Fifthly, the mentors were often not well-trained and professional. Lastly, the participants often had to devote huge amount of time in completing assignments for the training programme instead of devoting the time for school management (Bush et al., 2006).

One of the on-the-job leadership-training programme in Ghana is Leadership for Learning (LfL) which trains school leaders (Jull et al., 2014). An evaluation of the LfL programme shows that even though the school leaders might face barriers in implementing the ideas and principles of the programme into practice, they share positive perception about their relevance in leadership and learning practices (Jull et al., 2014). There are also studies that report the effectiveness of such training programmes to substantially improve the leadership pattern of the school leaders in South Africa. Naidoo (2019) studied how the teachers, head of the department and post level-one teachers assess the leadership qualities of their school leader who had graduated from Advanced Certificate in Education: School Leadership and Management (ACELM) programme in South African schools. The result showed that over 70 percent of the respondents agreed that their school leader who graduated from the ACELM programme ensured that the staff members created a positive climate for working in school. Additionally, over 60 percent agreed that their principal used different leadership strategies depending on the circumstances, and all the respondents agreed that their schools' principals, who graduated from ACELM, often demonstrated more effective management skills (Naidoo, 2019).

The literature shows encouraging evidence that highlights how the training programmes can successfully inculcate the leadership dimensions within the school leaders (e.g. Naidoo, 2019). However, there are often constraints with respect to, for example, time, distance to the training centre and costs, which might deter the school leaders from participating in these training programmes (Bush et al., 2006). Online distance learning may prevent these barriers from interfering with the school leaders' participation in the training programmes. However, thus far, no other study has analysed the most effective way of organising online distance learning for school leaders.

The cited studies provide some knowledge on effective school leadership in general. However, there is little experimental evidence of an efficient and effective way to train school leaders in their leadership skills. Effective school leader training can contribute to the professional development of school leaders, to increase effective school leadership, which in turn is expected to have an influence on both teachers and students in the long run (Glewwe and Muralidharan, 2016). Although teachers and students' performance is outside the scope of this research, increasing effective school leadership is at the core of it. Therefore, the research question of this paper is: *What is the effect of trainer-led trainings in a professional development programme for school leaders, in comparison with a peer-led training?*

In order to answer that question, a randomised controlled trial was conducted among Rwandan school leaders who participated in an online leadership training programme. The effectiveness of the trainer-led in comparison to peer-led training was analysed by looking into both direct outcomes during the programme, such as participation rates and exam scores, and indirect outcomes (all measured via questionnaires) such as leadership skills (measured via various leadership dimensions), motivation and satisfaction of school leaders.

## 2. Methodology

### 2.1. Intervention

The intervention of the continuing professional development (CPD) programme on effective school leadership takes place in the institutional context of formal education in Rwanda. The purpose of the Diploma Programme for Effective School Leadership is for school leaders and deputy school leaders to grow in their role as school leader, to develop their competences, to improve the overall school environment and to lead their teachers in order to improve teaching quality, with the ultimate goal to improve students learning, well-being and achievements. Effective school leaders are believed to motivate teachers to invest in their professional development and encourage exchange and learning from each other.

The diploma programme, consisting of 40 credits offered in four modules, is a one-year long programme that originally was set up to have 18 contact days (of which 16 training days in blocks of 2 days, and 2 examination days). In 2019, the programme was offered as a blended programme, with 14 training days face-to-face (f2f) and 2 days through online/distance learning. As of 2020, due to the COVID-19 pandemic, the full programme was offered online, except the examinations which were done face-to-face. This online version of the programme is the one being studied in this paper. The role of the trainers (lecturers from the UR-CE and other universities in Rwanda) is different for the f2f mode of delivery (that was used pre-COVID) and the online mode. In the online mode, the trainers make instructional videos available in the online environment, and act merely as a coach, by logging in frequently to answer questions, and to stimulate discussions on the forum. Trainers follow-up on the online activities of the trainees, while VVOB follows up on the online activity of the trainers. All trainers have received an e-tutoring programme prior to facilitating the online programme. Next to the activity in the formal online environment, many trainers have WhatsApp group discussions with the trainees they are responsible for, and they frequently offer support by telephone. This support involves both

technical and learning support. To prepare trainees for the online CPD programmes, they take part in a preparatory digital literacy training which equips them with the skills to navigate the Moodle environment and complete assignments online. Note that in the experiment at hand the researchers compare this default setting of the online mode with a condition where there is no trainer involved in the online environment, except for grading assignments and assessment.

The Diploma Programme on Effective School Leadership consists of four modules: (1) Overview of school leadership and working with parents and the wider community; (2) Creating strategic direction for the school; (3) Managing the school as an organisation; and (4) Leading learning & leading teaching. These modules are based on the five professional standards for effective school leadership. Furthermore, there are 5 crosscutting themes: school improvement planning, inclusive education, gender, monitoring and evaluation, ICT integration and school collaboration.

In these modules participating school leaders (also referred to as trainees) use an interpretative framework of a school leader, consisting of professional self-understanding and subjective education theory. Trainees are challenged to a constant interaction between thinking and practice. Reflective practices are very important in the programme and are a crucial process to remain critical towards oneself and one's work. Printouts of the programme manuals and other learning materials are distributed to the trainees. This includes four extensive programme manuals, one for each module, with theory and learning activities.

As the programme is competence based, it contains both formative and continuous assessment as well as summative assessment. Furthermore, group learning and sharing experiences is an explicit part of the programme. The programme includes a field visit by trainers to the schools of the trainees. The aim of the field visit is to support the trainees. They receive feedback on how they can perform on the five standards of effective leadership.

### 2.2. Experimental Setup

An experimental study that involves both a trainer-led group and a peer-led group was conducted. Schools are randomised into one of the two study arms according to the administrative sector level, meaning that within a sector all schools are either part of the trainer-led group or of the peer-led group. The reason for randomizing schools at sector level and not at school level, was driven by the fact that school leaders in one sector often know each other and are likely to exchange on ideas and information in for instance Professional Learning Communities which would increase the chance of contamination. Both groups received guidance

from a UR-CE trainer on how to access the online programme and were supported by this trainer during a field visit. Both groups also received the CPD programme fully online.

The trainer-led group received guidance from trainers in online activities while the peer-led group (only) received guidance from peers in online activities. For example, during individual learning activities the trainees in the trainer-led group received feedback from the trainer, while trainees in the peer-led group got automated feedback. Trainees in the peer-led group frequently used peer feedback and peer learning without involvement of trainer, while the trainees in the trainer-led group only occasionally used peer feedback and peer learning. During forum discussions and brainstorm sessions the trainer actively moderated the discussion in the trainer-led group, while in the peer-led group the peers moderated the discussion and the brainstorm themselves. In the trainer-led group, trainees were required to attend one synchronous session per module (additional sessions are optional). Trainees in the peer-led group did not have such a session, although recordings of these sessions were also shared with trainees from the peer-led group. However, the peer-led groups still got assigned a trainer, for marking assignments and the assessments, and for facilitation in the online environment (although they get much less time for that than the trainers in the peer-led group). As a result of the lower involvement of the trainers in the peer-led group, there are 33 trainers for 233 trainees in the trainer-led group, which is about 1 trainer per 7 trainees and 9 trainers for 230 trainees in the peer-led group, which is about 25 trainees per trainer.

### 2.3. Data Collection

The data for this study were collected via various ways. The participation in the various components of each module was automatically registered in the digital environment of the online Moodle. The data from the formative and summative assessment were provided via an Excel sheet by the assessors. The remaining data on outcome measures and background characteristics of the school leaders via pre- and post-test questionnaires using enumerators that are based in Rwanda and work for or are hired by VVOB. These pre- and post-test questionnaires contain both motivation and satisfaction of school leaders, as well as the school leadership dimensions. The latter were also assessed by a random pair of teachers from the same schools where the school leaders work.

### 2.4. Participating school leaders and schools

The total population for analysis for this paper involves 327 school leaders. A total of 48% of all school leaders in the sample were peer-led and the rest (52 percent) were trainer-led.

The experiment originally started off with 486 participants. However, there was some non-response and dropout in the pre-test already with a total of 53 individuals that were lost. Subsequently, some school leaders who filled out the pre-test did not complete the post-test questionnaire, leading to a further decrease of 122 cases. This gives an attrition rate of 27% for the questionnaire, which is evenly distributed among the trainer- and peer-led group. Note that this is not the same as attrition from the programme, because only the sample for which there is full information is used, which is the questionnaire-sample. This brings the total sample to 327 participants who completed the post questionnaire of which 158 school leaders belong to the peer-led group and 169 school leaders to the trainer-led group.

The background information on the peer-led school leader respondents and the trainer-led school leader respondents involved in the study was compared to see if, on average, they are similar in terms of all background characteristics. This background information is collected in the post-test questionnaire. Note that a large share of respondents did not answer the question which subject they taught before becoming a school leader. Although the reason for this is unknown, it might be that this question was misunderstood, and interpreted as which subjects they teach (present tense). Other respondents may not have answered this question, because they are currently not teaching any subjects. Furthermore, a couple of observations on other characteristics are missing.

Table 1 shows that between the peer-led group and the trainer-led group, there is no significant difference between their mean values corresponding to demographic characteristics such as age, gender, work experience, and the characteristics of the schools (in terms of student population and teacher population, etc.) to which they are affiliated. In other words, the trainer-led group and the peer-led group are, on average, very similar in the sense that none of the p-values corresponding to each of the test statistics are significant at the 5 percent level. Note that the comparability between the samples was checked for the data that was available. There are no significant differences between the two groups for these samples.

Table 1 T-statistics, Mann-Whitney statistics and Chi-squared statistics of treatment versus comparison group (school leader) based on assessment, process and questionnaire outcomes

**Table 1**

*T-statistics, Mann-Whitney statistics and Chi-squared statistics of treatment versus comparison group (school leader) based on assessment, process and questionnaire outcomes*

| Variable | N | Average | Std. Dev. | N | Average | Std. Dev. | T-statistic | P-value |
|---|---|---|---|---|---|---|---|---|
| | **Peer-led Group** | | | **Trainer-led Group** | | | | |
| Age | 154 | 43.38 | 6.88 | 167 | 42.97 | 6.81 | 0.76 | 0.44 |
| Years of working as school leader in school | 154 | 5.45 | 3.63 | 166 | 5.51 | 4.64 | -0.05 | 0.95 |
| Years of working as school leader in other school (if applicable) | 69 | 5.88 | 3.89 | 90 | 6.85 | 4.64 | 1.40 | 0.16 |
| Students' population in school | 154 | 1248.90 | 833.27 | 167 | 2625.99 | 13588.86 | 1.25 | 0.21 |
| Teachers' population in school | 154 | 34.56 | 13.31 | 167 | 32.07 | 12.78 | -1.71 | 0.08 |

| Variable | N | | | N | | | Pearson Chi2 | P-value |
|---|---|---|---|---|---|---|---|---|
| **Gender** | | | | | | | | |
| *Male* | 122 | | | 136 | | | 0.24 | 0.61 |
| *Female* | 32 | | | 31 | | | | |
| **Current function:** | | | | | | | | |
| *Deputy school leader* | 91 | | | 81 | | | 3.61 | 0.06 |
| *School leader* | 63 | | | 86 | | | | |
| **Worked as school leader in other school:** | | | | | | | | |
| *Yes* | 72 | | | 92 | | | 2.22 | 0.14 |
| *No* | 82 | | | 75 | | | | |
| **Subjects taught** | | | | | | | | |
| Science | 18 | | | 18 | | | 0.35 | 0.54 |
| Humanities and Arts | 11 | | | 14 | | | 0.04 | 0.83 |
| Language and Literature | 17 | | | 20 | | | 0.00 | 0.98 |
| Entrepreneurship | 4 | | | 5 | | | 0.00 | 0.93 |
| General Studies and Communication | 4 | | | 2 | | | 1.10 | 0.29 |
| Other | 7 | | | 11 | | | 0.41 | 0.52 |

*: significance level at between 1 to 5 percent level; ** significant at less than 1 percent level
*Note: In this table there are no significant differences between the two groups.*

## 2.5. Outcome measures

The relevant outcomes focused on in this study are the following: (1) participation rates in the online Moodle environment in which the online course takes place; (2) formative and summative assessment outcomes from the diploma programme (performance on exams, assignments and the portfolio of evidence); (3) questionnaire outcomes on the level of satisfaction with the CPD programme and e-learning environment; and (4) outcomes on barriers

to participate in e-learning, job satisfaction, work task motivation, motivation to learn, self-efficacy and outcomes regarding leadership styles, competences and skills.

### 2.5.1. Participation rates

In the digital environment of the online Moodle, the participation in the various components of each module was automatically registered. These components consist of participation in the quizzes, feedback assignments, forum discussions and workshops. As each module usually consist of multiple activities belonging to one component, the participation for each school leader was calculated as the share of activities that (s)he attended which is expressed as a percentage in Table 2. Note that the first take was applied and not the resit data.

**Table 2**

*Descriptive statistics participation rates and assessment outcomes*

| Variable | Obs. | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Activity M1 | 322 | .807 | .215 | 0 | .98 |
| Activity M2 | 320 | .82 | .232 | .042 | 1 |
| Activity M3 | 321 | .7 | .27 | 0 | 1 |
| Activity M4 | 203 | .772 | .27 | 0 | 1 |
| Formative assessment M1 | 322 | 10.149 | 2.78 | 0 | 14.025 |
| Formative assessment M2 | 322 | 7.674 | 3.57 | 0 | 13.613 |
| Formative assessment M3 | 322 | 8.787 | 3.784 | 0 | 14.205 |
| Formative assessment M4 | 322 | 8.659 | 3.796 | 0 | 14.475 |
| Exam score M1 | 322 | 27.713 | 4.578 | 0 | 38 |
| Exam score M2 | 322 | 26.871 | 5.433 | 10 | 40 |
| Exam score M3 | 314 | 24.893 | 6.222 | 0 | 38 |
| Exam score M4 | 319 | 30.113 | 5.686 | 7 | 40 |
| Passing rate M1 | 322 | .913 | .282 | 0 | 1 |
| Passing rate M2 | 322 | .693 | .462 | 0 | 1 |
| Passing rate M3 | 322 | .686 | .465 | 0 | 1 |
| Passing rate M4 | 322 | .801 | .4 | 0 | 1 |

*\* Activity measured in value between 0 and 1, 1 representing 100% activity; Formative assessment ranges between 0 and 15; Exam score ranges between 0 and 40; Passing rate is a value between 0 and 1, 1 representing passing the module and 9 representing failing the module.*

### 2.5.2. Formative and summative assessment outcomes

The CPD programme includes both formative assessment (60%) and summative assessment (40%), which are graded by the trainers, who are assigned to the groups of participating trainees (i.e. school leaders).

For each module the formative assessment consists of 2 practice-oriented written assignments where the participant can score a maximum of 15 points per assignment. In total there are 8 assignments divided over the 4 modules. In addition, during each module the portfolio of evidence is assessed. For the portfolio, the participant can obtain a maximum of 25 points per module. Furthermore, participation in online and distance work is monitored. For the formative assessment outcome, a weighted average is calculated for all activities that are part of the formative assessment. Note that the first take was applied and not the resit data.

The summative assessment consists of a two-hour written exam for each module, taking place onsite. Trainees are only allowed to participate in the written exam for each module, when they have at least 85% attendance rate for the module and have submitted all assignments for the module. For the examination, the participant can obtain a score of up to 40 points. Note that the first take was applied and not the resit data.

The passing rate is based on the average of the combined formative and summative assessments, and indicates whether a participant has passed the module or not.

### 2.5.3. Leadership outcomes

The school leaders were provided questionnaires, both pre- and post-intervention, and their responses were recorded on the following aspects:

1)     Barriers to e-learning on a 5-point Likert scale (1= strongly disagree, 5= strongly agree)
2)     Job Satisfaction on a 5-point Likert scale (1= extremely dissatisfied, 5= extremely satisfied)
3)     Work tasks motivation on 5-point Likert scale (1= completely disagree, 5= completely agree)
4)     General self-efficacy on a 5-point Likert scale (1= strongly disagree, 5= strongly agree)
5)     Motivation to learn on a 5-point Likert scale (1= strongly disagree, 5= strongly agree)
6)     Instructional leadership on a 7-point Likert scale (1= never, 7= every day)
7)     Transformational leadership on a 5-point Likert scale (1= not at all, 5= always)
8)     Leadership overall on a 4-point Likert scale (1= high level of support needed, 4= no support needed at present)
9)     Trust in school leaders on a 5-point Likert scale (1= strongly disagree, 5= strongly agree)
10)     Distributed leadership on a 5-point Likert scale (1= strongly disagree, 5= strongly agree)

These 10 constructs consist of an average value based on several statements that were included in the questionnaires that jointly comprise these constructs. Furthermore, the questions underlying constructs 8, 9 and 10 are used to create additional constructs that measure Robinson et al. (2008) leadership dimensions. These five groupings are based on a systematic review and meta-analysis of the previous literature. The authors argue that five dimensions could be derived from 199 listed survey items or constructs in their study. These five leadership dimensions with definitions are taken from Robinson et al. (2008, p.656) and summarised in Table 3. In the final column five dimensions of Robinson et al. (2008) were aligned to the Rwandan five national school leadership standards, as this is what the modules Diploma Programme on Effective School Leadership explicitly relate to.

**Table 3**

*Leadership dimensions*

| Leadership dimensions (Robinson et al., 2008) | Definition | Rwandan five national school leadership standards |
|---|---|---|
| D1) Establishing goals and expectations (Q8.4, 8.9, 10.2, 11.1, 11.2, 11.3) | Includes the setting, communicating, and monitoring of expectations learning goals, standards, and expectations, and the involvement of staff and others in the process so that there is clarity and consensus about goals. | Leading learning, also by working with parents and the local community. |
| D2) Strategic resourcing (Q8.10, 9.1) | Involves aligning resource selection and allocation to priority teaching goals. Includes provision of appropriate expertise through staff recruitment. | Strategic direction for the school. |
| D3) Planning, coordinating, and evaluating teaching and the curriculum (Q8.2, 8.2 8.8) | Direct involvement in the support and evaluation of teaching through regular classroom visits provision of formative and summative feedback to teachers. Direct oversight of curriculum through school wide coordination across classes and year levels and alignment to school goals. | Managing the school as an organisation; leading teaching. |
| D4) Promoting and participating in teacher learning and development (Q8.5, 10,4 10.5, 10.6, 10.7, 10.8, 10.9, 10.10) | Leadership that not only promotes but directly participates with teachers in formal or informal professional learning. | Leading teaching. |
| D5) Ensuring an orderly and supportive environment (Q8.1, 8.6, 8.7, 9.3, 9.4) | Protecting time for teaching and learning by reducing external pressures and interruptions and establishing an orderly and supportive environment both inside and outside classrooms. | Managing the school as an organisation. |

In addition to questionnaires among school leaders, this study also includes a random pair of teachers from the schools of which the trainees are participating in the diploma programme. The teachers assessed the school leadership style and competences of their school leaders. The main reason those responses were collected is to control for socially desirable answers from the school leaders on the questionnaires for non-cognitive outcomes on leadership, and to have a more objective measure of school leadership. Therefore, the answers from the teachers were analysed to measure impact of the trainer-led vs. peer-led intervention. Note that the teachers' questionnaire only covered the leadership topics (6) to (10). Descriptive statistics of all constructs including their reliability score are presented in Table 4.

The reliability was measured through alpha scores of the school leader and teacher questionnaire. Most of the scales in the questionnaires are measured well (alpha score at least 0.7), but lower reliability statistics were observed for some scales, despite the good overall quality of the selected questionnaires, the extensive piloting phase and the professional translation/presentation of the English questions into Kinyarwanda. This is most likely due to the population of study whereas the questionnaire was conducted among Rwandan school leaders and teachers, in most cases the questionnaires have only been validated in the past in Western societies, and, additionally, not necessarily among school leaders or teachers. Further, it may be the case that the Rwandan population answered some questions in a socially desired way. Cultural norms and values can influence the way respondents perceive a question, and, as such, how they provide answer to that question (Furnham, 1986). It was argued that the outcome measures that produced stable results in both the baseline and final measurement should be retained for further evaluation. These are the scales that have a reliability of at least alpha = 0.6. The scales that have a reliability between 0.6 and 0.7 will be considered with extra caution when discussing the results.

**Table 4**
*Descriptive statistics and reliability measure post-test leadership outcomes school leaders and teachers*

| Variable | Obs. | Mean | Std. Dev. | Min | Max | Reliability |
|---|---|---|---|---|---|---|
| **School leaders** | | | | | | |
| E-learning barrier | 324 | 3.704 | .54 | 2.25 | 5 | 0.79 |
| job satisfaction | 324 | 3.845 | .506 | 1.643 | 5 | 0.89 |
| Motivation | 324 | 3.564 | .337 | 2.533 | 4.533 | 0.72 |
| Self-efficacy | 324 | 4.272 | .453 | 2.875 | 5 | 0.85 |
| learning motivation | 324 | 3.928 | 0.34 | 2.95 | 4.7 | 0.68 |
| instructional leadership* | 324 | 5.399 | 1.035 | 1.8 | 7 | 0.85 |
| transformational leadership | 324 | 4.172 | .419 | 2.619 | 5 | 0.88 |
| leadership overall** | 324 | 2.647 | .869 | 1 | 4 | 0.95 |

| Variable | Obs. | Mean | Std. Dev. | Min | Max | Reliability |
|---|---|---|---|---|---|---|
| trust in school leader | 324 | 4.516 | .439 | 2.75 | 5 | 0.62 |
| distributed leadership | 324 | 4.384 | .476 | 2.7 | 5 | 0.89 |
| distributed leadership - Establishing goals and expectations | 324 | 4.392 | .539 | 2.333 | 5 | 0.76 |
| distributed leadership - Promoting and participating in teacher learning | 324 | 4.381 | .501 | 2.714 | 5 | 0.86 |
| Leadership dimension D1 – Establishing goals and expectations | 324 | 3.833 | .426 | 2.667 | 4.667 | 0.68 |
| Leadership dimension D2 – Strategic Resourcing | 324 | 6.852 | 1.437 | 2 | 9 | 0.70 |
| Leadership dimension D3 – Planning, coordinating and evaluating teaching and the curriculum | 324 | 2.689 | .904 | 1 | 4 | 0.88 |
| Leadership dimension D4 – Promoting and participating in teacher learning | 324 | 4.15 | .444 | 2.75 | 4.875 | 0.79 |
| Leadership dimension D5 – Ensuring an orderly and supportive environment | 324 | 3.451 | .547 | 2.2 | 4.4 | 0.47 |
| **Teachers** | | | | | | |
| instructional leadership* | 301 | 3.493 | 1.04 | 1 | 6.2 | 0.84 |
| transformational leadership | 301 | 3.701 | .536 | 2 | 4.9 | 0.91 |
| leadership overall** | 301 | 4.198 | .478 | 2.111 | 5 | 0.83 |
| trust in school leader | 301 | 4.097 | .616 | 2 | 5 | 0.74 |
| distributed leadership | 301 | 4.356 | .37 | 3.35 | 5 | 0.76 |
| distributed leadership -  Establishing goals and expectations | 301 | 4.308 | .483 | 2.667 | 5 | 0.65 |
| distributed leadership - Promoting and participating in teacher learning | 301 | 4.376 | .4 | 3.214 | 5 | 0.72 |
| Leadership dimension D1 – Establishing goals and expectations | 301 | 4.203 | .454 | 2.667 | 5 | 0.65 |
| Leadership dimension D3 – Planning, coordinating and evaluating teaching and the curriculum | 301 | 4.218 | .582 | 2 | 5 | 0.66 |
| Leadership dimension D4 – Promoting and participating in teacher learning | 301 | 4.371 | .388 | 3.25 | 5 | 0.72 |
| Leadership dimension D5 – Ensuring an orderly and supportive environment | 301 | 4.169 | .501 | 2.2 | 5 | 0.72 |

*Instructional leadership overall has a score between 1 and 7.*
*\*\* Leadership overall has a score between 1 and 4.*
*All other scales are between 1 and 5*

### 2.6. Estimation method

The study was designed as a randomized trial, wherein participants were randomly assigned to the two groups. This means the analysis can take place with relative straightforward statistical techniques. These include a comparison of the trainer-led scenario with the peer-led scenario in relation to well-chosen outcomes (as described above), while controlling–for background information of school leaders and/or schools, as well as controlling for the group level in which the school leaders received the training using regression techniques.

To estimate the impact of participation ($P_{is}$) in the leadership programme for school leaders on the outcome measures ($Y_{is}$), the following linear regression was used:

$$Y_{is} = \gamma_0 + \mu_0 P_{is} + \sigma_s + \xi_i \qquad (1)$$

The parameter $\sigma_s$ reflects again unobserved group-level influences, and $\xi_i$ the usual standard error.

Participation in leadership training is normally likely non-random. Several covariates, often unobserved in the data, may determine the participation status of school leaders, while, at the same time, they are determinants of $Y_{is}$. Omitted variable bias may then bias the estimate of $\mu_0$. To solve the endogeneity issue, the advantages of random assignment were explored for the two groups.

Random assignment implies that significant differences between treated and untreated teachers are based on a random error in the assignment process. As a result, systematic differences between the treatment and control group are cancelled out (Rubin, 1974; Angrist & Pischke, 2008). Or put differently, by applying RCT, it is possible to account for the omitted variable bias by looking at differences between the two groups outcomes of participating school leaders.

In addition to relying on random assignment, a set of covariates (that may also add to the explanatory power of the variation in the outcome) was added to the regression analyses. From the school leader background characteristics, years of experience, age, years as a school leader in that school, gender, position (school leader or deputy school leader), and level of education qualification were added. At the school level, the size of the student population, the number of teachers in the school, and the school type (private school, public school or government-aided school) were included. For the outcomes on satisfaction, self-efficacy, motivation, and leadership the pre-test measure as a control were added to the regression as well.

Furthermore, standard errors were clustered at the level of the group in which the school leader participated to account for the groups in which the training takes place. This includes controlling for the trainer, that both guides the group (in case of the trainer-led group) as well as grades the exams, assignments, portfolios etc. (both groups).

## 3. Results

The foregoing tables show the short version of the regression results.

Table 5 shows the participation rate, as well as the formative and summative assessment outcomes and the passing rate for each of the four modules separately. The results in table 5 show that there are no significant differences between the two modalities for the participation and the passing rate. For the formative assessment, a significant difference in favour of the peer-

led group in Module 2 was found, and for the summative assessment (exam score) a significant difference in favour of the peer-led group in Module 4 can be seen. Most other coefficients are negative, indicating a higher score for the peer-led group, although the difference is not significant. All in all, the analyses of the participating and assessment outcomes are in favour of the peer-led group.

Table 6 shows the self-reported outcomes by the school leaders on e-learning barriers, motivation, self-efficacy, satisfaction and the various leadership outcomes (instructional leadership, transformational leadership, leadership overall, trust in school leader, and distributed leadership, as well as the 5 leadership dimensions that are derived from these leadership constructs). Table 6 also shows that trainer-led school leaders rate themselves significantly higher on overall leadership (significant at the 10%-level) and on planning, coordinating and evaluating the teaching of the curriculum at their school. Furthermore, they report to encounter less e-learning barriers. Peer-led school leaders on the other hand rate themselves higher on self-efficacy, as well as all constructs that are related to distributed leadership.

Table 7 shows the leadership outcomes and dimensions reported by the randomly selected teachers from the school from which the school leaders participated in the leadership training. Note that the results of individual teachers are aggregated (averaged) at the level of the participating school leader, to account for the fact that the number of teachers that have assessed the leadership skills of the school leaders may differ between schools.

Interestingly, none of these self-reported results on the leadership constructs are confirmed by the randomly selected teachers from the schools of the participating school leaders, neither for the outcomes that were more positively self-reported by the trainer-led nor for the outcomes that were more positive for the peer-led group[1]. The only outcome that is significantly different when teaches assess their school leaders' leadership skills is instructional leadership, which is rated in favour of the peer-led school leaders.

The results show that for most outcomes there is no significant difference between the two groups, despite a much larger trainer time investment in the trainer-led group. However, there are a few differences in outcomes. For two modules, it was found that peer-led school leaders perform significantly higher on both formative and summative assessments. And although trainer-led school leaders self-report fewer e-learning barriers, and higher overall

**Table 5**

*Regression analyses participation and assessment outcomes*

| | Participation rate during Module | | | | Formative Assessment | | | | Exam score (summative assessment) | | | | Passing rate | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M1 | M2 | M3 | M4 | M1 | M2 | M3 | M4 | M1 | M2 | M3 | M4 |
| Peer-led group | 0.0394 | -0.0143 | 0.0276 | 0.00966 | -0.826 | -0.715** | -0.627 | 0.104 | -0.262 | 1.244 | -0.577 | -2.439** | -0.0431 | -0.0278 | -0.0272 | -0.0209 |
| | (0.0238) | (0.0285) | (0.0432) | (0.0568) | (0.481) | (0.306) | (0.541) | (0.482) | (0.719) | (1.113) | (1.126) | (0.856) | (0.0419) | (0.0514) | (0.0666) | (0.0582) |
| Control variables | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Observations | 314 | 312 | 313 | 196 | 313 | 313 | 313 | 313 | 313 | 313 | 305 | 310 | 313 | 313 | 313 | 313 |
| R-squared | 0.073 | 0.093 | 0.067 | 0.051 | 0.109 | 0.132 | 0.103 | 0.082 | 0.054 | 0.137 | 0.068 | 0.133 | 0.095 | 0.081 | 0.092 | 0.111 |
| # Clusters | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |

*Robust standard errors in parentheses*

*** p<0.01, ** p<0.05, * p<0.1*

**Table 6**

*Multivariate regression analyses Leadership outcomes – School leaders*

| | E-learning barrier | job satisfaction | motivation | self efficacy | learning motivation | instructional leadership | transformational leadership | leadership overall | trust in school leader | distributed leadership | distributed leadership - Establishing goals and expectations | distributed leadership - Promoting and participating in teacher learning | Leadership dimension D1 – Establishing goals and expectations | Leadership dimension D2 – Strategic Resourcing | Leadership dimension D3 – Planning, coordinating and evaluating teaching and the curriculum | Leadership dimension D4 – Promoting and participating in teacher learning | Leadership dimension D5 – Ensuring an orderly and supportive environment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peer-led group | -0.147* | -0.0599 | -0.0319 | -0.0870* | -0.687 | 0.0106 | -0.00464 | 0.172* | -0.0322 | -0.116** | -0.147** | -0.107** | -0.0562 | 0.205 | 0.217** | -0.0743 | 0.0524 |
| | (0.0708) | (0.0484) | (0.0334) | (0.0473) | (0.418) | (0.0967) | (0.0541) | (0.0872) | (0.0504) | (0.0494) | (0.0662) | (0.0506) | (0.0520) | (0.169) | (0.0866) | (0.0476) | (0.0658) |
| Control variables | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Observations | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 |
| R-squared | 0.118 | 0.162 | 0.103 | 0.157 | 0.113 | 0.158 | 0.213 | 0.053 | 0.165 | 0.187 | 0.207 | 0.139 | 0.097 | 0.066 | 0.056 | 0.117 | 0.061 |
| # Clusters | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

**Table 7**

*Multivariate regression analyses Leadership outcomes – Teacher*

| | instructional leadership | transformational leadership | leadership overall | trust in school leader | distributed leadership | distributed leadership - Establishing goals and expectations | distributed leadership - Promoting and participating in teacher learning | Leadership dimension D1 – Establishing goals and expectations | Leadership dimension D3 – Planning, coordinating and evaluating teaching and the curriculum | Leadership dimension D4 – Promoting and participating in teacher learning | Leadership dimension D5 – Ensuring an orderly and supportive environment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Peer-led group | -0.598** | -0.0399 | 0.0296 | 0.0432 | 0.0234 | 0.0240 | 0.0200 | 0.0491 | 0.0508 | 0.00625 | 0.0333 |
| | (0.210) | (0.0772) | (0.0688) | (0.0970) | (0.0727) | (0.0737) | (0.0805) | (0.0831) | (0.0666) | (0.0802) | (0.0767) |
| Control variables | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Observations | 244 | 244 | 244 | 244 | 244 | 244 | 244 | 244 | 244 | 244 | 244 |
| R-squared | 0.197 | 0.272 | 0.293 | 0.270 | 0.168 | 0.096 | 0.158 | 0.248 | 0.231 | 0.165 | 0.227 |
| # Clusters | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |

*Robust standard errors in parentheses*

*** p<0.01, ** p<0.05, * p<0.1*

leadership skills, this was not confirmed by the teachers from their schools, who also assessed their school leader's leadership skills. They actually rated the school leaders that had the peer-led training higher. This points at an overestimation of skills by the trainer-led school leaders, which is not reflected in the more objective measures or in the evaluation of the teacher of their school.

Furthermore, when comparing the costs of the two different modalities per participant, it was found that the costs for the peer-led participants are 1.4 times lower than the costs per participant in the trainer-led group (a total of €619 per participant versus €884 per participant) (see Haelermans et al., 2022 for detailed information on how these costs are calculated).

In sum, the results imply that that the peer-led condition outperformed the trainer-led condition and is lower in costs. So getting back to the research question, that asked what the effect was of a trainer-led training program compared with a peer-led training programme, it can be concluded that there is no positive effect of the trainer-led training program in comparison with the peer-led program. On the contrary, the effect is negative for the trainer-led group for the objective outcomes where a difference was found. Furthermore, the effect is not only in favour of the peer-led group in the studied outcomes, but also in costs.

## 4. Discussion

The literature indicates that online moderation by trained trainers may play a positive role in better student performance (Yen et al., 2018), this does not necessarily have to be the case, as can be concluded from this study. On the other hand, the literature also indicates that interaction with a tutor is not per definition always meaningful in an e-learning course, and, as such, not always adding to student performance, as compared to a well-designed e-learning course with only limited mentoring available (Price et al., 2007). The latter also seems to be the case in this study, because no evidence was found that the more active and frequent presence of a trainer in the trainer-led group leads to better (objective) outcomes. A possible explanation for these findings might therefore be that the role and interaction of the trainer with the trainees in the trainer-led group were not frequent and meaningful enough, or that the online training skills of these trainers were too low, to lead to a significant difference in the online environment. Unfortunately, this could not be observed during the experiment. It is also possible that there is an aversion of the school leaders for formal trainers, or that peers understood each other much better, leading to a better learning experience. Another potential reason is that the peer-led group, who was aware of the fact that they had less access to a trainer, developed much better reflection

and self-regulation skills to benefit more from the training. Most likely, the actual explanation is a combination of the options mentioned before. Unfortunately, all these possible explanations cannot be tested in the current study, and for future research it would be advisable to get a better idea on the actual role and participation of the trainers and the peers in the online environment, for example via qualitative research, as well as on their motivation and self-regulation skills, for example via questionnaires.

It is important to realize that it has not been possible to compare the effectiveness of either programme with earlier cohorts that have participated in fully f2f or blended versions of the training programme, because there was no f2f or blended version in the year of this study. Therefore, it is not possible to draw any conclusions on how effective a f2f training programme is as compared to an e-leaning condition. It can only say something about which form of e-learning condition is more effective than the other. Additionally, it is also not possible to link these findings to earlier literature that focuses on the effectiveness of school leadership training programmes, as this research did not focus on that question. A question whether such a programme was effective was not asked, but merely which condition of offering this programme was more effective than the other. It is thus recommended that future research will compare f2f or blended trainings with e-learning sessions to analyse the effectiveness of school leadership training programmes. Especially because Bruns et al. (2017) found positive and significant effects of such an ICT-based programme compared to f2f trainings.

## 5. Conclusion

In this paper, the effectiveness of two different conditions of offering online leadership training for secondary school leaders in Rwanda was studied. A randomised controlled trial among school leaders who participated in the leadership training, comparing a trainer-led condition with a peer-led condition. Overall, it was found that for most outcomes there is no significant difference between the two groups, despite a much larger trainer time investment in the trainer-led group. For two modules, the peer-led school leaders perform significantly higher on both formative and summative assessment. But trainer-led school leaders self-report lower e-learning barriers, and higher overall leadership skills. However, this is not confirmed by teachers from their schools who assessed their school leader's leadership skills as well, and do not report significant differences, except for instructional leadership in favour of the peer-led group of school leaders. The results imply that the more objective measures all point in favour of the peer-

led group. This conclusion cannot only be drawn based on the participation, assessment and leadership outcomes, but are also confirmed by a short satisfaction questionnaire, that was anonymously distributed at the end of the CPD programme. Participants in the peer-led group were significantly more satisfied with the programme than participants in the trainer-led group.

The contribution of this study is therefore threefold: 1) this study is the first to make a clear comparison between different training methods in the context of African teacher trainings, 2) this is one of the few studies to provide causal evidence on professional training programmes for school leaders, at all, but particularly in Africa, and 3) thus far, no other study has analysed whether peer-led or trainer-led online distance learning for school leaders is the most effective for school leaders, which is particularly valuable to get insights in during these times of a global pandemic.

All in all, the conclusion is clear: given the much lower costs for organising an online leadership training in a peer-led way, and the results that are almost all in favour of the peer-led group, it does not seem to be worth it to make this online training trainer-led. Therefore, the implication of this study is that the more cost effective option of training school leaders while using peer-led training is the better option to train school leaders in different leadership styles.

**Data availability statement:** For replication purposes, the data are available upon request from the corresponding author.

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