



RIGHT TO PLAY
PROTECT. EDUCATE. EMPOWER.

Right To Play E-training and Certification Project Evaluation: Endline Report

Prepared by Laterite and Oxford MeasurEd

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laterite
DATA | RESEARCH | ANALYTICS

 **Oxford
MeasurEd**

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1. Introduction

1.1 Background

Ninety-two percent of children in low-income countries are predicted to reach adulthood without the skills they need to thrive (International Commission on Financing Global Education Opportunity, 2016). Holistic skills development through play-based pedagogies can help tackle this problem, improving academic performance, socio-emotional skills, and physical and psychosocial wellbeing (Parker and Thomsen 2019). However, the implementation of such pedagogies faces significant constraints.

One such constraint is the lack of high-quality teacher training schemes on how to implement Play-Based Learning (PBL) in the classroom. Right To Play, the Government of Rwanda, and the University of Cambridge, and the University of Rwanda College of Education, have partnered to address this issue through an accredited blended-training course for teachers in Rwanda funded by the LEGO foundation. This project aims to leverage the scalability, accessibility, cost-effectiveness, and impact of online training. Rwanda was identified as an optimal location to test this approach due to its efforts to become a regional leader in technology and the country's plans to integrate play-based learning into their education policies and to strengthen Teacher Professional Development systems.

The Learning through Play E-training and Certification program is implemented through a blended Continuous Professional Development (CPD) approach. It trains, certifies, and mentors lower primary teachers (P1-P3) in Rwanda to deliver the competency-based curriculum (CBC) through Learning through Play (LtP). It aims to provide the essential knowledge and skills for the participants to facilitate more collaborative, engaging, and playful learning classrooms. The program was first piloted with a small “pre-alpha” cohort of 30 lower primary teachers, eventually expanding to seven districts in Rwanda (Burera, Muhanga, Musanze, Ngoma, Ngororero, Nyanza, and Rwamagana). The program was rolled out and now reaches 304 public and government-aided schools and 3,343 lower primary teachers (25% male, 75% female), who will in turn reach up to 158,837 lower primary learners. The program adopts a user-centered design and co-creation approach through giving teachers a central role in the design of the blending learning course.

The program aims to achieve positive impact by addressing two long-term outcomes:

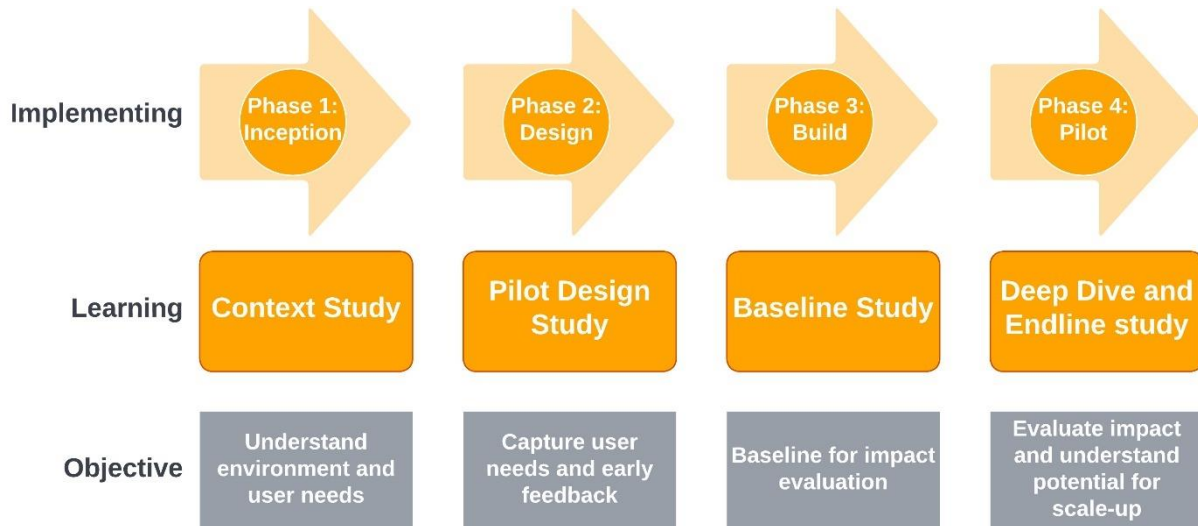
1. Improve teacher classroom practice in delivering the CBC through the implementation of Learning through Play in lower primary classrooms.
2. Increase Right To Play's ability to develop and deliver scalable and playful online Teacher Professional Development.

1.2 Study objectives

Laterite and Oxford MeasurEd conducted a mixed methods impact evaluation to evaluate the overall effectiveness of the piloted E-training and certification project. This report brings together evidence from the baseline and endline, including qualitative interviews with lower primary teachers, their school leaders and classroom observations using the LEGO

Foundation's PLAY tool. Qualitative data from focus group discussions (FGDs) with teachers and learners provide nuanced insights into teachers' and students' experiences with the course and Learning through Play.

Figure 1: Overview of learning studies in relation to right to play implementation stages.



The aim of this evaluation is to assess the impacts of the blended training on teacher and head-teachers knowledge, attitudes, and their practice of play-based learning in the classroom. In addition, we seek to:

- Assess current barriers and challenges to course access/blended training participation and course completion.
- Investigate the key causal pathways and assumptions made in the pilot's theory of change.
- Assess the program's impacts on key outcomes related to teacher and headteacher knowledge, practices, and attitudes and implementing play-based learning in the classroom.
- Contribute to capturing a selection of indicators in the logical framework at impact, and long-term outcome level where surveys and FGDs are listed as a means of verification.

This study relies on data collected among schools, teachers, and students. We focus on teachers eligible to participate in the E-certification course who registered for or completed the blended training between the dates of surveying (October 2023 for the baseline and June 2024 for the endline, before revision sessions and exams begun). This study represents the first cohort of trainees reached by the pilot e-certification course.

Evaluation Report Structure

- **Chapter 2** provides an overview of the RTP E-certification and Training program and the causal pathways associated with it. Based on these pathways, we present the key research questions at the end of the chapter.
- **Chapter 3** describes the evaluation design and the data sources used. It highlights the key methods and analysis techniques applied throughout the evaluation.

Additionally, it presents an overview of the treatment and control groups surveyed (schools, teachers, and headteachers) at baseline and endline, and investigates the comparability of these groups.

- **Chapter 4** presents the key findings, which are structured along the causal pathways outlined in chapter 2 using a framework of knowledge, attitudes, and practices. It combines insights from quantitative surveys, classroom observations, and insights from qualitative interviews and FGDs conducted.
- **Chapter 5** provides conclusions and recommendations.

2. The RTP E-training and Certification program

2.1. The E-training and Certification course

The course is designed as a blended CPD course with an online and a face-to-face component. The online component includes a self-paced course and online live sessions facilitated by lectures from University of Rwanda-College of Education (URCE). Teachers are offered videos, interactive exercises, teaching resources, and quizzes to help them progress through the course. A variation of the online course targets school leaders. The course is split into two modules, each consisting of five units. Teachers are expected to complete each unit within two weeks.

- **Module 1:** Foundations in Learning through Play provides teachers with a broad understanding of the topic and consists of five units:
 - The importance of play
 - Play as a pedagogy for learning
 - Classroom management and building a positive learning community
 - The role of the teacher in Learning through Play
 - Formative assessment of CBC skills
- **Module 2:** Learning through Play for Competency-Based Curriculum (CBC) teaching and learning examines how Learning through Play can be used to deliver the CBC. It consists of five units:
 - Play as a method to implement the CBC
 - Playful subject implementation
 - Playful lesson planning
 - Learning through Play teaching and learning materials and resources
 - Being a role model for Learning through Play

The face-to-face component of the course starts off with a two-day in-person orientation for teachers, and an equivalent session specifically for school-based mentors and school leaders. The orientation sessions are facilitated by Right To Play, URCE and Rwandan Basic Education Board (REB). While teachers are participating in the online course, they are supported through two regular in-person events:



Bi-weekly Communities of Practice (CoP): School-based mentors organize a community of practice for the teachers following the online course to reflect on their recent learnings, practice, challenges, and successes with their peers. The CoP is held every two weeks and is facilitated by the school-based mentor.



Monthly coaching visits: School-based mentors function as coaches for their school's teachers. They meet once a month with every teacher they are coaching to help them reach their performance goals. These visits include setting personal goals related to Learning through Play, observing classes using the provided observation tool, providing actionable feedback, and supporting teachers in finding solutions to their challenges.



Activities delivered by URCE: URCE lecturers conducted one-time face-to-face classroom observations in Nyanza and Ngororero, and they delivered four online live sessions.

During the first year of implementation there have been some important changes to the implementation of the program, due to reasons outside of RTP's control. Most notably, teachers in the second cohort of the program no longer have the option of receiving external accreditation through URCE. This also means that there are no live lectures from URCE staff for cohort 2. In addition, the orientation sessions are now only provided to school leaders, school-based mentors, and SET (Science Elementary Technology)- teachers, who in turn are expected to inform their colleagues about the set-up of the program and help all teachers register on the online learning platform.

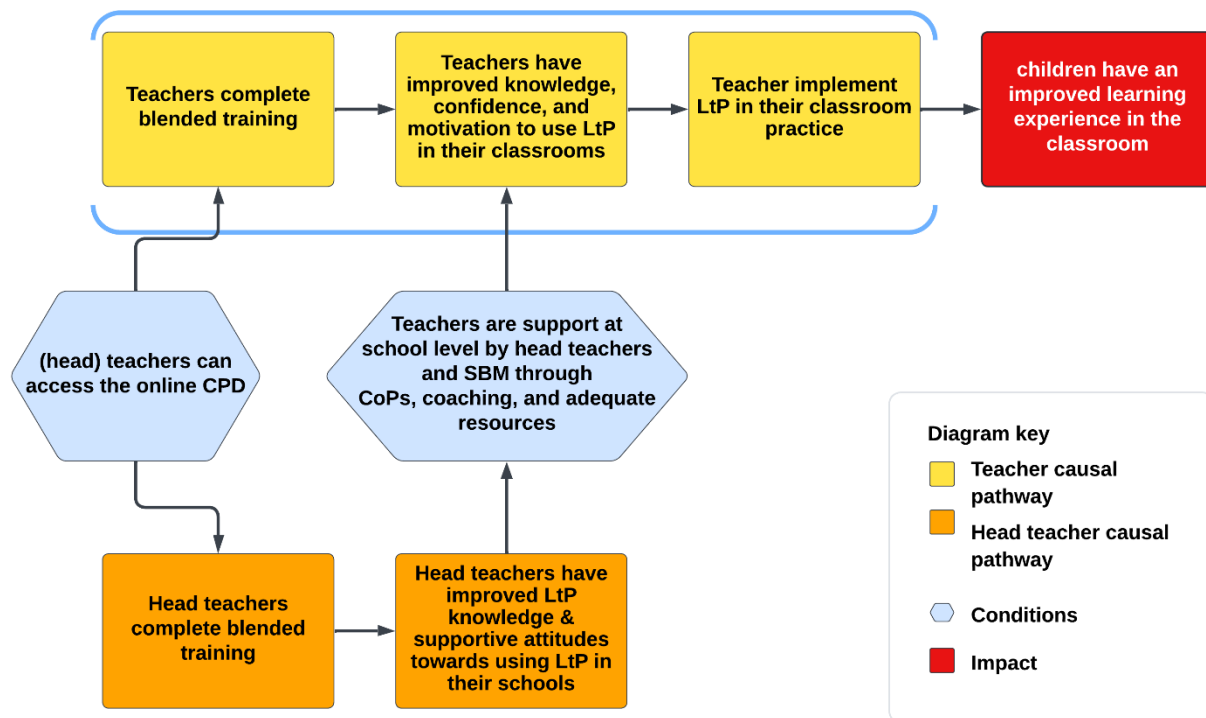
Since teachers of the second cohort have not yet completed their training, the impact evaluation focused on cohort 1 only.

2.2 Causal pathways

The evaluation is structured along the causal pathways (Figure 2) that teachers and headteachers follow when going through the certification program.

For teachers in schools that participate in the project, Figure 2 shows that teachers first require adequate access and time to access the online course to participate and complete the online component of the training. Once teachers have gone through the online course, it is theorized that they increase their knowledge about Learning through Play (LtP) approaches and change their attitudes (that is: motivation and confidence to use LtP in the classroom). The Theory of Change thus hypothesizes that completion of the course is associated with increased knowledge about LtP, and subsequently, increased motivation. Next, the causal pathways indicate that this will lead to primary 1 to 3 teachers implementing LtP-based approaches in their day-to-day work in the classroom. The Theory of Change then anticipates that teachers with higher levels of confidence and motivation are more likely to implement LtP-based approaches and practices in the classroom. Ultimately, it is theorized that implementing these LtP-based approaches leads to an improved learning experience for children in the classroom.

Figure 2: Simplified causal pathway for Teachers and Headteachers



For school leaders that participate in the certification program, the Theory of Change hypothesizes a similar causal pathway. Here, it is theorized that school leaders or head teachers with adequate access and time to complete the blended training increase their knowledge about LtP approaches, and will create a conducive environment for teachers, through CoPs, via School-Based Mentors, and observation and coaching. Teachers are more inclined to incorporate Learning through Play in their classrooms when head teachers and SBMs have created a school environment that provides supportive CoPs, observations and coaching. This is shown as a ‘moderator’ effect in blue (Figure 2).

2.3 Research questions

The study is structured around the themes of access, knowledge, attitudes, and practice. Each team is developed into research questions designed to explore critical steps in the E-certification project’s causal paths. We distinguish between analyzing the causal chain associated with the project and studying the impacts of the project.

Access:

- What are the key determinants of E-course access and E-course completion?

Knowledge & attitudes:

- To what extent does participation in the E-certification program enhance teachers' knowledge, motivation and confidence and school leaders' support for Learning through Play?
- What is the effect of school-level support on teachers' course completion, knowledge, and attitudes towards Learning through Play?
- What is the impact of the E-certification program on teachers' and school leaders' knowledge and attitudes regarding Learning through Play?

Practice:

- To what extent does training participation, knowledge, and motivation enhance teachers' implementation of Learning through Play approaches in the classroom?
- What is the effect of school-level support on the implementation of Learning through Play approaches in the classroom?
- What is the impact of E-certification program on teachers' use of Learning through Play in the classroom?
- How did the blended training affect students' learning experiences?
- How do other CPD programs affect the changes in knowledge, attitudes, and practice that we observed?

3. Evaluation Design

This study was designed to evaluate the program's effects on teachers' and head teachers' knowledge, attitudes, and practices using a quasi-experimental, longitudinal design based on a matched control group. This includes qualitative and quantitative data collection at two points in time: baseline and endline, with two groups - schools participating in the E-training project and matched control schools.

This quasi-experimental approach is a research method that helps us understand a program's impact by comparing outcomes between two groups of schools: those who participate in the program and a similar group that does not. The control or comparison group represents the counterfactual situation that would have happened in the absence of the E-certification course.

3.1 Sampling strategy

Sampling schools

The E-certification course is offered at school level. Right to Play had already established eligibility criteria for schools to be included in the treatment group receiving the E-certification course. These criteria included being connected to electricity and to the internet, availability of computers and mobile devices, and teachers with previous training in English. All schools in the selected districts that met the inclusion criteria were eligible to participate in the E-certification course. For the treatment group, the sampling frame (the list of schools from which we randomly sampled) consisted of the set of 118 primary schools in the three districts targeted by Right to Play as the first cohort to attend the course in September 2023. From this set of 118 schools where the program was rolled out, 85 schools were randomly selected to survey as treatment group schools. The treatment group is thus composed of schools from the districts of Muhanga, Nyanza, and Ngororero (see Table 1).

Selecting control group schools

Control group schools were selected at baseline according to the comparable eligibility criteria used for treatment schools, using matching techniques and the Ministry of Education's Education Management Information System (EMIS) dataset, which provides further information about school resources. The information about schools was confirmed prior to data collection through short interviews with school leaders. This is outlined in the baseline report (see Laterite & Oxford MeasurEd: Findings from the baseline evaluation of Right to Play's E-certification course).

The extensive amount of data available in the EMIS database and the additional geospatial data from Laterite's database ensured that enough information was used to ensure that the control schools group can act as a solid counterfactual in this evaluation design. Some schools were excluded from the potential pool of control schools because they were either targeted by other Learning through Play interventions from Right to Play in the past or because they were part of the cohort that will receive the E-certification course in January 2024. The control group schools thus consist of comparable treatment group schools in the eight neighboring

districts (Gakenke, Gisagara, Huye, Kamonyi, Karongi, Nyamagabe, Nyabihu, and Rutsir) that will not be exposed to the course in the second cohort (January 2024) and that have not been exposed to any interventions on Learning through Play by Right to Play in the past.

Table 1: Distribution of sampled schools by treatment arm and district

District Name	Arm of the study	
	Control	Treatment
Gakenke	10	0
Gisagara	9	0
Huye	18	0
Kamonyi	19	0
Karongi	3	0
Muhanga	0	30
Ngororero	0	23
Nyabihu	7	0
Nyamagabe	12	0
Nyanza	0	32
Rutsiro	7	0
Total	85	85

Sampling teachers within schools

Teacher survey: Five randomly selected teachers (primary grade 1, grade 2 or grade 3) per school.

School leader survey: One head teacher or school leader per school.

Classroom observation: Two classrooms per school.

3.2 Data sources

All data collection tools for this study had gone through an extensive tool development or adaptation and review process, including:

- Review of research and pre-existing instruments
- For classroom observations, the LEGO PLAY tool was adapted by Oxford MeasurEd with input from Right to Play and Laterite
- For all other instruments, development of draft versions with input provided by Right to Play and Oxford MeasurEd
- Final tool translation, back-translation, and instrument testing to ensure clarity in meaning and accuracy of translations

Primary data collection deployed five survey instruments:

School leader survey: This survey seeks to understand and track changes in school leader knowledge and attitudes towards Learning through Play and in their support for the use of Learning through Play in the classroom. To achieve this, we interviewed one headteacher for each sampled school to collect data on areas including:

- Current work status and qualification
- School development, leadership, and mentoring
- Existing support systems for teacher learning (e.g., Communities of Practice, School-Based Mentors) and perceived effectiveness
- Knowledge of Learning through Play practices
- Attitudes and beliefs towards Learning through Play

Teacher survey: This survey seeks to understand and track changes in teacher knowledge and attitudes towards Learning through Play (including their motivation and confidence to use it in the classroom), self-reported teaching practices with respect to Learning through Play, and access to support to implement Learning through Play in the classroom. To achieve this, we interviewed five teachers from each school and collected data on areas including:

- Current teaching status and qualifications
- Access to electronic devices and the internet
- Experiences with previous online training or training on Learning through Play
- Access to support for learning at the school level (e.g., Communities of Practice, School-Based Mentors) and perceived effectiveness
- Teacher knowledge and beliefs towards Learning through Play
- Teacher attitudes towards Learning through Play, including confidence and motivation to implement it in the classroom
- Self-reported teacher practices in the classroom, with a focus on Learning through Play

Classroom Observation Tool: This seeks to understand and track increases in the implementation of Learning through Play into teaching practices. It covers domains of teaching practices aligned with the constructs at the basis of the E-certification course and Learning through Play:

- Support for connection to experience
- Support for problem solving
- Support for exploration and agency
- Support for social connectedness
- Active participation
- Positive emotional climate

The study employed the PLAY tool developed by the LEGO Foundation and adapted to the Rwandan context by Oxford MeasurEd. This tool has also been adapted and validated by Oxford MeasurEd in neighboring countries (Uganda and Kenya). Classroom observations were conducted with two teachers for each sampled school.

Table 2: Summary of data sources used in this evaluation

Instrument	Focus	Description of Sample	Duration
1) School Leader Survey (electronic)	School leadership support for learning, knowledge, and attitudes towards Learning through Play	One head teacher per sampled school	1 hour
2) Teacher Survey (electronic)	Teacher knowledge and attitudes towards Learning through Play; Teacher practices with respect to Learning through Play; access to support for learning and to implement Learning through Play	Five teachers per sampled school	1 hour
3) Classroom observation	Integration of Learning through Play into Teaching Practices	Two teachers per sampled school	40 minutes
4) FGDs with teachers (paper)	Teacher perceptions and attitudes towards Learning through Play; Teacher motivation and confidence to use Learning through Play in the classroom	Two discussions for each treatment district	1 hour 30 minutes
5) FGDs with students (paper)	Students' experiences in the classroom; students' interactions with teachers	Two discussions for each treatment district	1 hour
6) Auxiliary data: LMS (learning management system)	E certification completion for each teacher enrolled in the E-certification course merged with relevant survey data.	All teachers in the treatment group enrolled in the E-certification course	-

FGDs with Teachers to understand teachers' perceptions and attitudes towards learning through play, as well as their motivation and confidence to implement it in the classroom. At the endline, the focus groups also covered teachers' experience with blended training and with implementing Learning through Play. Although this is already measured in the quantitative teacher survey, the qualitative discussion gathered more detailed feedback on the perceived effectiveness and feasibility of Learning through Play and child-centered approaches in the classroom. Two teacher FGDs were conducted in each of the three treatment districts for a total of 6 discussions.

FGDs with Students to understand students' experiences with their classes and their interactions with teachers. By employing a participatory approach, i.e., a drawing exercise, students were asked about positive and negative experiences in the classroom and with their teachers and what makes a good experience in the classroom for them. Two student FGDs were conducted in each of the three treatment districts for a total of six discussions. For each district, one discussion only included male students, and one discussion only included female students.

For the school leader and teacher survey, Laterite coded the survey into SurveyCTO and collected the data electronically. Data from the student and teacher FGDs was collected on paper, with recordings being transcribed and translated later. The results of classroom observations were entered into SurveyCTO after the observation.

Auxiliary data: LMS-data. The Government of Rwanda has created a Learner Management System (LMS) to serve as an e-learning portal for all teacher CPD trainings, including the E-certification course offered within this project. Laterite connected the data on course completion for all teachers in schools that participated in the E-certification program to assess course participation and course completion.

3.3 Overview of data collection

The evaluation collected both qualitative and quantitative data through five data collection activities, three of which are quantitative and two are qualitative.

- Quantitative data collection took place in a total of 170 schools (85 from the treatment group, 85 from the control group):
 - Teacher Survey: A face-to-face survey with 850 teachers (5 per school)
 - School Leader Survey: A face-to-face survey with 170 school leaders (1 per school)
 - Classroom observations: An observation of in-class teaching practices of a subset of 340 surveyed teachers (2 per school)
- Qualitative data collection took place in the three treatment districts:
 - Student FGDs: Six FGDs, two in each district, with a total of 48 P3 students aged 8-10
 - Teacher FGDs: Six FGDs
 - , two in each district, with a total of 48 teachers

After a pilot study conducted on May 27, 2024, data for quantitative data was collected between 30 May and 17 June 2024, and FGDs were conducted in the same timeframe. All data collection targets were met. However, some teachers and school leaders were not available for interviews during the endline data collection. These respondents were replaced by other lower primary teachers or school leaders.

3.4 Final evaluation sample

3.4.1 Attrition

At endline, we revisited the same 170 schools that participated in the baseline, with some replacement of the original respondents:

- Teachers, 734 of the 849 respondents (86%) from baseline participated in the endline survey.
- Classroom observations, 278 of the 340 teachers (82%) from baseline were also observed at endline.
- School leaders: 124 of the 170 respondents (73%) participated in both the baseline and endline surveys.

We predicted the probability of successfully tracking respondents at the endline using a logistic regression based on baseline characteristics of teachers and school leaders to assess whether attrition (respondents who potentially drop out at the endline) was selective.

The baseline characteristics included in this model are listed in Appendix Table 2, 3 and 4 for teachers, classroom observations, and school leaders, respectively. These tables compare the respondents who participated in both baseline and endline to the respondents who only participated at baseline.

For teachers, we find that women and those with a postgraduate diploma in teaching are more likely to drop out of the survey. For school leaders, attrition is significantly associated with years of experience and having a certificate in teacher training. The results of the logistic regression are presented in Appendix Tables 5, 6 and 7 for survey teachers, classroom teachers, and school leaders, respectively.

For the impact analysis, we applied a propensity score matching step at the teacher and school leader level to ensure comparability. Consequently, we can be confident that our estimates capture causal treatment effects (rather than compositional changes across treatment groups).

3.4.2 Treatment and control group balance

Appendix Table 8 shows that for the 734 teachers who participated in the survey at baseline and endline, the treatment and control groups in the survey panel are similar on almost all characteristics at baseline, except the two variables indicating years of experience and some age categories. Teachers in treatment schools appear to be more experienced, and there are more teachers in younger age categories in control schools. Such a light imbalance was already present in the baseline.

Appendix Table 9 shows that for the 278 teachers who participated in the classroom observation at baseline and endline, the treatment and control groups in the classroom observation panel are similar on all characteristics at baseline, except for one age category indicator. There are more teachers in the age category 31-35 in the treatment group.

Appendix Table 10 shows the comparison between control and treatment on the main characteristics of the 124 school leaders who participated in the survey at baseline and endline. We find the same differences in the baseline characteristics that we found with the sample of 170 school leaders (i.e. the full baseline sample), except for gender which shows imbalance with more female school leaders in the treatment schools compared to the control schools.

Overall, we can be confident that our treatment and control groups are comparable for teachers (both in the survey and classroom observations) and school leaders. Similar to baseline, we control for the imbalances on the main characteristics of the respondents throughout the analysis and we apply a propensity score matching step at the teacher and head-teacher level, as mentioned above.

3.5 Analyses techniques

3.5.1 Analyzing the causal chain

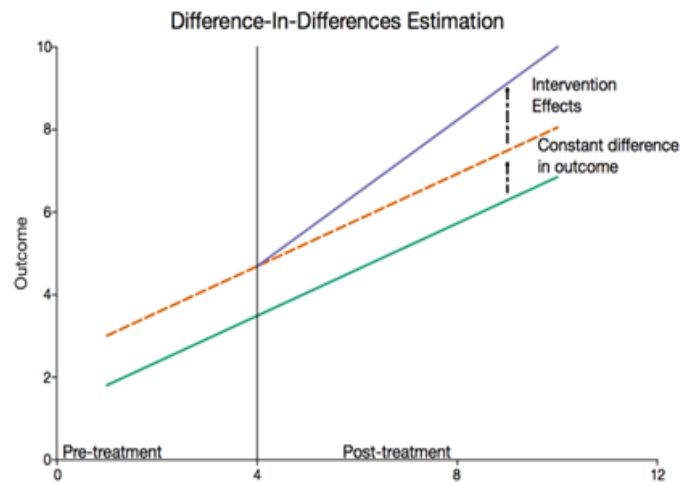
We used Ordinary Least Squares (OLS) or logistic regression models, depending on the specific outcome under study, to estimate the relationships between key constructs at each step of the causal chain. This analysis was carried out exclusively with data from the treatment group including schools from Nyanza, Ngororero and Muhanga districts to trace how different components in the causal chain influence each other for those who participated in the project.

We modelled the impact of different levels of training completion on teachers' and headteachers' knowledge, attitudes and practice of Learning through Play (LtP). To ensure the robustness of our findings, the models incorporated a set of covariates, such as teacher (or head teacher) gender, age, and experience in the education sector. These controls are essential because characteristics such as teaching experience might independently affect a teacher's knowledge of LtP, regardless of their participation in the training program (i.e., a teacher with many years of experience may already have high levels of knowledge about learning-to-play approaches regardless of their participation in the certification program).

3.5.2 Analyzing program impacts

Our approach to analyze program impacts was to combine difference-in-differences analysis with propensity score matching (PSM). This approach allows us to rigorously assess the causal effects of the program by comparing outcomes between the treatment and control groups over time, as illustrated in Figure 3. The key notion behind difference-in-differences analysis is that the treatment group's growth in outcomes is steeper than that of the control group after the program begins. The vertical gap between the purple line (actual outcome for the treatment group) and the dashed orange line (expected outcome without the program) after the intervention represents the program's impact.

Figure 3: Illustration of difference-in-differences estimation



For teachers, our analysis focused on the group of teachers surveyed at baseline and at endline and excluded teachers from Muhanga who due to implementation delays did not complete the training program yet. However, we have seen some imbalances between groups, with the treatment group having, for instance, slightly more experienced teachers. Therefore, we implemented Propensity Score Matching (based on baseline characteristics of teachers only) to ensure comparability between groups. As previously mentioned, women were more likely to drop out between baseline and endline and our analysis took this attrition into account.

For school leaders, we followed a repeated cross-section approach. In the baseline report, we have already established that treatment and comparison schools are comparable on a wide range of characteristics. However, in 46 schools the school leader at endline was different from the person interviewed at baseline. This staff turnover is not related to participation in the E-certification and training program. It is, however, impossible to limit the analysis to schools where the school leaders remained the same because this would push the sample size below a threshold sufficient to support meaningful conclusions. Therefore, we used a repeated cross-section approach for the school leader analysis taking into account that some characteristics of the school leaders may influence key outcomes of interest. For instance, more experienced school leaders may have higher previous levels of knowledge. From our attrition analysis, we see that school leaders who participated at baseline were slightly more experienced than those who participated at endline and this may influence the impacts we observe.

We again used a Propensity Score Matching approach for the repeated cross-section of school leaders to ensure that the group of school leaders surveyed at baseline and endline is comparable in terms of their experience, gender, age, language spoken at home, and previous participation in training (on school administration, school leadership, and coaching or mentor during and outside education).

In summary:

- we analyzed data from the teachers surveyed at baseline and endline and deployed a matching approach to account for possible differences between treatment and control group teachers.
- on the school leader analysis, we considered the same schools at baseline and endline but not the same individuals, and we deployed a matching approach to account for possible differences.

3.5.3 Analysis of qualitative data

We employed deductive and inductive thematic coding to analyze the FGDs conducted with teachers and students.

The process began with transcribing and translating the recordings from the FGDs. We then applied deductive thematic coding to organize the data according to predefined themes aligned with the study's objectives, such as teachers' attitudes towards Learning through Play or students' classroom experiences. Simultaneously, we used inductive coding to allow new, unexpected themes to emerge organically from the data, ensuring that we capture all relevant insights.

Once the coding was complete, we performed a thematic analysis to identify patterns and relationships within the data. This analysis complemented the findings from the quantitative surveys and classroom observations, providing a richer, more nuanced understanding of teachers' and students' experiences and perceptions.

3.6 Monitoring, Evaluation and Learning (MEL) indicators

Table 3 presents the MEL indicators selected through a logic model developed by RTP and Laterite, and measured at endline. Some of those indicators reflect the change in outcomes between baseline and endline by counting the number of respondents for whom we observed an improvement in their scores, while other indicators report the levels of outcomes at endline. We use both the teacher and school leader survey datasets, as well as the PLAY classroom observation dataset, the LMS dataset, and a dataset with information on the reach of the E-certification and training program.

The logic model used to select indicators was adapted to the data sources available. Results for those indicators as well as details on their construction are reported in Appendix Table 12.

Table 3: Logic model

Overall objective: Improved learning experience for lower primary school (P1-P3) girl and boy learners in Rwanda through blended LtP training for lower primary teachers	
Indicators available: Enhancement in children's perceptions of positive interactions with their teachers in the class (qualitative evidence only)	Indicators not part of this report: # of children enrolled in school with learning instruction led by teachers trained in LtP
Long-term outcome 1: Improved teacher classroom practice in delivering the CBC through the implementation of LtP in lower primary classrooms	Long-term outcome 2: Increased ability of RTP to develop and deliver scalable, playful online TPD
Indicators available: % of teachers with improved teacher practice by integrating gender responsive LtP methodologies into classroom teaching practices % of teachers with improved confidence to deliver LtP in the classroom	Indicators not part of this report: Tested and effective TPD blended course content and implementation modalities in LtP pedagogy developed for scale
Intermediate Outcome 1: Improved knowledge, attitudes, and behaviours of lower primary teachers to use LtP for the delivery of the CBC in their classrooms	Intermediate Outcome 2: Accredited and integrated functional TPD system for LtP pedagogy established in Rwanda
Indicators available: % of teachers that have improved knowledge of gender sensitive, child-centered LtP techniques % of teachers with improved motivation to use LtP in the classroom % of schools that qualify as Play Schools	Indicators available: % of school leaders with improved knowledge and skills to support teachers' integration of LtP in their practice - Indicators not part of this report: # of LtP e-course modules accredited by URCE and validated by MINEDUC for continual TPD in Rwanda
Output 1.1. LtP online training delivered to lower primary teachers	Output 2.1. School leaders and SBMs supported to improve capacity in LtP pedagogy and coaching
Indicators not part of this report: #/% of teachers who report being satisfied with course content	Indicators available: % of school leaders and SBMs trained on LtP % of SBMs and/or school leaders conducting monthly classroom observations for coaching # of school leaders and SBMs reached by the RTP program
Output 1.2. Lower primary teachers supported through school visits, CoPs, and coaching	Output 2.2. Engagement with school, district and national education officials
Indicators available: % of teachers who report receiving LtP support from their school heads and/or SBMs	Indicators available: # of district and sector officials reached by the RTP program - Indicators not part of this report: # of school, district and national education officials attending the orientation sessions on the project and the LtP approach # of education officials who participate in school visits and/or classroom observations

Output 1.3. Consistent and reliable access to online CPD provided to lower primary teachers	Output 2.3. Program approach designed, with lessons learned applicable to other contexts where RTP works
Indicators available: % of lower primary teachers who completed the LtP e-course	Indicators not part of this report: Best practices identified and shared with stakeholders
Output 1.4. Orientation conducted with lower primary teachers	Output 2.4. Partnerships in place with national and international institutions for future scale-up
Indicators available: % of lower primary teachers attending the orientation sessions on the project and the LtP approach	Indicators not part of this report: # of MoUs and work agreements signed with national and international stakeholders

3.7 Limitations

Before diving into the findings section, it is important to note the limitations of the study presented in this report.

Concurrent CPD initiatives

First, schools where the E-certification and Training program has been implemented (the treatment group) and those in our comparison group—where the program has not been introduced—have previously participated and are currently engaged in other teacher Continuing Professional Development (CPD) initiatives, including:

- Rwanda Equip, which aims at empowering government teachers through classroom management techniques that use scientifically proven pedagogical approaches, a digital teaching approach and carefully designed learning materials,
- Right to Play's Gender Responsive Education And Transformation (GREAT) program, which seeks to improve girls' learning outcomes and leadership skills through play-based, gender-responsive teaching and learning,
- Right to Play's Plug-in Play (PiP) program, which uses Learning through Play with Technology (LtPT) approaches specifically in Science and Elementary Technology (SET) subject.

Approximately one quarter of teachers in each group report having participated in at least one of these programs. It is, therefore, likely that these additional CPD programs confound the anticipated changes in teachers' knowledge, attitudes, and practices. Their influence is potentially complex:

- On the one hand, participation in another CPD program can have a negative impact on the knowledge and adoption of LtP, particularly where the alternative teaching method is not aligned or even contradicting core principles of LtP. This is particularly likely for Rwanda Equip.
- On the other hand, participation in another CPD program can have a positive impact on the knowledge and adoption of LtP, particularly where the CPD program is aligned with LtP. This poses a risk to the identification of the impacts of the certification program if the control group receives such training.

Where possible, our analysis seeks to shed light on the effect of the various CPD programs listed above to understand the extent to which concurrent programs may influence the effectiveness of the E-certification and training program. Such concurrently running programs are a reality of the education system in Rwanda. Where possible, we assess whether the group who participates in multiple CPD-projects (such as Rwanda Equip or GREAT) displays different knowledge attitudes and practices.

The challenge here is that analyzing the causal effects for participants in other concurrent CPD programs, and those who do so selectively, faces the issue of having too few participants in each subgroup. This, as mentioned earlier, leads to a reduction in statistical power and precision due to the smaller sample sizes within each subgroup. We extracted qualitative findings from FGDs on the possible interplay between the E-certification project and other concurrently running CPD-programs.

Variation in course completion

Second, in Muhanga district the implementation of the project was delayed meaning that the teachers sampled at baseline for the treatment group would not have been able to complete the course by the time the endline evaluation was conducted. As a consequence, the data collected from those teachers and school leaders does not provide valid information on the impact of the program.

To account for the delayed implementation in Muhanga district, we excluded all data from this district from the impact analysis. The reported results are hence intention to treat (ITT) effects. The ITT estimates represent the average effect on all teachers that were enrolled in the course. ITT is considered the best practice in reporting program effectiveness, since it accounts for the fact that not all targeted teachers will complete a training. The ITT impact estimates also enable a realistic cost-effectiveness analysis, since cost are usually incurred for all course participants, independent of whether they complete the course successfully.

For the causal chain analysis, we chose to include all teachers assigned to the treatment group at baseline, thus also including teachers from Muhanga. The causal chain analysis uses LMS completion data, allowing us to use a continuous measure of course completion ranging between 0 -60 depending on how many units the teacher has completed. We then look at whether teachers with higher completion levels also score better on knowledge, motivation and practice as is assumed in the Theory of Change. The data from teachers from Muhanga contributes to this analysis by providing observations at the lower end of the completion scale, which allows for more accurate modelling of the relationships between the level of completion and the other outcome indicators.

4. Findings

This chapter presents the key findings, which are structured along the causal pathways outlined in chapter 2 using a framework of knowledge, attitudes, and practices. It combines insights from quantitative surveys, classroom observations, and insights from qualitative interviews and FGDs conducted.

4.1 Access to devices and course participation

This section investigates the key determinants of access to the blended course as well as course participation in the course. Identifying barriers and challenges related to access is an essential step into supporting recommendations for further project implementation and design. Even where barriers cannot be amended, results may help target schools and teachers where the conditions are more likely to enable course completion.

Access

Findings show that virtually all teachers and school leaders have access to at least one electronic device (i.e. a computer, a smartphone or a tablet). For teachers, 90% can access an electronic device at least 6 hours a week. However, 9% report having access less than 1 hour per week. We also find that 92% of teachers use a smartphone outside of school as their primary device to access the online course. In terms of internet, 96% of teachers and 95% of school leaders report having access, but we find that the quality is considered low. The two most frequently reported challenges for internet access are the mobile internet cost and low network coverage/quality. 71% of teachers have limited time to access the internet, with 20% who can access the internet less than 3 hours per week. All detailed results can be found in Appendix Table 11.

Participation and completion

Findings from teacher surveys from cohort 1 (Nyanza and Ngororero only) indicate that 88% of teachers in treatment schools participated in the blended training. The Learner Management System (LMS) data shows that 61% of these cohort 1 teachers completed the course. It should be noted that 29% of sampled teachers have no record in the LMS, it is unclear whether they have participated and completed the course. If looking only at the teachers in our sample that are enrolled in the course on the LMS (n=196), 86% have completed the course.

The majority of participants reported spending between two to four hours per week on course work. Half of them consider the course duration about right, while 44% consider it too short. However, for those considering the course duration either about right or too short, only 37% report completing the course. In addition, half of the school leaders agree that teachers have enough time after school to learn. Virtually all teachers who completed the course report that the course was beneficial to them, and 70% of them found the content manageable and were able to complete all the required coursework in the time allocated. Finally, the orientation session appears to be beneficial to 80% of teachers.

For school leaders, 54% report participation in the RTP CPD training on LtP but only 99% report having completed the six modules.

4.1.1. Qualitative evidence on access and completion

Teachers highlighted four challenges related to accessing the blended training:

- connectivity issues,
- digital literacy,
- time for learning, and
- language barriers.

Teachers experienced a variety of connectivity issues: some teachers do not have access to electronic devices when they need, the internet connection may be unstable or only available at school, and the LMS would freeze. Some teachers found navigating the course on the LMS was challenging and missed a table of content to ease navigation. They highlight that many teachers lack the digital skills to confidently learn online. However, teachers also pointed out that online learning had been an opportunity for them to acquire digital skills. Teachers also report that they do not have enough time to complete the online training. Their work schedules are full, and after school they often have other responsibilities. While some teachers report that they have dedicated time for CPD at school, they also mention that that time is limited and not exclusively dedicated to the RTP blended training. Lastly, teachers encountered a language barrier. The English language content was hard for them to understand, as illustrated by the quote below:

“However, the problem could be the language; not all of us are familiar with the English language. You may read ten words but understand five words only. It could have been better if we were together and worked as a group and then got support when we faced challenges. If a person understands what you don’t understand they will support you and so on.”

– Teacher

The access challenges teachers faced also affect the completion of the course. Teachers report that connectivity issues and lack of time slowed down their progress and demotivated them.

Teachers also provided suggestions about what could improve their learning experience. A majority of teachers would like to have more opportunities for in-person learning. They named live teaching demonstrations, in-person training, and learning together as a group of colleagues as activities that would support them. Teachers emphasize that they learn through observation and imitation, and having the option of asking for immediate clarification from a trainer or colleague is also a prominent reason to prefer in-person training opportunities. This is important in the context where those teachers were part of cohort 1 and therefore receive live online sessions. The scalable version of the program (i.e. for teachers of cohort 2) does not receive such sessions.

Teachers would appreciate receiving a hard copy of course content to be able to facilitate their learning when they fail to log in to the LMS or to quickly look up information in the future.

“Another thing that we need to understand more to integrate plays, we need a model lesson and learn how an experienced person facilitates the lesson and not a school mentor or a person who teaches ICT/SET from our school. It can either be a head teacher because school leaders were trained or any other person from you [RTP]; this can help us more.” – Teacher

When it comes to support received at the school level, teacher most frequently refer to the time that their school leaders have granted them to study, and the learning materials they provide. School-based mentors were rarely named, and mostly in the context of helping with connection issues. Communities of practice were not named by any teacher, though some teachers mentioned that they would meet with colleagues during CPD hours. Only one teacher mentioned a classroom observation conducted by the school leaders as a source of support for their learning and implementation of Learning through Play.

4.1.2 School (leader) support

The school (leader) support is a crucial element in the causal chain where school-based mentors, communities of practice, and head teachers would support and stimulate teachers in their CPD, ultimately enabling them to implement play-based learning approaches in the classroom.

How we measured: school leader support

The assessment of school leader support is categorized into three sub-components: support from headteachers/school leaders, support from Communities of Practice (COPs), and support from School-Based Mentors (SBMs). Each sub-component is evaluated using specific survey items that capture the respondents' perceptions of the support provided in these areas, with responses measured on a 5-point Likert scale.

Support from Headteachers/School Leaders is measured by evaluating how committed headteachers are to supporting teachers in their professional development and classroom practices. For example, we asked respondents to reflect on whether "the headteacher in my school is committed to supporting the continuous professional development of teachers" and whether "the headteacher in my school regularly conducts classroom observations to monitor teachers' instructional practices."

Support from Communities of Practice (COPs) assesses the perceived effectiveness of these groups in aiding teachers' professional growth and instructional methods. Examples of survey items include "Communities of Practice are committed to helping teachers to overcome challenges when applying new learning methods in the classroom" and "the support I received from the Community of Practice informed my teaching practices."

Support from School-Based Mentors (SBMs) examines how School-Based Mentors contribute to teachers' professional development and teaching practices. Respondents were asked whether they

agreed that "School-Based Mentors are committed to helping teachers to overcome challenges when applying new learning methods in the classroom" and whether "the support I received from a School-Based Mentor informed my teaching practices."

Each survey item was coded to reflect the level of support perceived by the respondents. These responses, comprising a total of 15 items across all sub-components, were then aggregated to form an overall support score for each sub-component. Higher scores indicate greater perceived support from headteachers, COPs, and SBMs, providing a comprehensive view of the different layers of support available to teachers within the school system.

We also provide an overall measure, this combines the scores on all items related to the schools' supportive environment.

Figure 4: Teacher's rating of support received by SBMs, COPs and Head Teachers (treatment group only, at endline)

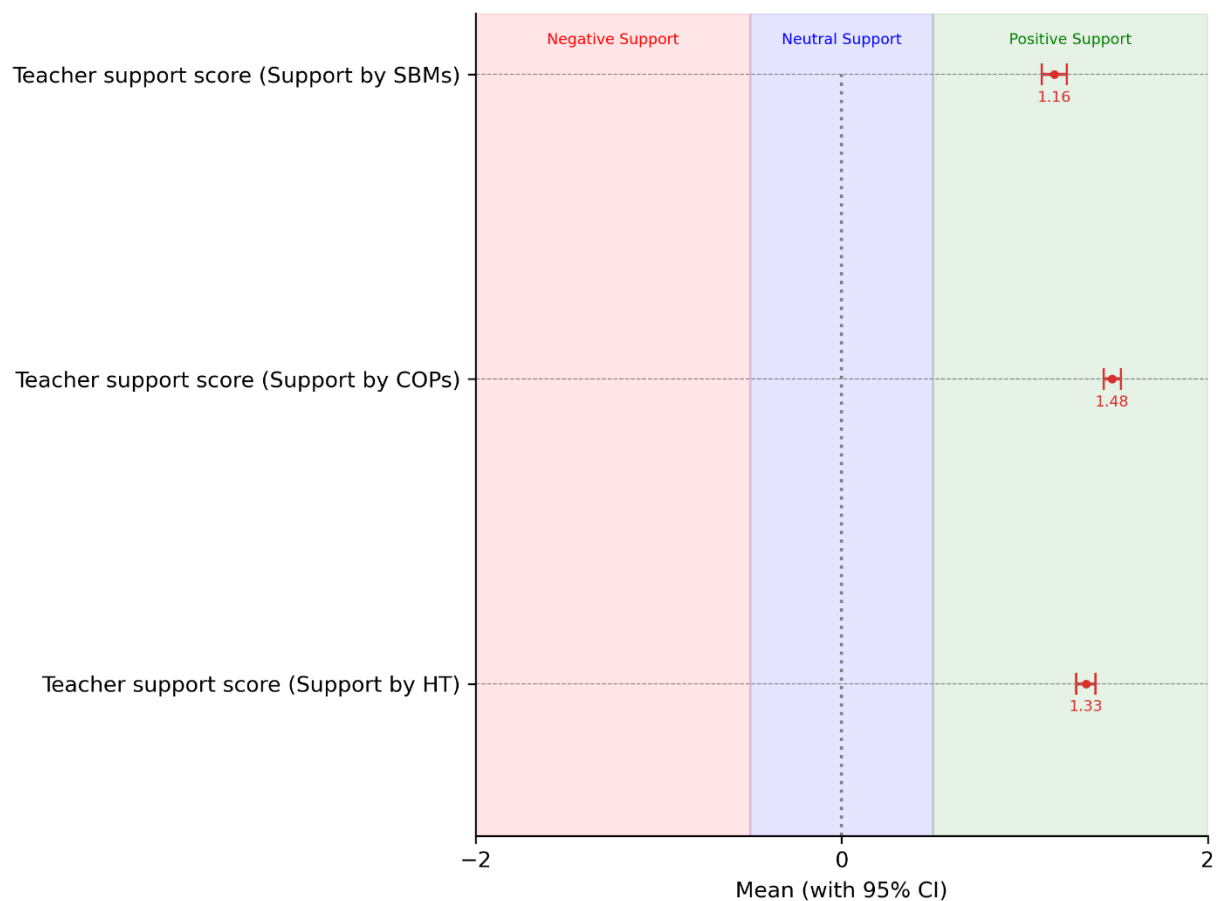


Figure 4 illustrates teachers' ratings of the support they receive from School-Based Mentors (SBMs), Communities of Practice (COPs), and Head Teachers (HTs) or the 'supportive environment' that they experience. Each subscale represents one of these support sources, with the mean rating and its 95% confidence interval (CI) displayed on a scale ranging from -2 (most negative rating) to 2 (most positive rating).

The data show that all teachers perceive the support they receive from CoPs, SBMs, and head teachers as positive. The mean score for support from SBMs is 1.16, indicating that teachers

generally feel supported by their School-Based Mentors, though this is the lowest score among the three subscales. The support from CoPs has the highest mean score at 1.48, suggesting that teachers perceive the Communities of Practice as particularly effective in aiding their professional growth. Support from Head Teachers also scores positively, with a mean of 1.33, reflecting a strong commitment by Head Teachers to supporting teachers' professional development and classroom practice, as perceived by teachers in the treatment group.

A key feature of the theory of change is that CoPs, SBM's and head teachers foster a conducive environment and nudge teachers to complete the e-course. Despite teachers rating the support relatively positively, we do not find that the extent to which teachers rate these COP's, SBM's and head teachers as supportive is related to whether they complete the E-certification course or not. (Appendix Table 1).

4.2 Knowledge

How we measured: teacher and school leader knowledge

The construction of the teacher knowledge indicators involves three key areas: How Children Learn, Teaching Practices, and Gender and Inclusion. Each of these areas is measured through a series of questionnaire items, where respondents indicated their level of agreement on a 5-point Likert scale.

How Children Learn items assess teachers' beliefs about the importance of play, student autonomy, group work, and active engagement in learning. For example, statements like "Students learn better when they have opportunities to be involved actively in learning activities" (positive) and "Students learn best when they are sitting still at their desks" (negative) are included.

For knowledge about Teaching Practices, the items explore teachers' attitudes toward hands-on activities, student choice in learning, and the application of learned concepts. For instance, one item states, "Teachers should provide students with opportunities to apply the concepts they have learned in new or different contexts" (positive), reflecting progressive teaching practices.

Gender and Inclusion area addresses teachers' beliefs about gender equality and the inclusion of students with disabilities. This includes items like "Teachers must adapt their teaching practices to ensure their lessons are accessible to both girls and boys" and "The needs of students with disabilities can be best served in special, separate classes or schools".

Each survey item was recoded into 'correct' and 'incorrect' responses based on alignment with best practices in play-based learning and inclusive education. These recoded responses were then aggregated into an overall 'knowledge score' for each respondent, ranging from 0 to 100 where high scores represent more knowledge.

We also use a composite measure, Knowledge all, that combines the scores of all underlying items on the sub-components. Note that these knowledge scores are constructed using the same survey items for teachers and school leaders.

How we measured: course completion

For teachers, we use a continuous measure of course completion and a self-reported course completion indicator. The continuous measure of course completion was captured from the Learner Measurement System (LMS) provided by Right to Play.

This continuous measure of course completion captures whether teachers completed the E-certification course in a granular manner and ranges from 0 to 60.

The LMS-data ascribes a completion score for Module 1 (Foundations in Learning through Play) and a completion score for Module 2 (Learning through Play for CBC teaching and learning) between 0-30. Laterite merged the LMS data on completion with its survey data based on teacher identification numbers and teacher names in case teacher identification numbers were unavailable.

In total, we have surveyed 366 teachers in the treatment group at endline. We were able to merge the completion rates for 256 teachers (69% of the treatment group at endline). The remaining 110 teachers for which we have survey data were not present in the LMS data and we do not have a granular completion metric available for these teachers (26% of these 110 teachers report completing the course). In the analysis where granular completion data is necessary, we restrict the subsample to only those teachers for which we have LMS-data available.

We assumed that teachers would go through these modules consecutively. In cases where the LMS data indicated that teachers had a completion score on Module 2 but had missing data on Module 1 (n=6 teachers in the surveys), we imputed the completion of those teachers using the average completion score on module 1.

Second, because the LMS-data is incomplete for teachers, we use a self-reported measure of completion. The survey, at endline asked whether teachers had participated in the Right to Play e-certification course and if yes, whether they had completed the course.

For school leaders, we only use a self-reported measure of course completion. The school survey asked whether teachers had participated in a course provided by RTP. Subsequently, it asked which parts the school leader completed (ranging from part 1 to 6). We use a continuous measure of completion ranging from 0 to 6. All head teachers that indicated that they did not participate in the course receive score 0 on this continuous completion measure.

4.2.1 Evaluating the causal pathway for knowledge: teachers

Aside from accessing the course, completing the course is the next step in the causal path. In this section, we address the question: To what extent does participation in the E-certification project enhance teachers' knowledge?

Given the Theory of Change one would expect an increase in knowledge among teachers who participated in the course, as the modules focus on a fundamental understanding of learning to play and delivering a competency-based curriculum for school children. The first step in the causal pathways relies on the notion that completing or participating in the E-certification course and the blended components of the training increase teachers' (and headteachers') knowledge about learning to play.

To investigate the relationship between course completion and knowledge, we use the LMS-teacher data from which we derive a more granular, continuous knowledge score, as

described in “How we measured course completion”. We assessed to what extent course completion leads to increases in knowledge for teachers using the analysis techniques outlined in section 3.5.1. The relationship between the course completion score as drawn from the LMS system, is depicted in Figure 5.

Figure 5: Causal path teachers: course completion (continuous) and knowledge (all). Note: Predicted values of teacher knowledge by course completion score and 95CI's, teacher controls held at their means, endline only, n= 256, s.e.'s clustered at school-level

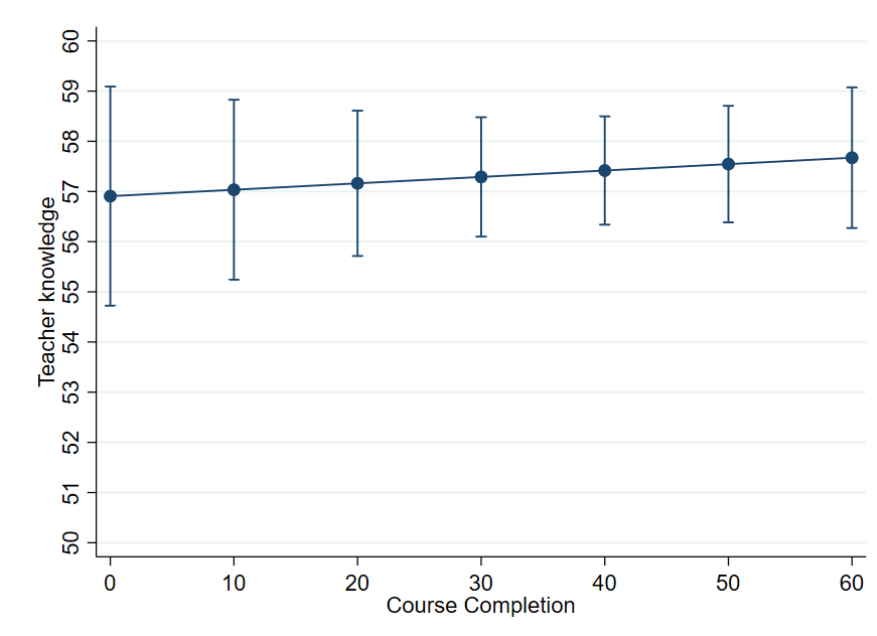


Figure 5 shows the course completion score, ranging from 0-60 on the horizontal axis, and the values on teacher knowledge on the y-axis. In these regressions, we control for teacher socio-demographics as outlined in the treatment group balance section estimate the values on knowledge, setting these controls at their means. This means that the line depicted can be interpreted as the relationship between course completion and knowledge for the average participant. We see that there is no relationship between course completion and knowledge for the treatment group. Where we would have expected a steeply increasing line (as people progress through the course, their knowledge increases), we see a fairly flat line. The knowledge score for the people who have low completion is the same and within the margins of error as the score for people with a maximum of 60.

This suggests that the E-certification course did not improve teachers' knowledge about Learning through Play.

As an added robustness check, and to assess whether the findings may be an artifact of incompletely merging the LMS data, we also provide the self-reported completion metric and then compare whether teachers who self-report to have completed the course report higher knowledge scores in Figure 6. Here, we see that the knowledge scores are the same for those who did not complete and the teachers who did. Differences are not significant ($p=0.78$ for a t-test comparing two groups, assuming unequal variances in the two groups).

Regarding support from SBMs, CoPs and head teachers we find that teachers who rate this support as better have slightly higher knowledge scores compared to those teachers who rate this support of lower quality (Appendix: Table 13).

In Figure 7, we assess whether other programs may have a confounding effect on this envisioned relationship. We investigate the relationship between course completion (based on LMS-data) and knowledge in the treatment group for those teachers that participate in other programs (such as Rwanda Equip, PIP and GREAT) and those that do not. At the endline, for teachers in the panel dataset, 71 teachers (28%) also participate in other programs such as Rwanda Equip or PiP. We separate the relationship between course completion and teacher knowledge scores for teachers who only participate in the E-certification course and those that participate in the E-certification course *and* in either Equip, PIP, or GREAT, in Figure 7. The red line represents knowledge scores across varying levels of course completion for those who participate in the certification program and other programs, and the blue line for those that only participate in the certification program. First, we see that there is no relationship between course completion and knowledge for teachers who only participate in the E-certification course. This is consistent with the findings described above. Second, although the red line for teachers who have participated in PIP, GREAT, or EQUIP seems to show an upward trend, this effect is not statistically significant (given that the confidence intervals in blue and red overlap at all levels of course completion).

Figure 6 Causal path: Teacher knowledge score by self-reported completion (n=296 teachers, endline only)

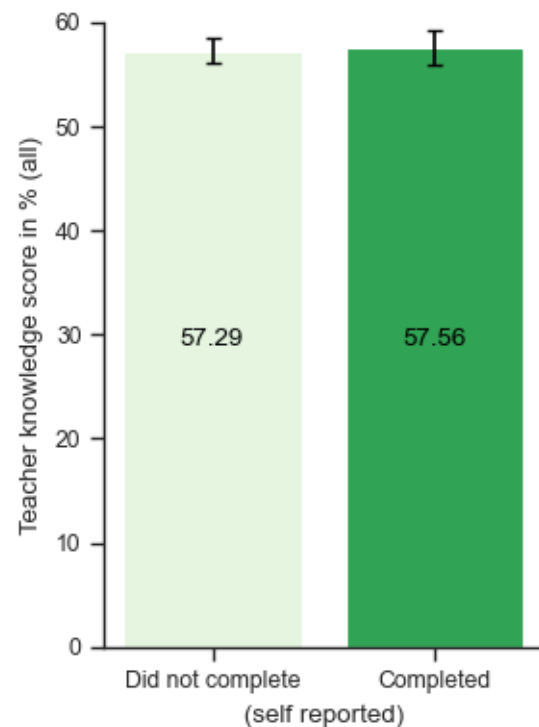
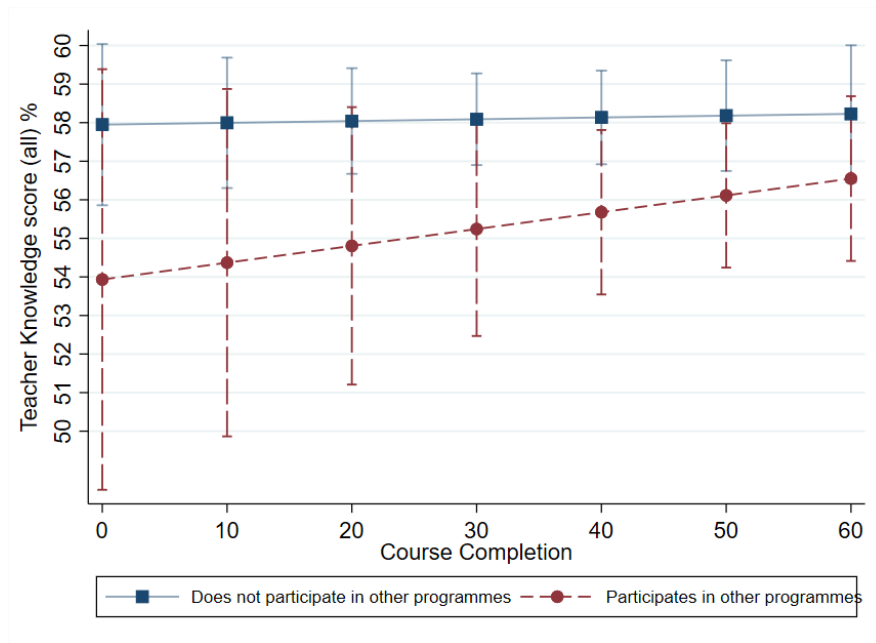


Figure 7: Causal path teachers: confounding effects of other programs, course completion (continuous) and knowledge (all).



We note that the sample size for the group of teachers who have participated in both the E-certification course and any other program is very limited (71 teachers). Therefore, the reliability of any findings from this subgroup is reduced, as small sample sizes can lead to less precise estimates and increase the likelihood of random variation affecting the results. This limitation also diminishes the statistical power, making it harder to detect any true effects. Consequently, while we can provide some insights, the conclusions drawn from separating the sub-group of EQUIP, GREAT, or PIP participants should be interpreted with caution. These small sample sizes also mean that we cannot distinguish between the group of people that participate in either EQUIP, GREAT or PIP.

While the sample size is too small to draw strong conclusions on confounding effects, we can point out that any potential confounding effects, either significant or not, are unlikely to affect interpretation of the results, given that the data does not show any effect of the E-certification course on knowledge (Figure 5).

Teachers in the FGDs mention a variety of other teaching training programs that they have or are participating in. Teachers highlight that it is challenging for them to combine play-based learning with some of the other teaching methods that they are asked to implement. The most notable example is the current Rwanda Equip program, as it provides very detailed lesson plans that teachers are meant to follow strictly. Teachers express the need to understand better how they can integrate Learning through Play with other teaching approaches. In addition, teachers emphasize that constantly shifting from one teaching program to another without evaluating and building on what has already been achieved is confusing and frustrating.

Teacher 1: [...] They confuse us when a project phases out and another one comes; MINEDUC or REB confuse us. For instance, the USAID project phased out and they left a project that is being implemented by the district. The BLF [Building Learning Foundations] and L3 [Literacy, Language, and Learning initiative] left and they left the responsibilities in the district's hands and the district then changed the education staff or the mayors or school leaders. Consequently, that project failed; ... it was useful to us but it is no longer being mentioned in the district. The district is no longer talking about the BLF, what they are not talking about is USAID which trained us in the Kinyarwanda subject and introduced a small project that replaced it. [...]

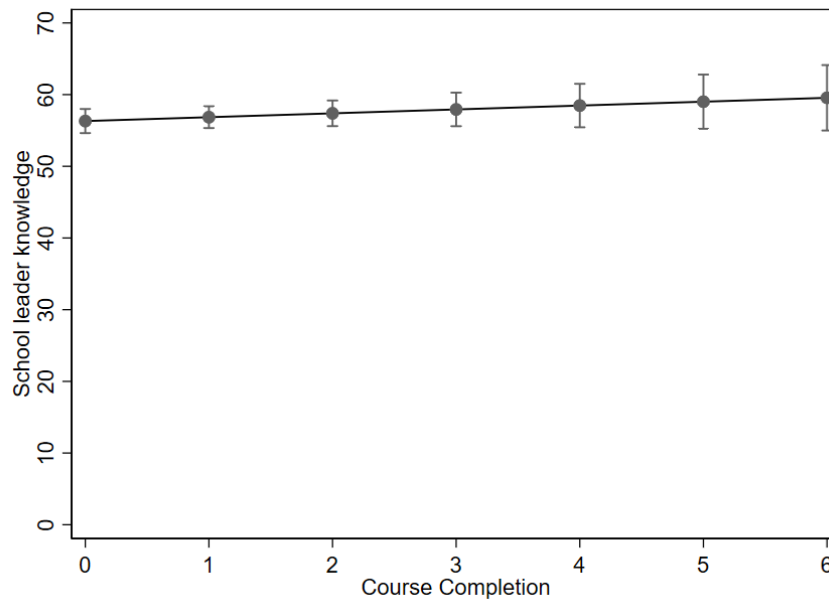
Teacher 2: There is something I would like to add, their projects come but they never ask us, the people who are on the field, what effect the project has on us and then ask if the project can continue or not. We are here educating the children of the country; we notice if something is important or not important. However, we even find what was important is phasing out. Therefore, that is the reason why we are saying that the project that was useful to us can be remembered and another project can come based on that project that came before; this can help us.

4.2.3 Evaluating the causal pathway for knowledge: school leaders

Only 9% of school leaders in the treatment group report completing all six modules of the online course at endline (excluding school leaders from Muhanga.) The relationship between course completion (self-reported) and knowledge for school leaders is shown in Figure 8.

Similar to the findings regarding teachers, we find that for school leaders' participation in the E-certification course does not lead to an increase in knowledge about Learning through Play.

Figure 8: Causal path school leaders: course completion (continuous 0-6 modules) and knowledge (all). Note: Predicted values of school leader knowledge by course completion score and 95CI's, teacher controls held at their means, endline only, $n=85$.



4.2.4 Knowledge-program impacts

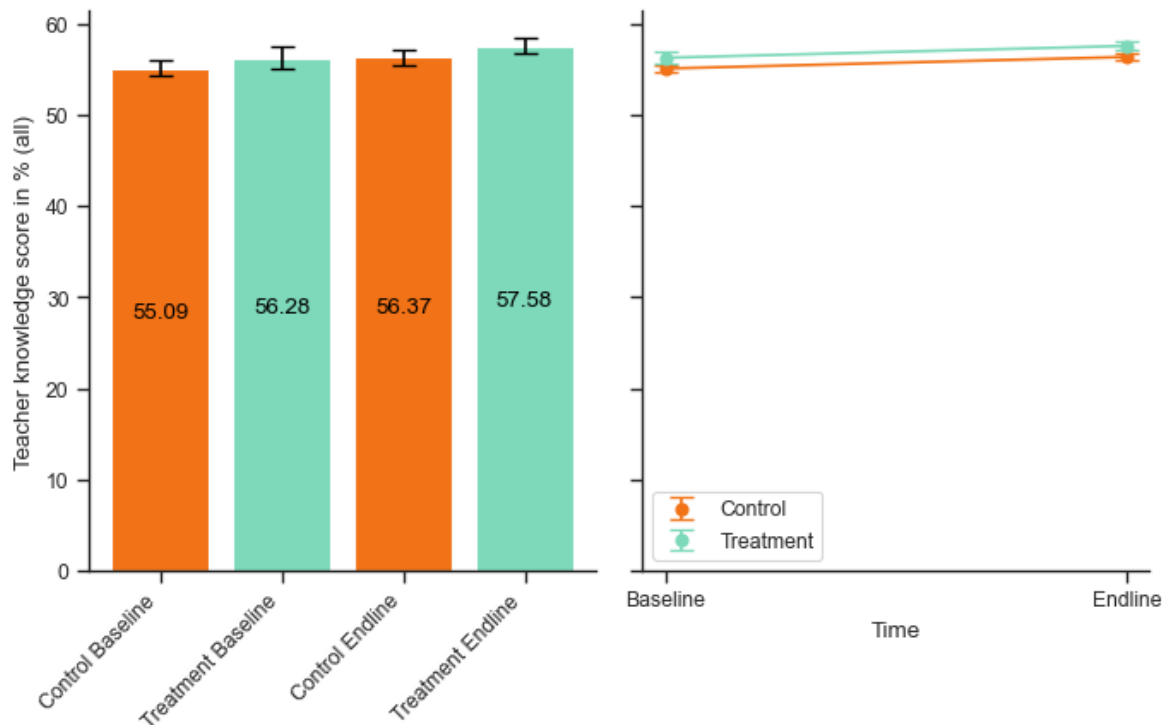
Teachers

Let us now turn to assessing the impacts of the program on teacher knowledge and compare the treatment against the comparison group. We present the findings in Figure 9 and Table 4. The bar plot on the left shows the matched averages of teacher knowledge scores at both baseline and endline for the control and treatment groups. This analysis includes only teachers who were able to complete the E-certification course between baseline and endline, that is schools from Nyanza and Ngororero district.

Each bar represents the average knowledge score, with error bars indicating the 95% confidence intervals. The knowledge scores range from 0-100. The orange bars represent the control group, and the green bars represent the treatment group. At baseline, the control group has an average knowledge score of 55.09%, and the treatment group has an average knowledge score of 56.28%. This indicates relatively low levels of knowledge across the board considering that the maximum knowledge score attained could be 100%.

Knowledge scores are not significantly different at endline. The line plot on the right shows the minor and statistically insignificant change over time.

Figure 9: Teacher knowledge about learning to play (all): Average knowledge score (0-100) Matched averages and 95% confidence interval for baseline and endline (left) and change between baseline and endline (right).



Source: Laterite computations, n= 597, p-value for the dif-in-dif 0.972

We also provide a table showing the results of the difference-in-differences analysis where the graphs are based on. Here we see that indeed the effect of the project on knowledge is not statistically significant as shown by the high p-value for the impact difference-in-differences.

Both the control and treatment groups show only minor differences in their scores from baseline to endline, and the differences between the two groups are small and statistically insignificant.

The impact of the E-certification course, as captured by the difference-in-differences estimate is statistically insignificant. This finding indicates that the E-certification course did not lead to an improvement in teacher knowledge about Learning through Play as measured by this composite indicator.

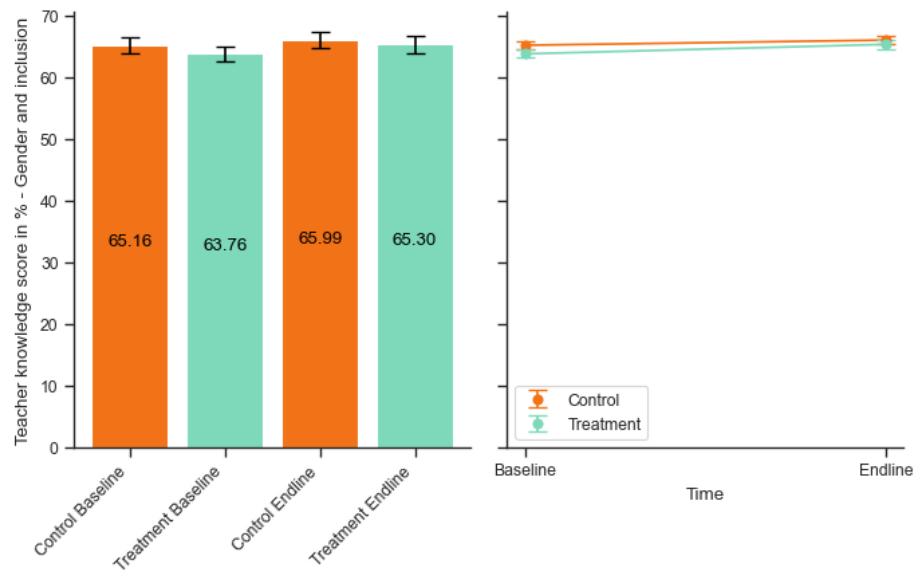
Table 4: Impacts of the E-certification course on teacher knowledge (overall).

Outcome:	Teacher knowledge score in % (all)		
Baseline	mean	s.e	p-value
(matched) Control	55.09		
Treated	56.28		
Difference (T-C)	1.18	0.76	0.12
Endline	mean	s.e	p-value
(matched) Control	56.37		
Treated	57.58		
Difference (T-C)	1.21	0.63	0.06
Impact: Diff-in-Diff	0.03	0.80	0.97
n (teachers)	597		
R-squared	0.01		

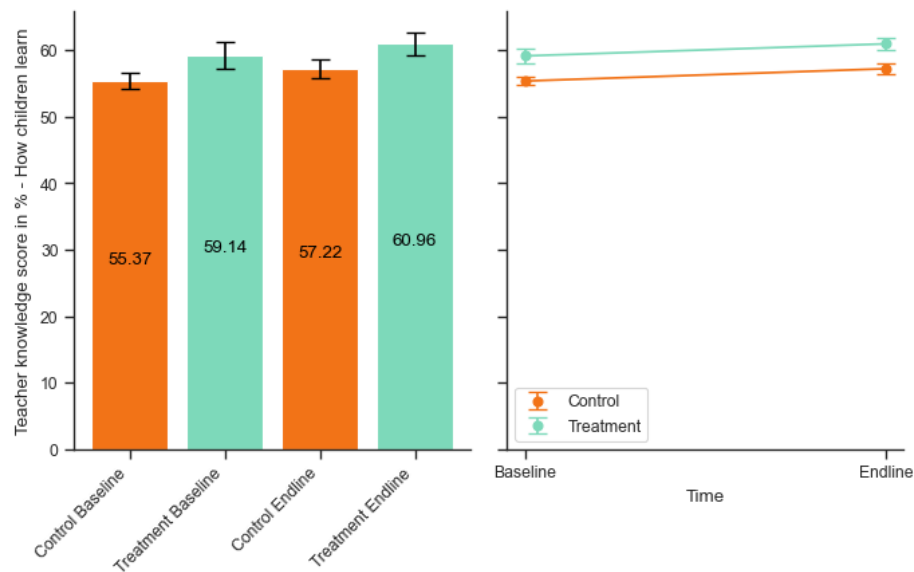
Note: statistics represent means and differences for the matched comparison group teachers (kernel matched difference in differences, estimation on panel dataset and common support only, means and differences estimated using linear regression), standard errors clustered at school-level.

Error! Reference source not found. Figure 10 distinguishes between the sub-components of teacher knowledge. We see that knowledge on gender and inclusion is highest when comparing the sub-components whereas knowledge about LtP-practices (reflecting knowledge about hands-on activities, student choices in learning, and the application of learned concepts) is lowest. We see that a similar pattern emerges when looking at the overall indicator that combines all these constructs; we find null effects, highlighting that the E-certification project did not improve the knowledge of teachers.

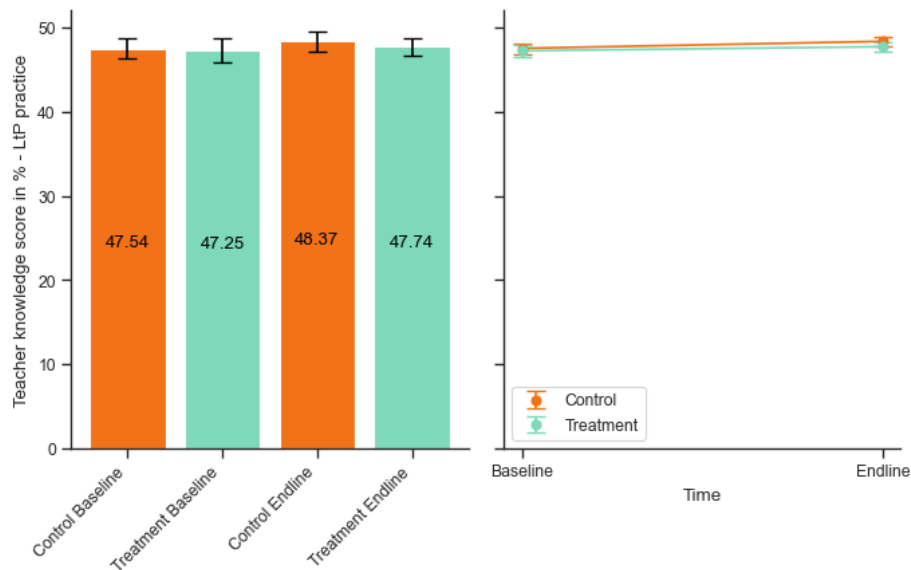
Figure 10: Teachers: Impacts of the E-certification program on knowledge sub-constructs. Impacts on knowledge about LtP-Practices (top) on knowledge about how children learn (middle), knowledge on gender and inclusive practices (bottom).



Source: Laterite computations, n= 597, p-value for the dif-in-dif 0.546



Source: Laterite computations, n= 597, p-value for the dif-in-dif 0.979



Source: Laterite computations, n= 597, p-value for the dif-in-dif 0.765

During FGDs and interviews, some teachers do highlight the knowledge that they acquired through the course, both on practical teaching skills and fundamental understanding of how children learn. This is at odds with the findings from the quantitative results where, when asked more specific and technical questions on LtP, we see no change between baseline and endline. Additionally, we find no evidence that teachers struggled with the course content. The teachers themselves point out that the course has shifted their mindset, and where previously they did not think that you could combine teaching and playing, they now see that students benefit from integrating play in their lessons. This finding indicates that teachers can recall practical aspects about LtP that they have picked up from the course, but not the theoretical aspects covered in the survey. However, not all teachers have equally internalized the fundamental premises of play-based learning. Teachers often still distinguish between play and “serious” learning. These teachers also tend to refer mainly to songs and energizers as play activities.

A majority of teachers also expressed that teachers should be leading class activities to ensure that students achieve the class objectives. Student-led play is seen as play only not leading to learning. This may indicate that teachers are lacking strategies to create agency for students within playful learning.

“In my view, a teacher-directed play is better because if a play is directed by students, students cannot find out what you have planned in that lesson. They can do whatever they want, and they can go outside the lesson. However, when you, the teacher, have planned a lesson and directed a play, the play is directed towards your objectives and you achieve your objectives without any difficulties.” – Teacher Nyanza

When asked about which parts of the course the teachers found particularly beneficial to their knowledge, the frequently named were:

- How to plan a lesson and integrate a playful activity
- How to use formative and summative assessments
- Classroom/group management
- Example videos of teachers using play-based learning

School leaders

We measured knowledge in a similar way for school leaders as we did for teachers. We used data from 274 school leader surveys from cohort 1 schools (including baseline and endline surveys) to estimate the impact of course participation on knowledge.

Table 5: Impacts of the E-certification course on school-leader knowledge (overall) (excluding Muhanga district schools)

Outcome:	School leader knowledge score in % (all)		
Baseline	mean	s.e	p-value
(matched) Control	55.7373		
Treated	55.8686		
Difference (T-C)	0.1313	1.3030	0.9292
Endline	mean	s.e	p-value
(matched) Control	55.0505		
Treated	56.4242		
Difference (T-C)	1.3737	1.3232	0.3030
Impact: Diff-in-Diff	1.2424	1.8585	0.5050
n (school leaders)	274274		
R-squared	0.02		

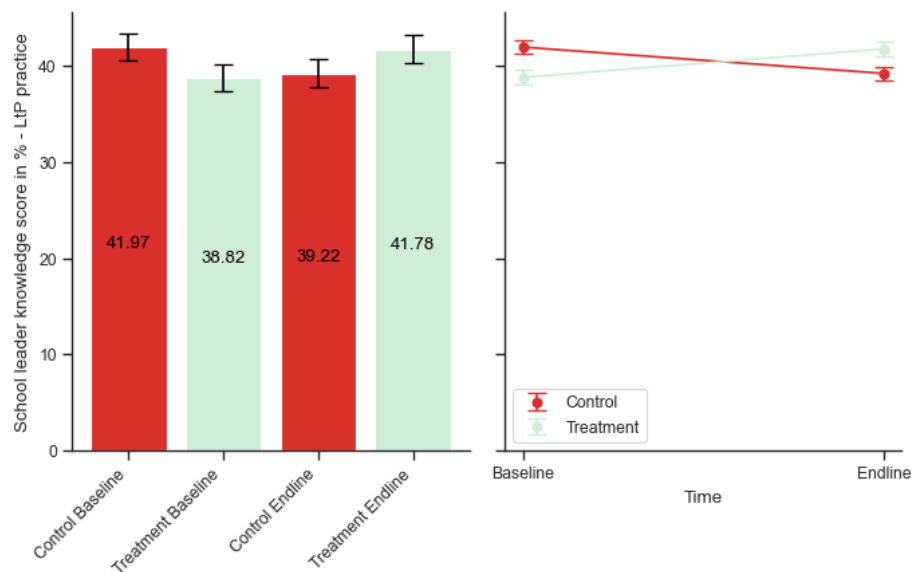
Note: Analysis on repeated cross-section of school leaders, statistics represent means and differences for the matched comparison group school leaders (kernel matched difference-in-differences, estimation on repeated cross-section, common support only, means and differences estimated using linear regression)

We see that the average knowledge score for control and treatment school leaders before participating in the course is identical at 56%. There is very little variance over time: The treatment group's knowledge score at endline is still 56%. There are thus no gains in knowledge about learning-through-play approaches among school leaders in those schools that participated in the program. Similarly, the difference-in-differences, which is the metric we use to establish impact by comparing growth among treatment and comparison group school leaders, shown in Table 5, is not statistically significant. This means that the E-certification program did not affect knowledge about LtP approaches among school leaders when looking at the overall composite knowledge indicator.

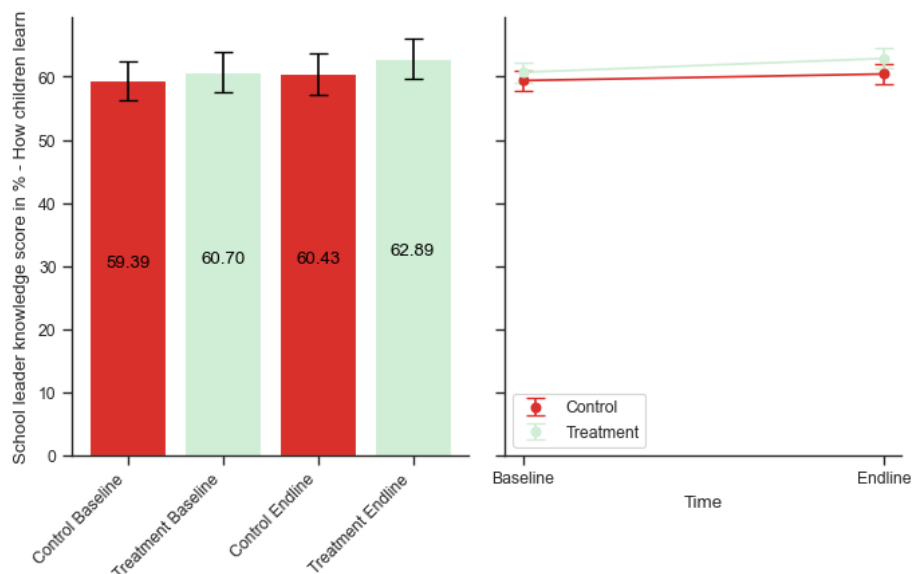
Figure 11 looks at the changes in knowledge on sub-constructs, LtP practices, how children learn, and gender and inclusive practices for school leaders. Knowledge scores on practices and how children learn are low. Here we see that school leaders merely attain knowledge scores between 40 and 64 on a 0 to 100 scale. We see that, similar to teachers, knowledge of gender and inclusion is comparatively high.

Strictly speaking we observe a statistically significant difference in differences in the results for school leaders' knowledge of LtP practices. This means that change between baseline and endline for the treatment group, is greater than the change between baseline and endline in the control group. However, we find that this is driven by the trends not moving in a similar or parallel direction. The level of knowledge about LtP practices among school leaders participating in the course increased by 3 points, while the knowledge in the control group fell by 3 points. In substantial term the increase in knowledge for school leaders is hence very small

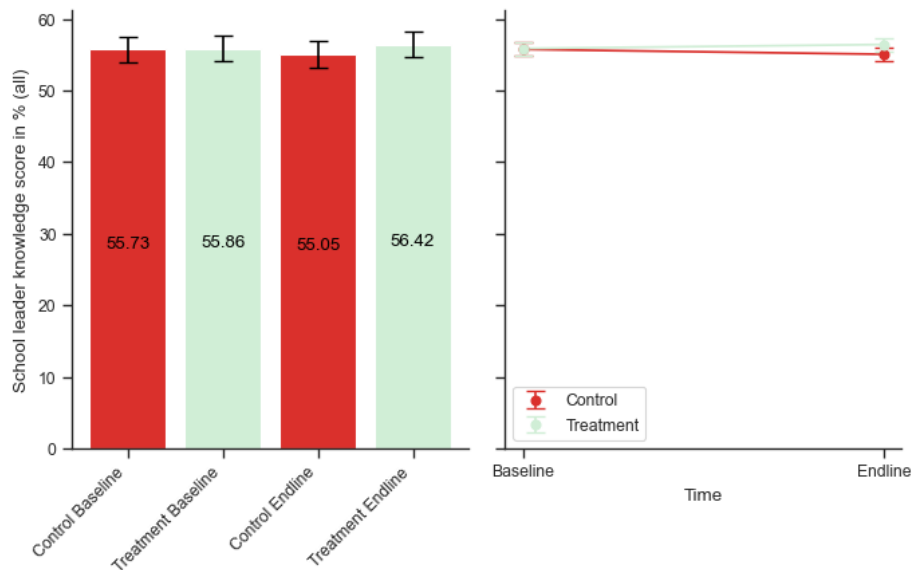
Figure 11: School leaders: Impacts of the E-certification program on knowledge sub-constructs. Impacts on knowledge about LtP- Practices (top) on knowledge about how children learn (middle), knowledge on gender and inclusive practices (bottom).



Source: Laterite computations, n= 274, p-value for the dif-in-dif 0.000



Source: Laterite computations, n= 274, p-value for the dif-in-dif 0.719



Source: Laterite computations, n= 274, p-value for the dif-in-dif 0.504

4.2.5 Knowledge: Key results

- **The E-certification course did not achieve its intended goal of enhancing teachers' and headteachers' knowledge about learning through play.**
- **Most teachers in the treatment group completed the course:** 61% of teachers in the survey sample. Only 9% of school leaders completed the course. The reported lack of take-up or completion among school leaders suggests that the E-course's content, delivery, or its ability to engage participants are avenues of future improvement for the program.
- **The analysis shows no significant improvement in knowledge among teachers who completed the E-certification course.** The flat relationship between levels of course completion and knowledge, as well as the lack of significant differences in knowledge scores between those who self-reported completion and those who did not, corroborates this finding.
- **This highlights that a critical link in the causal chain has not been made, hampering the program's effectiveness.** These findings suggest that even for those teachers who complete the course successfully (i.e., for those with high levels of completion in the LMS data), it does not translate into the expected gains in teacher knowledge.
- This is also evident in the impact estimates, comparing the treatment group to a control group: **the differences between baseline and endline in knowledge scores are very small in the treatment and control group (for teachers and school-leaders).** For both teachers and headteachers, we do not find that participating in the program increases knowledge about Learning through Play.

4.3 Attitudes

How we measured: attitudes; confidence in practices and motivation

A) Teachers:

Confidence in Practices (all teachers)

This assessed teachers' self-reported confidence in managing and delivering classroom activities. Ten items evaluated their ability to integrate participatory and playful approaches, manage behavior, and adapt teaching strategies. For example, one statement was, "I feel confident I can integrate participatory approaches, such as role-play or drawing, into my lessons," which teachers rated on a 5-point Likert scale. We have scored all the underlying items between -2 (completely disagree) and 2 (completely agree). The 'neutral' category is therefore centered at 0. Subsequently, we provide the average of all these 10 Likert scale items. Thus, low scores (-2) indicate the lowest level of confidence possible, and 2 indicates the highest level of confidence possible.

Motivation through Beliefs (teachers who know what LtP is only)

This gauged teachers' motivation to use Learning through Play (LtP) by assessing their beliefs about its effectiveness in improving educational outcomes and combining 20 questionnaire items. For example, teachers rated their agreement with the statement, "Learning through Play activities enable me to help children develop creativity," or "Learning through Play activities enable me to motivate children who show low interest in learning" using a 5-point Likert scale ranging from completely agree to completely disagree. To respond accurately to the items regarding motivation through beliefs, the teachers must know what LtP is. Teachers who do not know what Learning through Play is have a missing value on this indicator (n=170 teachers in the panel at the endline).

Motivation overall (teachers who know what LtP is only)

We combine both sub-scales for motivation into a single motivation indicator. Positive values (0 to 2) indicate higher levels of motivation, and negative values (-2 to 0) indicate low levels of motivation. For the overall motivation indicator, knowing what Learning through Play is necessary. Therefore, teachers with a missing value on motivation through beliefs are not included in the overall indicator.

School leaders

To assess school leaders' motivation to support the integration of Learning through Play (LtP) in their schools, we used questionnaire items that captured their beliefs, commitment, and perceived ability to support teachers. Contrary to teachers, we do not distinguish between sub-constructs in this measure. School leaders were asked to rate their agreement with statements such as "Teachers in my school should adopt Learning through Play methodologies in their classes" (positive) and "Learning through Play approaches distract students from curriculum content" (negative). The questionnaire also included items like "As a school leader, I am committed to helping teachers with integrating Learning through Play in their classroom" and "As a school leader, I have the resources needed to support teachers with integrating Learning through Play in their classroom" to gauge their commitment and confidence in supporting LtP.

Additionally, statements like "Learning through Play activities enable teachers to respond to difficult questions from learners" and "Learning through Play activities enable teachers to keep the classroom quiet when they are teaching" were included to understand school leaders' perceptions

of how LtP impacts teaching practices. The 5-point Likert items (completely agree—completely disagree) all score between -2 and 2, where higher scores (above 0) indicate higher levels of motivation.

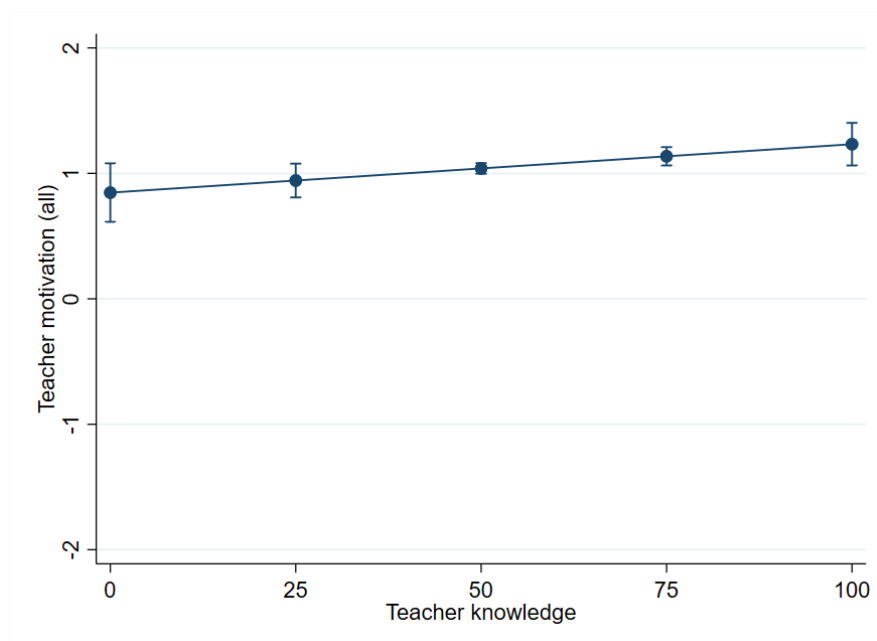
4.3.1 Evaluating the causal pathway for motivation and confidence: teachers

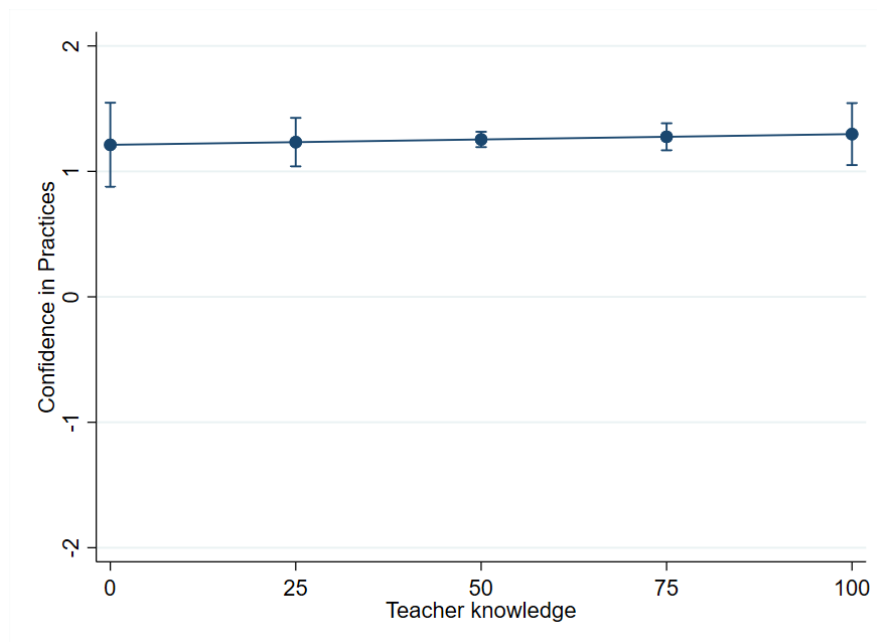
We first investigate to what extent the course completion improves the confidence of teachers in implementing LtP practices and their motivation to follow along the causal chain.

We use similar methods to assess this causal chain as in the knowledge section, where we estimate a regression, controlling for the characteristics of teachers using the panel dataset (those teachers who participated in baseline and endline) at the endline.

The graphs in Figure 12 depict the relationship between teachers' knowledge about LtP and their motivation, as well as their confidence in implementing these practices. On the horizontal axis, teacher knowledge is plotted, while the vertical axes represent motivation (top graph) and confidence in practices (bottom graph).

Figure 12: Causal path teachers: knowledge and motivation all (top) and knowledge & confidence in practices (bottom). Note: Predicted values of teacher knowledge by course completion score and 95CI's, teacher controls held at their means, endline panel only, n=366 for top graph, n= 360 for bottom graph, s.e's clustered at school-level.





In the top graph, which examines the relationship between teacher knowledge and motivation, the line is nearly flat, suggesting little to no correlation between the two variables. The relationship is not statistically significant ($p=0.058$, $n=360$, controlling for teacher socio-demographics). Whether a teacher has minimal or extensive knowledge of LtP, their reported motivation remains consistently around the same level, hovering slightly above the neutral point. **This indicates that simply increasing teachers' knowledge may not be enough to significantly enhance their motivation to implement LtP in the classroom.**

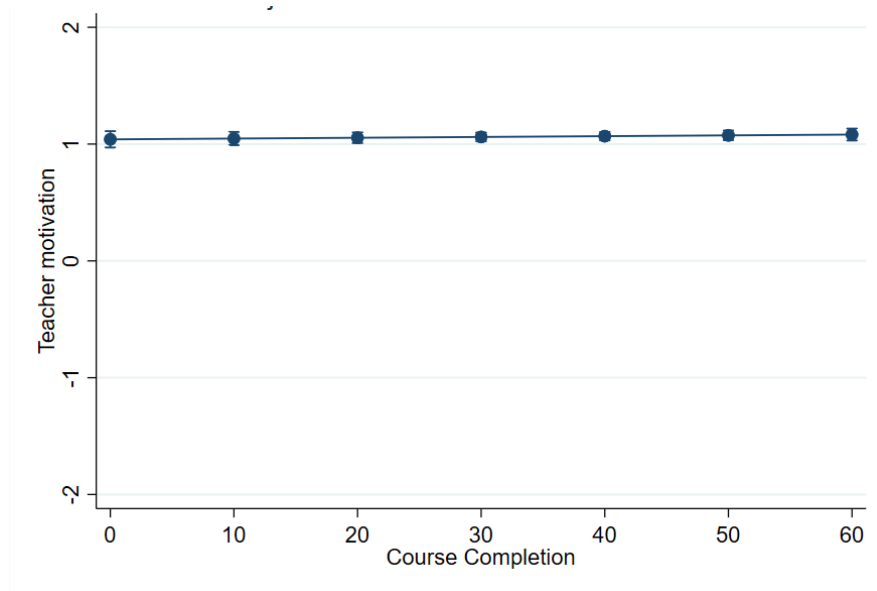
In the qualitative interviews, teachers report that they encounter a difficulty to combine LtP with other teaching methods with strict lesson plans, such as Rwanda Equip or Soma Umenye, or lesson plans provided by REB. **Being asked to implement two teaching methods that are incompatible demotivates teachers.** Teachers do report that learning per se is a motivation for them, but we find little evidence that teachers are motivated specifically by the implementation of LtP. Most teachers share that they want to learn about how to develop a lesson plan that focuses on the lesson objective, which hints towards a motivation in learning very practical and readily available knowledge. In this context, motivation in LtP specifically might be missing the component that introduces it in lesson planning according to teachers, which would make it easier to integrate alongside Rwanda Equip or Soma Umenye.

The bottom graph shows a similar trend when assessing confidence in practices. Here we use all teachers in the treatment group at endline ($n=360$). The line is again flat, with confidence levels remaining steady across different levels of knowledge. **This suggests that gaining knowledge does not translate into increased confidence in implementing LtP practices.** Teachers who have a higher understanding of LtP are not significantly more confident in their ability to apply these methods than those with less knowledge.

We see a similar picture if we assess the relation between course completion in the treatment group. Here we are only using the LMS data (results for the self-reported measures of completion are equivalent). In the graph above, we observe the predicted relationship

between course completion and teacher motivation. Course completion is measured on a continuous scale from 0 to 60, while teacher motivation is plotted on the vertical axis (see Figure 13).

Figure 13: Causal path teachers: course completion (continuous) and teacher motivation (all).



The line is flat, indicating that there is no meaningful relationship between the extent of course completion and the level of teacher motivation. The p-value coefficient for the course completion score in the underlying regression is the p-value is not significant ($p=0.401$). The confidence intervals for this coefficient also suggest no substantial effect. In other words, whether a teacher completed just a few units or the entire course, their reported motivation remains largely unchanged.

Regarding the supportive environment in schools, we find that teachers who rate COPs, SBMs, and head teachers as more supportive also display higher levels of motivation (see Appendix table 13Error! Reference source not found.). However, the interaction term between knowledge and school support is not significant. This suggests that the level of support provided by the school does not change the fact that knowledge, on its own, does not significantly influence motivation. In other words, even **in a very supportive school environment, having more knowledge about LtP does not lead to higher motivation.**

4.3.2 Confounding effects of other programs

To assess the confounding effects of other programs, we separated teachers who participate in other programs from those who do not. The results indicate that participation in other programs is associated with a slightly higher motivation score for teachers in both the control and treatment groups. In the control group, the mean motivation score was 1.04 for those not in other programs and 1.11 for those who were, resulting in a difference of -0.07. Although this difference achieved statistical significance right at the threshold of 0.05, it is marginal, suggesting a very slight confounding effect.

In contrast, the treatment group showed no significant difference in motivation levels between those who participated in other programs and those who did not. Here, the mean motivation scores were 1.06 and 1.09 for those not in other programs and those who were, respectively, with a difference of -0.04 and a non-significant p-value of 0.27.

These findings suggest that while participation in additional programs might marginally boost motivation among the control group, it does not in the treatment group.

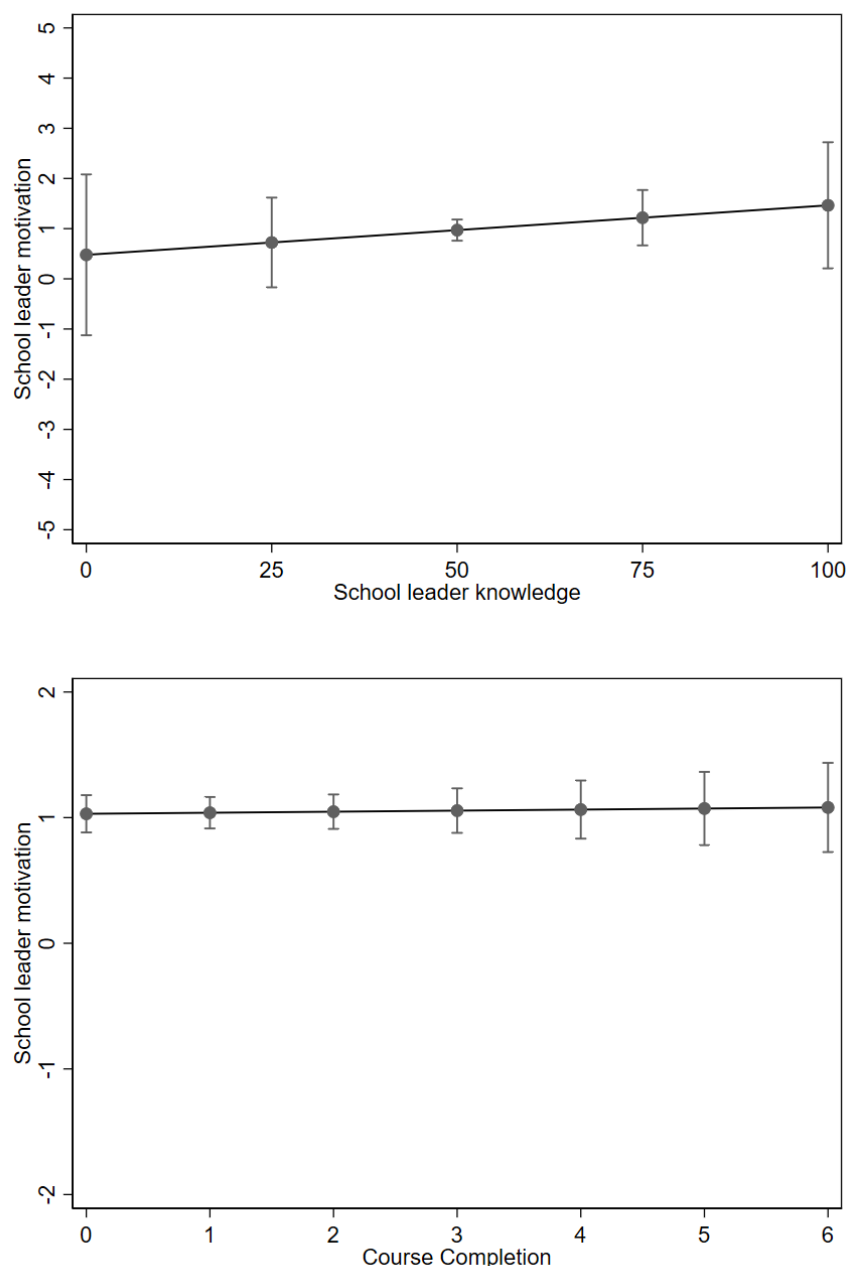
Table 6: T-tests for the difference in motivation for those that participate in another program (e.g., Equip) for the treatment and control group teachers.

Group	n	Mean Motivation	S.E	95% Confidence Interval
<i>Control Group</i>				
No Other Programs	238	1.04	0.02	[1.00, 1.08]
Other Programs	86	1.11	0.03	[1.05, 1.17]
Difference		-0.07	0.04	[-0.14, -0.00]
p-value				0.05
<i>Treatment Group</i>				
No Other Programs	254	1.06	0.02	[1.02, 1.09]
Other Programs	105	1.09	0.03	[1.04, 1.15]
Difference		-0.04	0.03	[-0.10, 0.03]
p-value				0.27

4.3.3 Evaluating the causal pathway for motivation and confidence: school leaders

In this section, we explore the extent to which school leaders' knowledge about LtP and their completion of the E-certification course impact their motivation and confidence in supporting LtP practices within their schools. The graphs in Figure 14 depict the relationship between school leaders' knowledge of LtP and their motivation (top graph) and the relationship between their course completion and motivation (bottom graph). School leader knowledge and course completion are plotted on the horizontal axis, while the vertical axes represent motivation in both cases.

Figure 14: Causal path school leaders: knowledge and motivation all (top) and course completion and motivation (bottom).



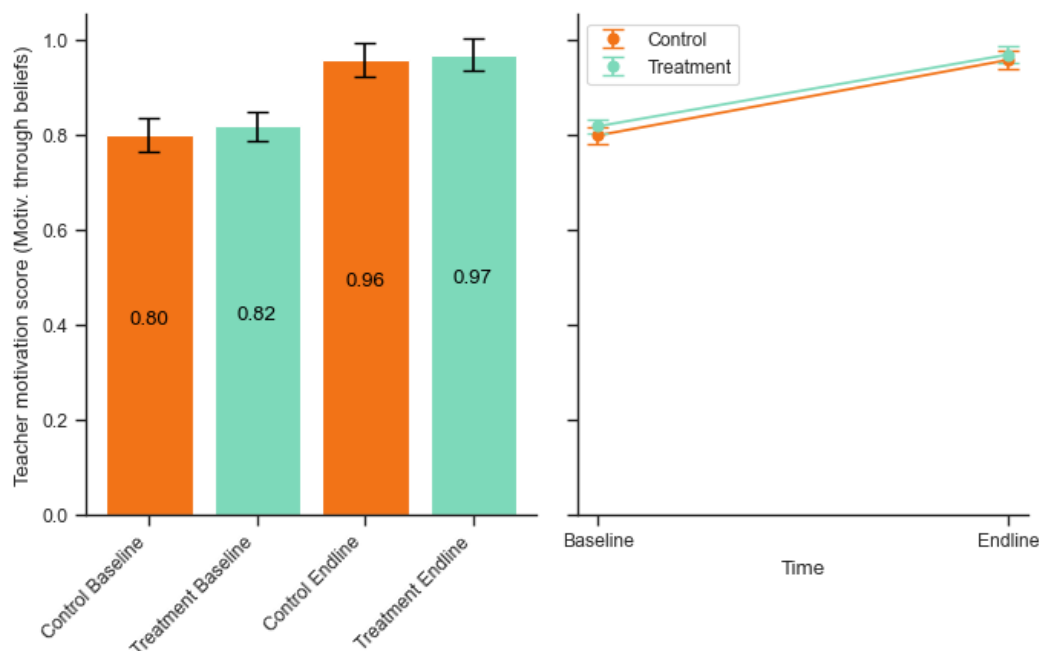
The line shows a slight upward trend, suggesting a positive relationship between knowledge and motivation. However, this relationship is not statistically significant, as indicated by the wide confidence intervals around the estimates. The modest increase in motivation as knowledge increases is not robust enough to conclude that greater knowledge directly enhances school leaders' motivation to support LtP.

The bottom graph shows the relationship between course completion and motivation. The nearly flat line suggests that course completion has little to no impact on school leaders' motivation. The underlying regression confirms this, with a non-significant p-value for the course completion coefficient, indicating that motivation remains largely unchanged regardless of how much of the course is completed. While greater knowledge does appear to enhance motivation slightly, the effect is modest as it is not due to completing the E-certification course.

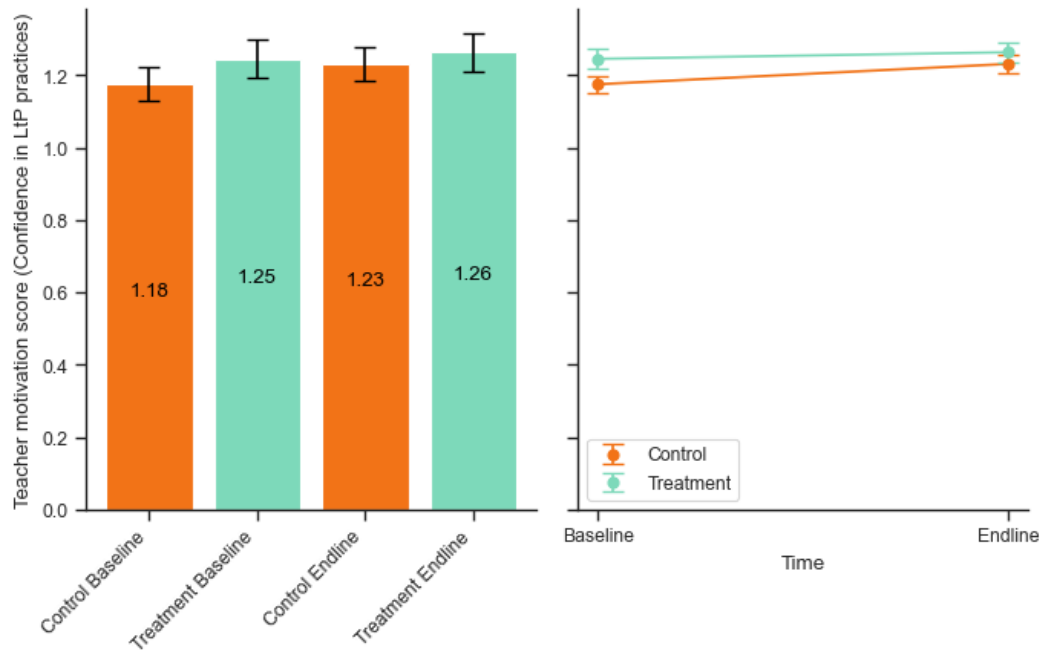
4.3.4 Impacts: attitudes

In Figure 15, we present the results regarding the impact of the program on attitudes. The results in the top graph concern the analysis regarding teacher motivation. Recall that the outcomes range from -2 to 2. We observe a slight growth over time in the treatment group, aligning with the positive trends identified in our earlier causal chain analysis. However, despite the treatment group moving to the right, the difference-in-differences analysis shows no significant impact of the program. This is because the control group's motivation also increased over time, leading to no significant difference between the two groups (see p-value of 0.781).

Figure 15: Teachers: Impacts of the E-certification program on attitudes. Motivation through beliefs (top) and confidence in LtP-practices (bottom).



Source: Laterite computations, n= 517, p-value for the dif-in-dif 0.781



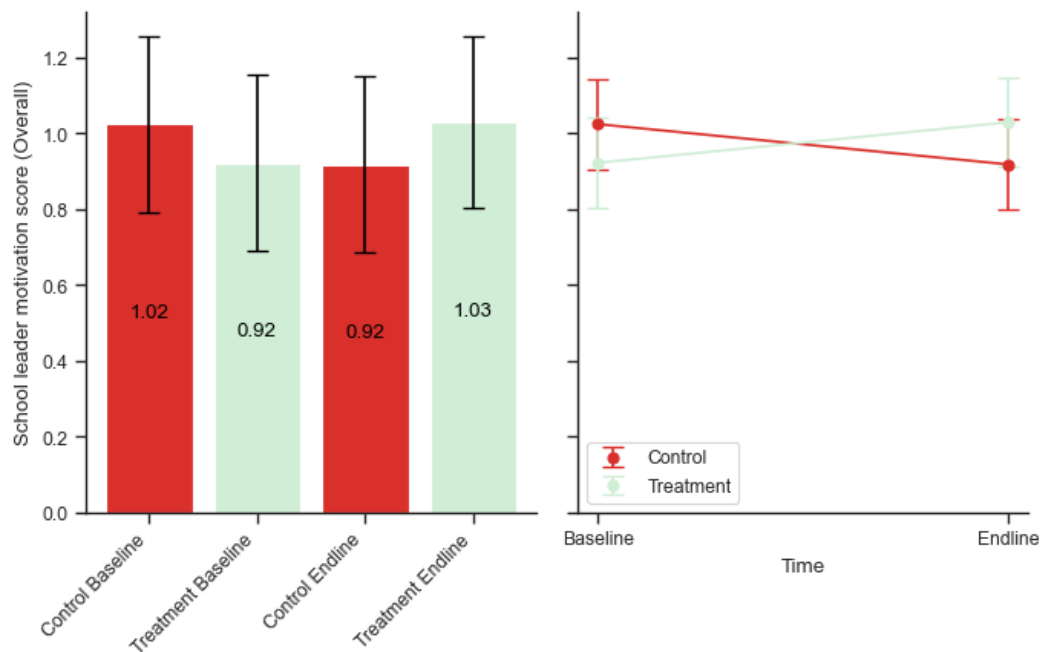
Source: Laterite computations, n= 597, p-value for the dif-in-dif 0.335

The bottom graph shows the results for confidence in implementing LtP practices. Similar to motivation, the treatment group has a slight upward trend, indicating that the program is nudging teachers in the right direction. However, the control group also experienced growth in confidence over time, resulting in no significant difference between the groups. These findings suggest that while the treatment group is trending positively, the parallel improvement in the control group means the program's overall impact on motivation and confidence is negligible.

The results of the difference-in-difference analysis for school leaders are presented in Figure 16. We only have a single measure of motivation. Motivation was assessed using a set of questionnaire items that captured school leaders' beliefs, commitment, and perceived ability to support teachers in implementing LtP. At baseline, the control group reported a higher average motivation score (1.02) compared to the treatment group (0.92). By the endline, the treatment group's motivation increased slightly to 1.03, while the control group's motivation decreased to 0.92. However, these changes over time are not statistically significant, as the differences fall within each other's confidence intervals. The fact that both groups' scores remained within overlapping confidence intervals indicates that any observed differences are minor and not meaningful. The difference-in-differences analysis further confirms that the project's impact on motivation is not statistically significant, with a p-value of 0.336 based on a sample size of 255 school leader observations (baseline and endline).

In summary, the **E-certification and Training program did not affect school leaders' motivation to support LtP practices in their schools**. The slight changes observed in both the control and treatment groups are within the margin of error and do not suggest a robust effect.

Figure 16: School leaders: Impacts of the E-certification program on Motivation overall.



Source: Laterite computations, n= 255, p-value for the dif-in-dif 0.366

4.3.5. Attitudes: Key results

- **The program did not lead to meaningful changes in teacher and headteacher motivation to implement LtP.**
- We find little qualitative evidence of a specific motivation from teachers to learn about LtP. Teachers mention however being interested in learning in general, with many of them mentioning learning about how to develop a lesson plan.
- Similarly, teachers' confidence in implementing LtP practices did not significantly improve due to the program.
- Regarding the causal chain, increasing knowledge about LtP through the E certification does not translate into increased confidence in implementing LtP practices for teachers.
- Participation in other programs, like Rwanda Equip, did not affect teachers' motivation in the treatment group.
- **Participation in other programs slightly boosted motivation in the control group, with a marginally significant difference (p-value of 0.05).**
- **The E-certification program did not significantly affect school leaders' motivation.**

4.4 Practice

In this section, we analyze the final step in the causal chain: implementing Play-Based Learning (PBL) in the classroom. The findings are based on classroom observations using the play-based learning observation tool provided by Oxford MeasurEd. We first analyze the teachers' proficiency levels of implementing play-based learning in the classroom, and subsequently analyze the impacts of the program on Play Scores.

How we measured: Practice: Play Scores

The study employed the PLAY observation tool developed by the Lego Foundation and adapted to the Rwandan context by Oxford MeasurEd. It seeks to understand and track increases in the implementation of Learning through Play into teaching practices by observing a teacher in their classroom for one lesson. This tool measures the quality of teacher support for various elements of Learning through Play, such as connection to experience, problem-solving, exploration, agency, participation, social connectedness, and positive emotional climate. For instance, the participation sub-construct assesses the level of student engagement, particularly in practicing skills introduced by the teacher, expressing opinions, and asking questions. A detailed list is provided in Appendix table 16.

The conceptual model hypothesizes that when these adult-child interactions and the process of learning through play happen, child learning outcomes including social-emotional development, language and numeracy, cognitive and executive function and engagement with community are improved.

Data from classroom observations was analyzed by Oxford MeasurEd. The ability of each item to discriminate between classrooms with higher and lower levels of play based learning was calculated and the reliability of the tool assessed. Items that did not discriminate well and were not essential elements of Learning through Play were removed. In total, six items were not discriminating, nine were "beginning to discriminate" and 13 showed fair discrimination. However, all the seven constructs listed above had at least one item with fair discrimination.

At baseline, similar analysis showed that items for two of the constructs, *active participation* and *positive emotional climate*, were not discriminating well between high- and low-performing teachers and were therefore excluded from the Learning through Play scores. Based on this information, Oxford MeasurEd tested two models at endline: one with the seven constructs and one with five. Results suggest that a model of PBL using just the *Support for Connection to experience*, *Support for Problem-solving*, *Support for Exploration*, *Support for Agency* and *Social Connectedness* constructs fits the data better than a model using all seven original constructs. Most items from the *Support for Participation* and *Positive Emotional Climate* constructs, however, still provide useful information on how child-centered learning in the classroom is.

The primary outcome of interest is the scaled Learning through Play score, which ranges from 320 to 909. Although each item is graded using a score between 0 and 2 or 0 and 3, Oxford Measured created a scaled Learning through Play score. This score is scaled to have a mean of 500 and a standard deviation of 100. Scale scores "weigh" items by difficulty. For the sub-constructs, they were reported across four levels (ranging from 1-4). These levels were determined using empirically and theoretically sound cut-off points, ensuring that each level corresponds to a specific range of observed behaviors and skills. First, at level 0 (i.e. scoring below 380), teachers for whom their ability level was below the difficulty level of the easiest item. In other words, they might be starting

to get a grasp of Learning through Play conducive interactions but are not demonstrating it consistently enough for it to be considered Learning through Play. Second, at level 1 (i.e. scoring between 380 and 600 points), those demonstrating teacher-directed interactive learning. Third, at level 2 (i.e. scoring above 600 points and up to 810 points), those demonstrating teacher-facilitated collaborative learning. Finally, at level 3 (i.e. scoring above 810 points), teachers demonstrate student-centered Learning through Play.

For the two sub-constructs *Support for Participation* and *Positive Emotional Climate*, the outcomes consist in the sum of the scores for the individual items. *Support for Participation* therefore ranges between 0 and 9, while *Positive Emotional Climate* ranges between 0 and 13.

This section presents results for the scaled Learning through Play score, the construct combining the five sub-constructs mentioned above and labelled 'proficiency level, participation sub-constructs, and emotional climate sub-construct.

4.4.1. Teacher proficiency in implementing learn to play in the classroom

It is helpful to understand PLAY scores used as the practice outcome measure to assess whether teachers are practicing (aspects of) LtP in their classrooms. Oxford MeasurEd analyzed what level of proficiency teachers have in implementing LtP. This is reflected in the proficiency scores, which assess which aspects of LtP are easier (at the beginning of the teacher trajectory) and which aspects are harder to implement, indicating higher levels of teacher proficiency in implementing LtP.

Figure 17: Schematic overview of Play-Based Learning/Learning through Play practices.

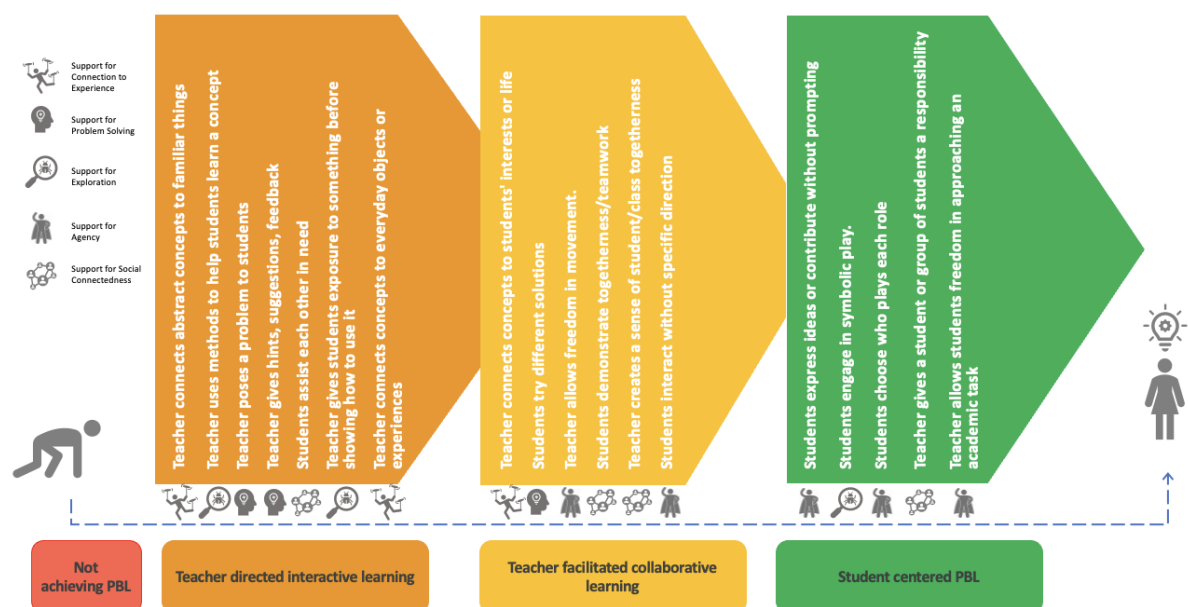


Figure 17 outlines the trajectory of teachers in implementing LtP in their classrooms. The practices teachers learn first are being able to connect abstract concepts to familiar things and the practices teachers are able to put in place only near the end of their PBL trajectory are giving a student or groups of students a responsibility and allowing students freedom in

approaching an academic task. This trajectory is then converted to proficiency levels. Oxford MeasurEd assigned proficiency levels across the teacher trajectory in order to describe where teachers in Rwanda are in terms of what they are actually doing in their classrooms in relation to PLAY and how they are distributed across the teacher trajectory (see Table 7).

Table 7: Proficiency levels for LEGO PLAY tool

Level	Description
Not achieving PBL yet (Level 0)	While the teacher might have exhibited examples of PBL conducive pedagogic techniques and interactions, these were not frequent or consistent enough to consider they constitute PBL in itself.
Teacher directed interactive learning (Level 1)	In level 1 classrooms: • The teacher is using pedagogical techniques that help students better interact with the content, by helping them visualize it or using alternative explanations. • There are examples of positive interactions between individual students. Instruction is still teacher-led, with few or no examples of student-centered learning
Teacher facilitated collaborative learning (Level 2)	In addition to exhibiting the interactions described in level 1, in level 2 classrooms: • The teacher uses pedagogical techniques that make the content more relevant and relatable for their specific students, by connecting it with their interests and lives. • Positive interactions go beyond specific exchanges between individual students, and actually show in a sense of group togetherness. • While instruction is still facilitated by the teacher, the relationships between students are actively used during class activities and students are given chances to learn from each other.
Student centered play-based learning (Level 3)	In addition to exhibiting the interactions described in level 2, in level 3 classrooms: • The teacher uses pedagogical techniques that give students ample space for participation, encouraging them to take responsibility for their own learning. • There are examples of students feeling free to express their ideas and proactively contribute to the class, as well as instances of symbolic play. • The teacher supports learning, but activities are student-centered.

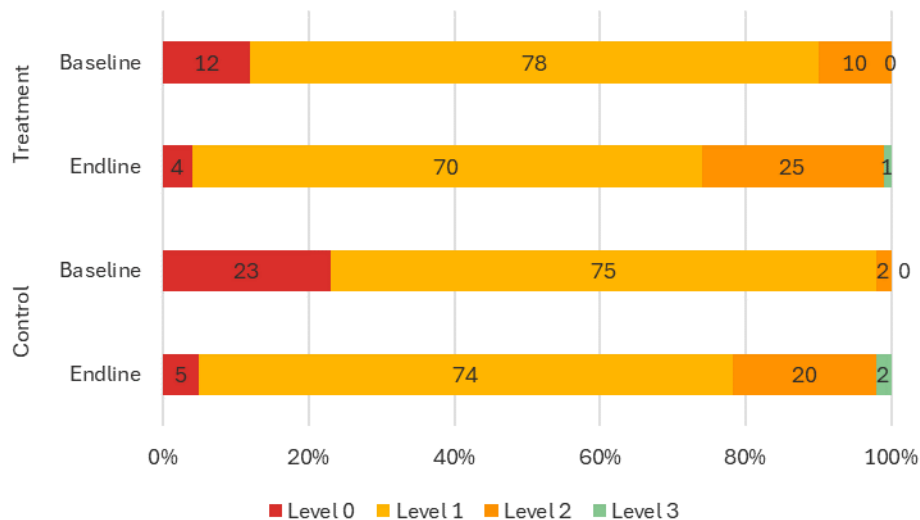
As can be seen in Figure 18, most teachers at baseline were not yet achieving PBL or were achieving the very basic proficiency level of teacher directed interactive learning. Only 10% of the treatment group and 2% of the control group at baseline were able to engage in teacher-facilitated collaborative learning or student-centered play-based learning.

At endline 26% of the treatment and 22% of the control group were achieving within this higher proficiency bands.

While this analysis does not speak to the impact of the E-certification, it provides a useful description of teacher practices in relation to PLAY, progress over time in both treatment and

control groups and highlights that the large majority of teachers continue to practice PBL in very elementary ways that do not reflect collaborative or student-centered learning.

Figure 18 Proportion of teachers in each proficiency level by group: treatment (top) and control (bottom) group



The emotional climate sub-construct, which ranges between 0 and 13 and consists in the sum of the scores of the individual items, captures the positivity and inclusivity of the classroom environment, including aspects like teacher praise, use of energizers, and fostering a risk-free environment for participation. At baseline, the control group had an average score of 6.57, while the treatment group was slightly higher at 7.04. By the endline, both groups had improved, with the control group at 6.84 and the treatment group at 7.60. The difference in the growth between the control and treatment groups was not significant, indicating that the project did not significantly influence the emotional climate of the classroom.

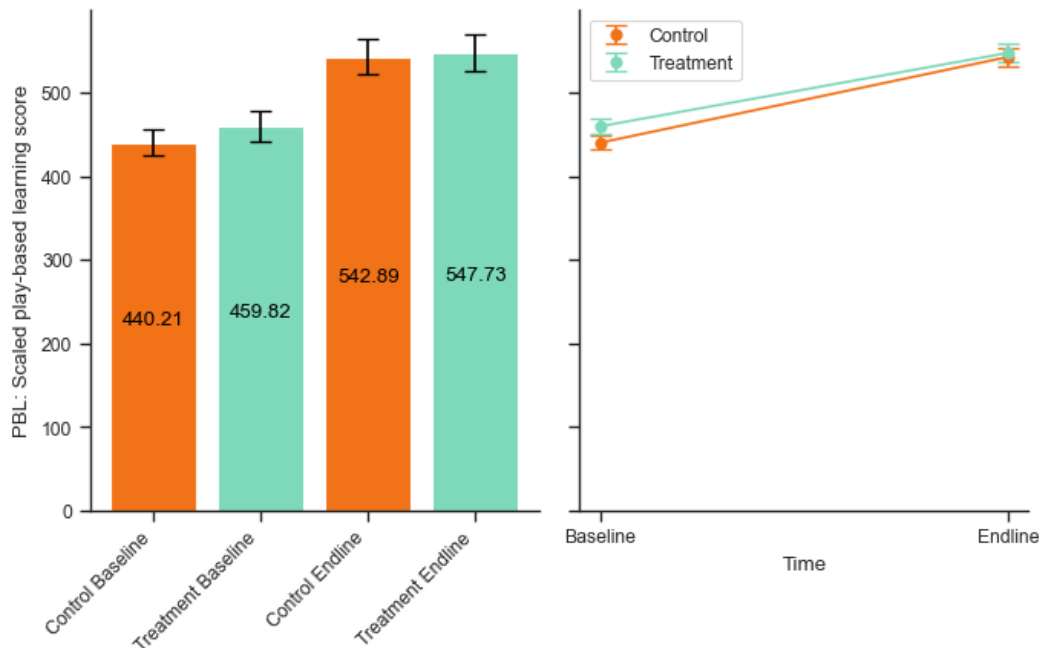
4.4.2 Impacts: practice

Our analysis focused solely on the impact estimates for these indicators, as we are unable to conduct a causal chain analysis for PLAY scores. This limitation is because the classrooms and teachers that teach in the classrooms observed at endline are not the same as those observed at baseline. This mismatch means that we cannot accurately link the observed play scores to individual teacher characteristics. Thus, while we can assess the broader impact of the E-certification course on the use of Learning through Play, we cannot delve into the detailed causal pathways as we did in other sections. We do, however, analyze a repeated cross-section, we use a matching approach (similar to school-leaders) to account for possible differences in the composition of the group of teachers that taught in the classes where the PLAY scores were collected.

The analysis focuses on the differences in PBL implementation between treatment and control groups at both baseline and endline, using a difference-in-differences approach. The primary outcome of interest is the scaled play-based learning score, which ranges from 320 to 909.

At baseline, the control group had a mean PBL score of 440.21 while the treatment group scored slightly higher at 459.82. The difference between the groups was 19.62 points, but this difference was not statistically significant ($p=0.12$), indicating that both groups have similar 'starting positions'.

Figure 19: Impacts: Scaled play-based learning score Matched averages and 95% confidence interval for baseline and endline (left) and change between baseline and endline (right)



Source: Laterite computations, $n=238$, p -value for the dif-in-dif 0.409

By the endline, both groups showed substantial growth in their PBL scores, but this cannot be attributed to the E-certification course. The control group improved to a mean score of 542.89, and the treatment group to 547.73. However, the difference between the groups at endline was even smaller, at just 4.84 points, and this too was not statistically significant ($p=0.76$). This indicates that this growth is not due to the E-certification program. The difference-in-differences estimate shows a slight decline of 14.77 points in the treatment group relative to the control group. This result suggests that the program did not have a significant impact on the implementation of play-based learning in classrooms, as the changes observed were within the margin of error ($p=0.41$).

Table 8: Impacts practice: Scaled play-based learning scores (ranging from 320 to 909). Repeated cross-sections difference-in-differences.

Outcome:	PBL: Scaled play-based learning score		
Baseline	mean	s.e	p-value
(matched) Control	440.21		
Treated	459.82		
Difference (T-C)	19.62	12.58	0.12
Endline	mean	s.e	p-value
(matched) Control	542.89		
Treated	547.73		
Difference (T-C)	4.84	15.54	0.76
Impact: Diff-in-Diff	-14.77	17.85	0.41
n (teachers)	269		
R-squared	0.22		

Note Analysis on repeated cross-section of teachers in classrooms, n teachers endline 301, baseline n=267, statistics represent means and differences for the matched comparison group school leaders (kernel matched difference-in-differences, estimation on repeated cross-section, common support only, means and differences estimated using linear regression)

In our qualitative discussions, teachers report using a variety of activities and strategies that they learned through the course. The most named activities are songs and movement (jumping, clapping etc.), using handmade cards with pictures, number, or letters, and other (self-made) learning materials. Teachers also use group work to encourage cooperation and learning from each other. Another aspect that teachers employ is the formative and summative assessment.

“We use different games; it depends on the subject you are going to learn. You analyze the topic you are going to teach, for instance, if it is a multiplication table, it might not be easy for a child to retain it in their memory, but if they use stones, they will just think they are playing. If you are going to learn multiplication by 3 for instance, if you put three stones there and another three there, if a student counts them, it will be easy for them to understand it. Although they are learning multiplication, they also understand where it comes from.” Teacher - Ngororero

Teachers describe a wide range of benefits they observe from using play-based learning. Teachers see their students as being active and engaged in class and enjoying learning. They emphasize that Learning through Play results in children developing a deeper understanding of concepts and retain acquired knowledge better. A further benefit observed by teachers is the positive impact on inclusion of students with a disability or learning difficulties and the reduction of gender stereotypes. Teachers know how to plan activities that include all students and meet their individual needs. Learning through Play also helps them identify individual talents, such as a student that may not be able to write but excels at drawing. As a result, students of all abilities and genders seem more engaged and motivated to study.

Teachers also report of students who previously were at risk of drop-out, who are now coming back to school regularly because they enjoy classes.

In addition, teachers are overwhelmingly positive about the effect Learning through Play has on the social relations within the classroom, both between student and teacher, and between students. Teachers for instance describe that playing together, particularly in mixed groups, with assignments that foster cooperation leads to students knowing and appreciating each other more.

“Before, a student would hide after seeing a teacher walking on the way. However, today, a student is interested in meeting and greeting a teacher and when a student has a problem, he/she opens up to you and informs you about the problem because he/she realizes that you work together with him/her.”. Teacher- Nyanza

Teachers also highlight that since introducing playful learning, the hierarchical relation between teachers and students has been replaced by a more open respectful relationship. Students are described as being more open, no longer fearing the teacher, and students are more likely to share about their personal struggles. Teachers further mention that the new class dynamic allows them to know each student better, thus making a more personalized support in each student’s learning journey possible.

Teachers however experience challenges with implementation. Among the structural constraints teachers mention are small classrooms, the class sizes which can reach 50-60 students, and the period length of 40 minutes. Although LtP is an approach that does not need specific resources, the availability of teaching resources is also seen as a constraint by the teachers. Availability of basic materials such as paper, pens, scissors, balls, counting materials, vary strongly from school to school. Some teachers report that nearly all resources are available upon request to the school leadership, while other teachers report that even paper is missing for whole semesters.

Teachers also express that they are struggling to invent activities and songs for all their lessons and topics. Suggestions made where to develop a book collecting all play activities and lessons, or to organize a competition for all participating schools, in which teachers and students develop activities to be shared with their colleagues.

Being asked to implement two teaching methods that are incompatible demotivates teachers. Teachers would like to see examples of how these different methods can be integrated. As mentioned earlier in the report when discussing motivation, we find evidence that a further difficulty teachers encounter is the combination of Learning through Play with other teach methods with strict lesson plans, such as Rwanda Equip or Soma Umenye, or lesson plans provided by REB.

In the focus group discussion with students, few children describe playful activities in their classrooms. The most named activities are drawing and singing. Most children enjoy these activities. A few children also point out that they do not enjoy singing or other activities in

English or French because they do not understand them. Students also describe note taking and writing among their favorite activities.

All children report that teachers are the ones choosing what activities they do in class, thus implying a restricted agency for children in the classroom. The situations in which they are allowed to make choices are restricted to classroom chores. For instance, the teacher or class representative may give them a choice to sweep or to mop the classroom.

Students experience of a class is highly dependent on the teacher and their teaching style. Students describe their favorite classes as those where teachers are kind and provide clear explanations. Children also value it when teachers provide individual assistance, if they did not understand something. Children describe their most disliked classes as those where teachers fail to explain anything but rather have students just copy what they write on the blackboard. This finding therefore advocates for more interactive lessons, as is introduced by a LtP approach. Students also describe cases of teachers sleeping in class or using corporal punishment, as their least favorite classes.

Overall, the children's description of their classroom experience does not provide evidence of consistent adoption of Learning through Play by their teachers.

4.4.3 Practice: key findings

- The E-certification program did not have a significant impact on the implementation of Learning through Play in classrooms, as measured by the scaled play-based learning score.
- At baseline, the majority of teachers in both treatment and control groups were either not yet achieving Learning through Play or were at the basic proficiency level of teacher-directed interactive learning.
- By endline, there was a modest increase in the proportion of teachers achieving higher proficiency levels (teacher-facilitated collaborative learning or student-centered play-based learning) in both groups, with 27% in the treatment group and 21% in the control group reaching these levels.
- Qualitative data suggests that teachers report using various Learning through Play activities and strategies learned through the course, observing benefits such as increased student engagement, better concept retention, and improved classroom social relations but this is not reflected in the qualitative data collected among children.
- Despite perceived benefits, teachers face challenges in implementing Learning through Play, including structural constraints (e.g., large class sizes, limited resources) and difficulties in integrating Learning through Play with other required teaching methods.
- FGDs with children revealed a disconnect between teachers' reported implementation of Learning through Play and students' experiences. While teachers reported using various playful activities, children described limited playful activities in their

classrooms and restricted agency in choosing activities, suggesting inconsistent adoption of Learning through Play principles across classrooms.

5. Conclusion

This report presented the results of the evaluation of the E-training and certification project on the attitude towards Learning through Play (LtP) and the use of LtP in the classroom practice for teachers and school leaders in 170 schools spread across three districts of Rwanda. This evaluation was structured along causal pathways that teachers and school leaders need to follow in order to ensure that children have an improved learning experience in the classroom.

To investigate the different links in these causal pathways, we used multiple sources of data that give us a holistic picture of a child's experience in the school environment. We surveyed teachers and school leaders. We also observed lessons to assess the implementation of LtP and we conducted FGDs with teachers and students. Finally, we accessed data from a Learner Management System to learn about course completion and participation.

Overall, the E-certification course did not achieve its intended goal of enhancing teachers' and school leaders' knowledge about learning through play.

While completion among teachers is at 86%, a minority of school leaders (9%) report having completed all units of the course. Despite teachers rating the support from school-based mentors, communities of practice, and head teachers relatively positively, we do not find that school (leader) support is associated with course completion. The reported lack of take-up or completion among school leaders suggests that the E-course's content, delivery, or its ability to engage these participants are avenues of future improvement for the program.

We found indications that the causal chain breaks at the first link of the hypothesized Theory of Change: Results show that despite the course's focus on foundational concepts and its alignment with a competency-based curriculum, the course completion data from the LMS system and the self-reported completion metrics suggest no significant improvement in knowledge among teachers who enrolled in the E-certification course. The lack of correlation between course completion scores and knowledge, as well as the lack of significant differences in knowledge scores between respondents who self-reported completion and those who did not, corroborates this finding. This finding remains true for teachers with high completion scores in the LMS data and for teachers that completed other CPD courses. This is also true for school leaders, for whom we find no improvement in knowledge scores for school leaders who have participated in the E-certification course. The lack of improvement of knowledge indicates that a critical step in the causal chain is not achieved, thus hampering the program's effectiveness at other levels.

Similarly, we found no impacts of the program on the envisioned indicators further down the causal chain. The program did not lead to any meaningful changes in teacher and school leader motivation to implement LtP, and this remains true for teachers who participated in other CPD programs among the treatment group. For the control group, participation in other programs slightly boosted motivation for teachers, but not for school leaders.

When looking at impact estimates – comparing the treatment group to a control group – the differences between baseline and endline in knowledge scores are very small in both groups

for teachers and school leaders, and levels of knowledge remain low at around 55%. Qualitative evidence shows that teachers argue that student-led play is perceived as play only, thus not leading to learning.

We find substantial growth in Learning through Play practice scores for both the treatment and control groups between baseline and endline. The difference between groups, however, is small at endline and not statistically significant suggesting that the program did not have a significant impact on the implementation of Learning through Play in classrooms. Overall, results highlight that the large majority of teachers continue to practice PBL in very elementary ways that do not reflect collaborative or student-centered learning.

5.1 Recommendations

The lack of impact of the current blended training on key outcomes of the E-training and certification project highlights a need to rethink and adapt the piloted training. The evaluation provides a few key insights on which elements of the course design may be fruitful to avenues for improvement.

- **Understanding teachers' knowledge acquisition.** The lack of observed improvements in knowledge may have different causes. While some teachers simply did not complete the course, it is particularly interesting that many teachers did complete the course successfully and still failed to retain core concepts of Learning through Play. It is, therefore, important to further investigate what knowledge teachers did acquire through the course, which concepts are particularly difficult for them to grasp or retain and which elements of the course were effective or ineffective at building knowledge.
- **Ratio of online to in-person training.** For a majority of the targeted teachers, the Learning through Play E-training and certification was the first time learning online. The combination of low digital literacy, an imperfect technical system and missing in-person training may have been a contributing factor to the low acquisition and retention of knowledge. In the FGD teachers expressed a need for in-person training that was not met by the current blended course design. Teachers name in-person teaching demonstrations and studying with a peer group at a physical location as potential elements that could enhance their learning experience.
- **Enhancing school level support.** Given the low completion rate of the course by school leaders, and the lack of changes in school leaders knowledge, it is unlikely that they are able to provide the school level support that teachers need to successfully learn about and adopt Learning through play in their teaching practice. An increased focus in building capacity at the school or sector level would therefore be a critical aspect to include in the next iteration of the training.
- **Adjusting focus and expectation to teachers' realities.** Teachers have scarce resources to spend on professional development, including limited if any dedicated learning time, and lack of time to prepare and explore new teaching techniques. In addition, teachers have large classes with high variation in student abilities. These structural challenges teachers face are likely impeding their ability to acquire the required knowledge and implement any substantial change in their teaching. In revising the blended training, it will hence be crucial to critically look at what volume

of content teachers can process with the time available and what core aspects of Learning through Play would be the easiest for teachers to implement in their current constraints. Focusing the course on fewer and most easily adopted concepts may help build a foundation that can be gradually enhanced over time.

- **System integration for sustainability.** Teachers express their frustration with a continuous stream of pedagogical approaches that they are expected to learn and adopt, only to be replaced by a new approach once donor funding runs out. Teachers are demotivated by unrealistic expectations and teaching approaches that do not align well in practice. Consequently, it will be paramount to develop strategies on how Learning through Play can be integrated in the current education system to ensure long-term sustainability and system level change. This may require substantial more involvement with education policy actors, as well as exploring different approaches to anchoring Learning through Play in teachers' training, for example by integrating it into teachers' pre-service pedagogical training.

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Appendix

Technical appendix: Propensity score matched difference-in-differences.

To estimate the propensity score, we first employ a logistic regression model (logit model) to predict the probability of a teacher (or head teacher) being assigned to the treatment group based on their socio-demographic characteristics. These characteristics include variables such as age, gender, years of experience, and other relevant factors. Importantly, to account for potential clustering effects within schools, standard errors are clustered at the school level.

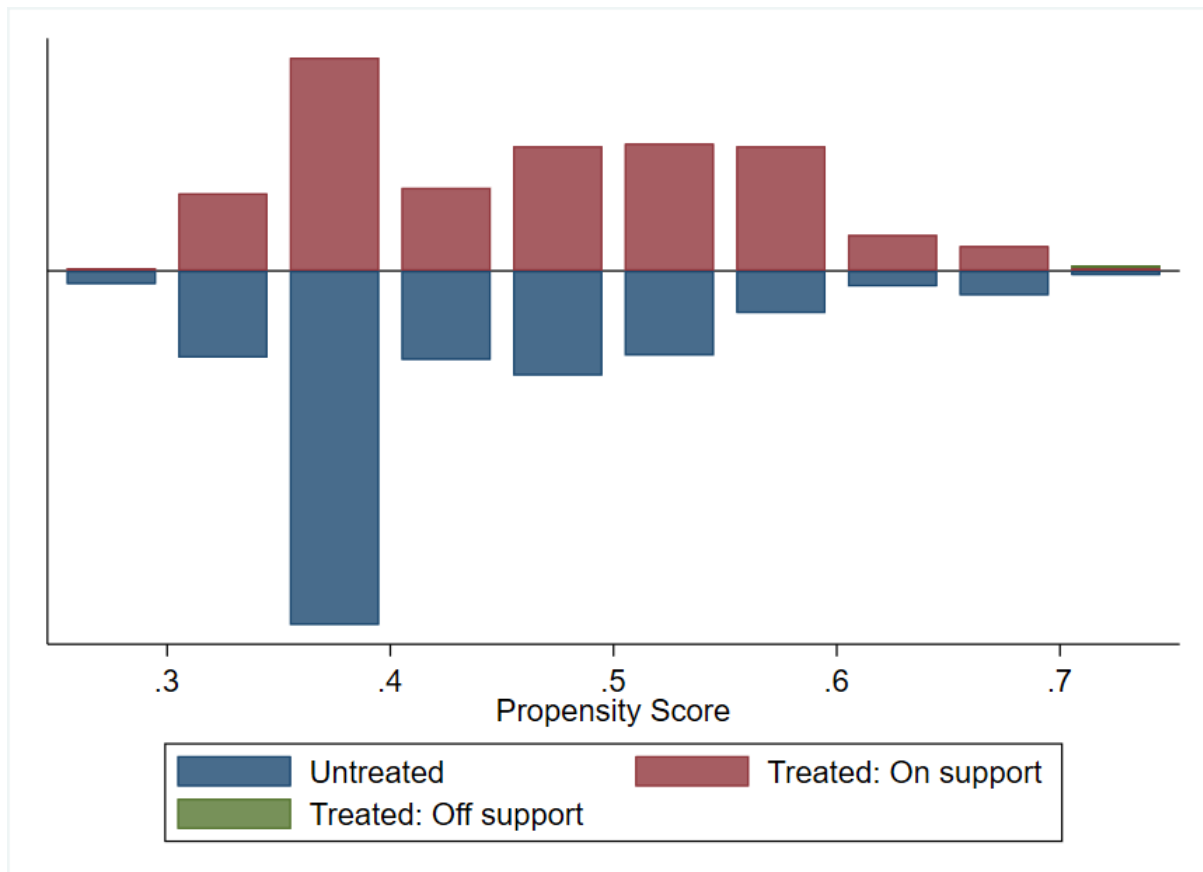
Appendix Table 2: Logit Model for Propensity Score Estimation teachers

Logistic regression: estimating teacher propensity score. (0=control group, 1=treatment group)		
Variable	Coefficient	t-statistic
Female	0.249	(1.10)
Age < 26	ref.	ref.
Age 26-30	0.0418	(0.13)
Age 31-35	0.568	(1.80)
Age 36-40	-0.246	(-0.63)
Age 41-45	-0.0427	(-0.11)
Age 46-50	0.401	(0.82)
Age 51-55	-0.409	(-0.59)
Age 56-60	0.525	(0.69)
Age > 60	-0.0868	(-0.08)
Teacher has a disability (1=yes, 0=no)	0.0169	(0.03)
Years of teaching experience	0.0212	(1.10)
Education (completed): secondary or lower		Ref.
Education (completed): Certificate	0.0793	(0.18)
Education (completed): Bachelor or higher	0.478	(1.62)
Constant	-0.806*	(-2.26)
Observations (teachers at baseline, panel only)	664	
Standard errors clustered within 167 schools		
t statistics in parentheses		
* p<0.05, ** p<0.01, *** p<0.001		

We see that although most individual socio-demographic variables do not show statistically significant associations with the likelihood of being assigned to the treatment group, the model as a whole still contributes to explaining treatment assignment. The lack of significance in the individual coefficients suggests that no single characteristic strongly predicts treatment, but collectively, these variables still help capture the underlying patterns of assignment. This indicates that the propensity score model is appropriately accounting for the observed socio-demographics, ensuring a balanced comparison between the treatment and control groups.

Once the propensity scores are estimated, we proceed with Kernel-based propensity score matching (PSM) for the difference-in-differences analysis. This method allows us to match treatment and control group participants more precisely by comparing those with similar propensity scores.

Appendix Figure 1: Common support teachers



In Appendix Figure 1 we show the overlap in propensity scores for the treatment and control group for teachers. This shows common support. Common support ensures that every treated unit has a comparable counterpart in the control group with a similar propensity score, which is crucial for a valid comparison.

The top bars represent the propensity scores for treatment group teachers while the bottom bars (in blue) represent the scores of those in the control group. The very small green bar indicates a teacher in the treatment group that is “off support”, meaning it lacks a comparable match in the control group based on its propensity score.

The propensity scores for the treatment and control groups overlap significantly, indicating that the scores are generally comparable between the groups. This overlap suggests that the matching process has been successful, with most treated teachers having a similar counterpart in the control group. The only exception is one observation, which lies outside this common support region, indicating it does not have a suitable match in the control group.

Overall, this graph confirms that the analysis includes comparable cases, with minimal exclusion due to lack of common support.

In the Kernel-based PSM, each control teacher is assigned a weight based on its proximity to the treatment teacher in terms of their propensity score. This weighting is done using a kernel function, which assigns higher weights to control units with propensity scores closer to those of the treatment units, and lower weights to those further away. By applying these kernel weights, we create a balanced comparison group that mirrors the treatment group as closely as possible, allowing us to more accurately estimate the causal impact of the program.

Specifically, we restrict the control group sample to observations that fall within the common support region—where the propensity scores of treatment and control units overlap—ensuring that comparisons are made between similar individuals. This approach ensures that the subsequent difference-in-differences analysis reflects the true effect of the intervention, minimizing biases that could arise from differences in baseline characteristics between the treatment and control groups.

Attrition and balance tables

These tables compare the baseline characteristics for the respondents who participated in both baseline and endline to the baseline characteristics for the respondents who only participated at baseline.

Appendix Table 3: Attrition balance table for teacher characteristics in the survey sample

	Baseline panel (n=734)	Baseline only (n=115)	Difference
Gender (%)			
Female	0.75	0.86	-0.11***
Age (categories) (%)			
18-25	0.11	0.12	-0.02
26-30	0.22	0.24	-0.01
31-35	0.18	0.19	-0.01
36-40	0.15	0.17	-0.02
41-45	0.16	0.16	0.00
46-50	0.10	0.04	0.07**
51-55	0.04	0.05	-0.02
56-60	0.04	0.03	0.01
Over 60	0.01	0.02	-0.01
What language do you speak at home most regularly? (%)			
Kinyarwanda	1.00	1.00	0.00
English	0.00	0.00	0.00
French	0.00	0.00	0.00
Do you have a disability? (%)			
Yes	0.03	0.01	0.02
Years of work experience in education role			
	11.10	10.12	0.98
Years of work experience working in this school			
	7.29	6.77	0.53
Highest level of education completed (%)			
Upper secondary or lower	0.10	0.13	-0.03
Bachelor or higher (bachelor masters, advanced diploma)	0.90	0.86	0.04
Teaching qualifications held (%)			
I do not hold any qualification for teaching	0.33	0.35	-0.02
Postgraduate diploma in teaching	0.00	0.01	-0.01**
Advanced Diploma in Education	0.01	0.04	-0.02*
Certificate in Teacher Training (Primary, A2)	0.64	0.56	0.08
Bachelor's of Education (A0)	0.02	0.05	-0.03**

Appendix Table 4: Attrition balance table for teacher characteristics in the classroom sample

	Baseline panel (n=278)	Baseline only (n=62)	Difference
Gender (%)			
Female	0.80	0.82	-0.03
Age (categories) (%)			
18-25	0.09	0.03	0.06
26-30	0.22	0.27	-0.06
31-35	0.16	0.19	-0.04
36-40	0.16	0.21	-0.05
41-45	0.18	0.23	-0.05
46-50	0.10	0.03	0.072*
51-55	0.04	0.00	0.043*
56-60	0.04	0.03	0.00
Over 60	0.01	0.00	0.01
What language do you speak at home most regularly? (%)			
Kinyarwanda	0.99	1.00	-0.01
English	0.00	0.00	0.00
French	0.00	0.00	0.00
Do you have a disability? (%)			
Yes	0.01	0.02	-0.01
Years of work experience in education role			
	11.80	10.37	1.43
Years of work experience working in this school			
	7.63	6.94	0.69
Highest level of education completed (%)			
Upper secondary or lower	0.10	0.11	-0.02
Bachelor or higher (bachelor masters, advanced diploma)	0.90	0.89	0.02
Teaching qualifications held (%)			
I do not hold any qualification for teaching	0.31	0.37	-0.06
Postgraduate diploma in teaching	0.01	0.05	-0.041**
Advanced Diploma in Education	0.66	0.53	0.128*
Certificate in Teacher Training (Primary, A2)	0.03	0.05	-0.02

Appendix Table 5: Attrition balance table for school leader characteristics in the survey sample

	Baseline panel (n=146)	Baseline only (n=46)	Difference
Gender (%)			
Female	0.31	0.28	0.02
Age (categories) (%)			
26-30	0.02	0.00	0.02
31-35	0.07	0.17	-0.11**
36-40	0.23	0.28	-0.06
41-45	0.20	0.11	0.09
46-50	0.30	0.28	0.02
51-55	0.12	0.04	0.08
56-60	0.05	0.07	-0.02
Over 60	0.02	0.04	-0.02
Do you have a disability? (%)			
Yes	0.02	0.02	-0.01
Years of work experience working in this school			
	5.31	6.15	-0.85
Highest level of education completed (%)			
Upper secondary or lower	0.19	0.13	0.06
Bachelors	0.62	0.65	-0.03
Masters or higher (bachelor masters, advanced diploma)	0.19	0.22	-0.03
Teaching qualifications held (%)			
I do not hold any qualification for teaching	0.01	0.02	-0.01
Postgraduate diploma in teaching	0.07	0.09	-0.02
Advanced Diploma in Education	0.09	0.00	0.09**
Certificate in Teacher Training (Primary, A2)	0.32	0.11	0.21***
Bachelors of Education (A0)	0.52	0.74	-0.22**

Appendix Table 6: Logistic regression results for attrition among survey teachers

	Coefficient	Z-score
Gender (%)		
Female	0.787*	2.35
Age (categories) (%)		
26-30	-0.0502	-0.13
31-35	0.160	0.41
36-40	0.185	0.40
41-45	0.179	0.34
46-50	-0.695	-0.93
51-55	0.974	1.13
56-60	0.274	0.27
Over 60	1.308	0.79
Do you have a disability? (%)		
Yes	-0.996	-0.86
Years of work experience in education role		
	-0.0178	-0.58
Years of work experience in this school		
	0.000963	0.04
Highest level of education completed (%)		
Bachelors or higher	-0.319	-0.61
Teaching qualifications held (%)		
Advanced Diploma in Education	1.350	1.62
Certificate in Teacher Training (Primary, A2)	-0.101	-0.37
Bachelors of Education (A0)	1.253	1.94
Constant		
	-2.376***	-5.64
Observations (n=846)		

Note: ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Appendix Table 7: Logistic regression results for attrition among observed teachers

	Coefficient	Z-score
Gender (%)		
Female	0.111	0.28
Age (categories) (%)		
26-30	1.307	1.51
31-35	1.426	1.65
36-40	1.195	1.34
41-45	1.133	1.19
46-50	-0.516	-0.38
56-60	0.224	0.16
Do you have a disability? (%)		
Yes	1.888	1.60
Years of work experience in education role		
	0.0199	0.53
Years of work experience in this school		
	0.0279	0.87
Highest level of education completed (%)		
Bachelors or higher	-1.373	-1.34
Teaching qualifications held (%)		
Postgraduate diploma in teaching	3.168*	2.20
Advanced Diploma in education	-0.444	-1.15
Certificate in Teacher Training	1.546	1.16
Constant		
	-2.727**	-3.02
Observations (n=324)		

Note: ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Appendix Table 8: Logistic regression results for attrition among survey school leaders

	Coefficient	Z-score
Gender (%)		
Female	0.0430	0.09
Age (categories) (%)		
31-35	1.743	1.25
36-40	0.454	0.37
41-45	-0.538	-0.43
46-50	-0.135	-0.11
51-55	-1.206	-0.87
56-60	0.00221	0.00
Do you have a disability? (%)		
Yes	0.271	0.17
Years of work experience in education role		
	0.0887*	2.22
Years of work experience in this school		
	-1.883	-1.12
Highest level of education completed (%)		
Bachelors or higher	-15.52***	-19.41
Teaching qualifications held (%)		
Advanced Diploma in education	-17.81***	-10.98
Certificate in Teacher Training	-1.283	-0.79
Bachelors of Education (A0)	-14.63***	-17.21
Constant		
	15.49***	7.48
Observations (n=158)		

Note: ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Appendix Table 9: Balance table for teacher characteristics in the survey panel

	Control	Treatment	Difference
Gender (%)			
Female	0.74	0.76	-0.02
Age (categories) (%)			
18-25	0.12	0.09	0.03
26-30	0.26	0.19	0.06**
31-35	0.16	0.20	-0.04
36-40	0.17	0.12	0.05*
41-45	0.15	0.17	-0.02
46-50	0.08	0.13	-0.05**
51-55	0.04	0.04	0.00
56-60	0.02	0.06	-0.03**
Over 60	0.01	0.01	-0.01
What language do you speak at home most regularly? (%)			
Kinyarwanda	1.00	1.00	0.00
English	0.00	0.00	0.00
French	0.00	0.00	0.00
Do you have a disability? (%)			
Yes	0.02	0.03	-0.01
Years of work experience in education role			
	9.95	12.27	-2.32***
Years of work experience working in this school			
	6.41	8.18	-1.77***
Highest level of education completed (%)			
Lower Secondary	0.00	0.00	0.00
Upper Secondary	0.86	0.83	0.04
Certificate (e.g. WDA, TTC)	0.05	0.05	0.00
Bachelors Degree (BA, BSc)	0.05	0.07	-0.02
Advanced Diploma	0.03	0.05	-0.02
Teaching qualifications held (%)			
I do not hold any qualification for teaching	0.35	0.31	0.04
Advanced Diploma in Education	0.01	0.02	-0.01
Certificate in Teacher Training (Primary, A2)	0.62	0.65	-0.03
Bachelors of Education (A0)	0.02	0.02	0.00

Note: ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Appendix Table 10: Balance table for teacher characteristics in the classroom observation panel

	Control	Treatment	Difference
Gender (%)			
Female	0.77	0.82	-0.04
Age (categories) (%)			
18-25	0.11	0.08	0.03
26-30	0.23	0.20	0.04
31-35	0.10	0.22	-0.13***
36-40	0.18	0.14	0.03
41-45	0.19	0.16	0.03
46-50	0.10	0.11	0.00
51-55	0.04	0.04	0.00
56-60	0.04	0.03	0.02
Over 60	0.01	0.02	-0.01
What language do you speak at home most regularly? (%)			
Kinyarwanda	0.99	0.99	0.00
English	0.00	0.01	-0.01
French	0.01	0.00	0.01
Do you have a disability? (%)			
Yes	0.01	0.01	0.00
Years of work experience in education role			
	11.78	11.82	-0.04
Years of work experience working in this school			
	7.20	8.04	-0.83
Highest level of education completed (%)			
Upper Secondary	0.88	0.84	0.05
Certificate (e.g. WDA, TTC)	0.05	0.04	0.02
Bachelors Degree (BA, BSc)	0.05	0.09	-0.04
Advanced Diploma	0.02	0.04	-0.02
Teaching qualifications held (%)			
I do not hold any qualification for teaching	0.31	0.31	0.00
Advanced Diploma in Education	0.01	0.01	0.00
Certificate in Teacher Training (Primary, A2)	0.67	0.65	0.02
Bachelors of Education (A0)	0.02	0.04	-0.02

Note: ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Appendix Table 11: Balance table for school leader characteristics in the survey panel

	Control	Treatment	Difference
Gender (%)			
Female	0.22	0.39	-0.16**
What language do you speak at home most regularly? (%)			
Kinyarwanda	1.00	0.99	0.02
Do you have a disability? (%)			
Yes	0.02	0.02	0.00
Years of work experience in education role			
	11.78	11.82	-0.04
Years of work experience working in this school			
	7.20	8.04	-0.83
Teaching qualifications held (%)			
I do not hold any qualification for teaching	0.00	0.02	-0.02
Postgraduate diploma in teaching	0.09	0.05	0.04
Advanced Diploma in Education	0.10	0.08	0.03
Certificate in Teacher Training (Primary, A2)	0.31	0.32	-0.02
Bachelors of Education (A0)	0.51	0.54	-0.03
Did your formal education include a course or training on school administration? (%)			
No training	0.34	0.43	-0.09
Some training	0.22	0.29	-0.07
Complete training	0.44	0.28	0.16*
Did your formal education include a course or training on school leadership? (%)			
No training	0.37	0.42	-0.04
Some training	0.20	0.35	-0.15*
Complete training	0.42	0.23	0.19**
Did your formal education include a course or training on mentoring or coaching? (%)			
No training	0.27	0.39	-0.11
Some training	0.34	0.42	-0.08
Complete training	0.37	0.19	0.188**
Have you done any training (NOT during your formal education) on mentoring or coaching as part of your professional development? (%)			
No training	0.25	0.34	-0.08
Some training	0.61	0.48	0.13
Complete training	0.14	0.19	-0.05
Is your school part of the RwandaEquip program? (%)			
Yes	0.27	0.22	0.06

Note: ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Additional tables

Appendix Table 12: Devices access by teachers

	N	%
Access to electronic devices		
% teacher has access to either computer, smartphone, or tablet	365	99.7
% of teachers with access to computer	270	73.77
% of teachers with access to smartphone	358	98
% of teachers with access to tablet	102	28
% of teachers with access to computer only at school	236	64
% of teachers with access to smartphone only at school	2	0.5
% of teachers with access to tablet only at school	90	24.6
Minimum weekly hours of access to any device		
0 hours	34	9.3%
At least 1 hour	332	90.7%
At least 3 hours	330	90.2%
At least 6 hours	329	89.9%
At least 12 hours	234	63.9%
Teachers with access to internet (on any device)		
	352	96.17%
Average hours of internet access per week		
Under 3 hours	73	20%
More than 3 hours	183	51%
No limit	101	28%
Main challenge with accessing internet		
None	43	12%
The mobile internet network coverage is lacking at the location where I use the device	136	37%
The cost of mobile internet	174	48%
Other	13	4%
Primary device used to complete RTP e-course		
A computer	19	6%
A tablet	7	2%
A smartphone	281	93%

Appendix Table 13: Regression analysis - School level support relation with course completion, teacher knowledge, motivation and practice of LTP.

Outcome	Teacher knowledge score in % (all)			Teacher motivation score (Overall)			PBL: Scaled play-based learning score		
	b	s.e	p	b	s.e	p	b	s.e	p
Overall support score (across COP SBM HT and resources)	1.857*	(1.019)	0.072	0.370***	(0.032)	0.000	14.292	(17.238)	0.409
Female	-1.131	(1.243)	0.366	-0.041	(0.030)	0.172	18.323	(16.661)	0.275
Age < 26	-2.769	(2.101)	0.191	-0.076	(0.054)	0.163	-68.955**	(33.024)	0.040
Age 26-30	-1.689	(2.154)	0.435	-0.053	(0.055)	0.334	-66.962*	(34.337)	0.054
Age 31-35	-8.095***	(2.601)	0.003	-0.084	(0.060)	0.165	-13.944	(38.414)	0.718
Age 36-40	-8.608***	(2.726)	0.002	-0.103	(0.068)	0.136	-10.621	(41.414)	0.798
Age 41-45	-9.854***	(3.279)	0.004	-0.064	(0.085)	0.458	-3.538	(54.693)	0.949
Age 46-50	-13.168***	(4.063)	0.002	-0.154	(0.094)	0.106	-6.641	(68.355)	0.923
Age 51-55	-11.167**	(4.570)	0.017	-0.239**	(0.104)	0.025	48.245	(75.094)	0.522
Age 56-60	-13.155**	(5.138)	0.012	-0.243	(0.147)	0.101	22.637	(106.496)	0.832
Has a disability	0.385	(2.733)	0.888	0.121*	(0.062)	0.055	-11.609	(68.250)	0.865
Years of work experience	0.333***	(0.112)	0.004	0.001	(0.003)	0.617	-2.376	(1.989)	0.236
Education (completed): Certificate	0.186	(2.169)	0.932	0.026	(0.060)	0.662	-16.286	(31.251)	0.604
Education (completed): Bachelor or higher	2.139*	(1.192)	0.077	0.084***	(0.031)	0.008	-2.859	(28.971)	0.922
Constant	57.939***	(2.394)	0.000	0.830***	(0.065)	0.000	586.437***	(32.450)	0.000
R-squared	0.070			0.366			0.071		
Observations	366			360			164		
	(teachers treatment group at endline)			(teachers treatment group at endline)			(classroom observations, treatment group, at endline)		
* p<0.05, ** p<0.01, *** p<0.001, standard errors clustered at school level.									

Appendix Table 14: Regression analysis of school support on teacher knowledge scores, motivation, and play-based learning scores.

Outcome	Teacher knowledge score in % (all)			Teacher motivation score (Overall)			PBL: Scaled play-based learning score		
	b	s.e	p	b	s.e	p	b	s.e	p
Overall support score (across COP SBM HT and resources)	1.857*	(1.019)	0.072	0.370***	(0.032)	0.000	14.292	(17.238)	0.409
Female	-1.131	(1.243)	0.366	-0.041	(0.030)	0.172	18.323	(16.661)	0.275
Age < 26	-2.769	(2.101)	0.191	-0.076	(0.054)	0.163	-68.955**	(33.024)	0.040
Age 26-30	-1.689	(2.154)	0.435	-0.053	(0.055)	0.334	-66.962*	(34.337)	0.054
Age 31-35	-8.095***	(2.601)	0.003	-0.084	(0.060)	0.165	-13.944	(38.414)	0.718
Age 36-40	-8.608***	(2.726)	0.002	-0.103	(0.068)	0.136	-10.621	(41.414)	0.798
Age 41-45	-9.854***	(3.279)	0.004	-0.064	(0.085)	0.458	-3.538	(54.693)	0.949
Age 46-50	-13.168***	(4.063)	0.002	-0.154	(0.094)	0.106	-6.641	(68.355)	0.923
Age 51-55	-11.167**	(4.570)	0.017	-0.239**	(0.104)	0.025	48.245	(75.094)	0.522
Age 56-60	-13.155**	(5.138)	0.012	-0.243	(0.147)	0.101	22.637	(106.496)	0.832
Has a disability	0.385	(2.733)	0.888	0.121*	(0.062)	0.055	-11.609	(68.250)	0.865
Years of work experience	0.333***	(0.112)	0.004	0.001	(0.003)	0.617	-2.376	(1.989)	0.236
Education (completed): Certificate	0.186	(2.169)	0.932	0.026	(0.060)	0.662	-16.286	(31.251)	0.604
Education (completed): Bachelor or higher	2.139*	(1.192)	0.077	0.084***	(0.031)	0.008	-2.859	(28.971)	0.922
Constant	57.939***	(2.394)	0.000	0.830***	(0.065)	0.000	586.437***	(32.450)	0.000
R-squared	0.070			0.366			0.071		
Observations	366			360			164		
	(teachers treatment group at endline)			(teachers treatment group at endline)			(classroom observations, treatment group, at endline)		
* p<0.05, ** p<0.01, *** p<0.001, standard errors clustered at school level.									

MEL indicators

Appendix Table 15: MEL indicators (cohort 1, excluding Muhanga district)

Indicator	Means of verification	Definition	Sample	Value
% of teachers with improved teacher practice by integrating gender responsive LtP methodologies into classroom teaching practices	PLAY classroom observation	Binary indicator equal to 1 for teachers who have increased their proficiency level by at least 1 level, and 0 otherwise.	Cohort 1 teachers observed at baseline and endline (n=90)	33%
			Only male teachers (n=24)	25%
			Only female teachers (n=66)	35%
% of teachers with improved confidence to deliver LtP in the classroom	Teacher survey	Binary indicator equal to 1 for teachers who have improved confidence to deliver LtP in the classroom, and 0 otherwise. The confidence variable averages across Likert scale items on the confidence of teachers with some teaching practice.	Panel of cohort 1 teachers surveyed at baseline and endline (n=234)	45%
			Only male teachers (n=72)	50%
			Only female teachers (n=162)	43%
% of teachers that have improved knowledge of gender sensitive, child-centered LtP techniques	Teacher survey	Binary indicator equal to 1 for teachers who have improved knowledge of gender sensitive, child-centered LtP techniques, and 0 otherwise. The knowledge variable averages across Likert scale items on LtP knowledge.	Cohort 1 teachers surveyed at baseline and endline (n=234)	45%
			Only male teachers (n=72)	43%
			Only female teachers (n=162)	46%
% of teachers with improved motivation to use LtP in the classroom	Teacher survey	Binary indicator equal to 1 for teachers who have improved motivation to use LtP in the classroom, and 0 otherwise. The motivation variable averages across Likert scale items on motivation to use LtP in the classroom.	Cohort 1 teachers surveyed at baseline and endline (n=234)	72%
			Only male teachers (n=72)	76%
			Only female teachers (n=162)	70%
% of schools that qualify as Play Schools	LMS completion data	Binary indicator equal to 1 for schools where all teachers have completed module 2 of the LtP e-course, and 0 otherwise	Cohort 1 schools registered in the LMS (n=156)	9%
% of school leaders with improved knowledge and skills to support teachers'	School leader survey	Binary indicator equal to 1 for school leaders who have improved knowledge and skills to support teachers' integration of LtP in their practice, and 0	Cohort 1 school leaders surveyed at baseline and endline (n=42)	45%
			Maleschool leaders (n=30)	40%

Indicator	Means of verification	Definition	Sample	Value
integration of LtP in their practice		otherwise. The variable provides a percentage of knowledge and support items that school leaders have answered correctly.	Female school leaders (n=12)	58%
% of teachers who report receiving LtP support from their school heads and/or SBMs	Teacher survey	Binary indicator equal to 1 for teachers who report having received support from a School-Based Mentor related to LtP in the past term, and 0 otherwise	Teachers at endline in the treatment group who report that there is an appointed School-Based Mentor in their school to whom they can refer to (n=271)	75%
			Male teachers (n=82)	71%
			Female (n=189)	77%
% of lower primary teachers who completed the LtP e-course	LMS completion data	Binary indicator equal to 1 for teachers who completed module 1, and 0 otherwise	Cohort 1 teachers registered in the LMS data (n= 1,073)	81%
		Binary indicator equal to 1 for teachers who completed module 2, and 0 otherwise	Cohort 1 teachers registered in the LMS data (n=1,073)	75%
% of lower primary teachers attending the orientation sessions on the project and the LtP approach	Teacher survey	Binary indicator equal to 1 for teachers who report having attended the face-to-face orientation session about the E-certification course, and 0 otherwise	Teachers at endline in the treatment group (n=276)	89%
			Male teachers (n=82)	89%
			Female teachers (n=194)	89%
% of school leaders and SBMs trained on LtP pedagogy	School leader survey	Binary indicator equal to 1 for school leaders who report having completed all modules of the online course.	Cohort 1 school leaders surveyed at endline (n=55)	9%
		Variable indicating the number of modules that school leaders report having completed on the RTP CPD training on LtP		0=65%
				1=7%
				2=2%
				3=5%
				4=7%
				5=4%
				6=9%
% of school leaders and SBMs trained on different modules of LtP pedagogy	School leader survey	Binary indicator equal to 1 for school leaders who report having completed a given module, and 0 otherwise	Cohort 1 school leaders surveyed at endline (n=55)	1.1=33%
				1.2=27%
				1.3=20%
				2.1=18%
				2.2=16%
				2.3=15%

Indicator	Means of verification	Definition	Sample	Value
% of SBMs and/or school leaders conducting monthly classroom observations for coaching	School leader survey	Binary indicator equal to 1 for school leaders who report having conducted classroom observations specifically to evaluate their teachers' implementation of LtP in the past year, and 0 otherwise	Cohort 1 schools leaders surveyed at endline (n=55)	84%
			Male teachers (n=40)	80%
			Female teachers (n=15)	93%
% of SBMs and/or school leaders conducting monthly classroom observations for coaching at different frequencies	School leader survey	Variable indicating the frequency at which school leaders conducted classroom observations to evaluate their teachers' implementation of teaching methods in the past year	Cohort 1 schools leaders surveyed at endline who report having conducted classroom observations to evaluate their teachers' implementation of teaching methods in the past year (n=46)	Once a week=37%
				Once every two weeks=7%
				Once a month=35%
				Once a term=22%
# of school leaders and SBMs reached by the RTP program	E-Certification reach dataset	Variable indicating the number of head teachers and SBMs and SET teachers reached by the RTP program	Head teachers reached	303
			School-Based Mentors and SET teachers reached	571
# of district and sector officials reached by the RTP program	E-Certification reach dataset	Variable indicating the number of district and sector officials reached by the RTP program	District education officials reached	14
			Sector education officials reached	82

Play scores

Appendix Table 16: Item list and sub-constructs play scores

Item	Label
Support for Connection to Experience	
ce1	Teacher connects concepts to everyday objects or experiences
ce2	Teacher connects concepts to students' interests or life
ce3	Teacher connects abstract concepts to familiar things
ce4	Teacher uses language other than the language of instruction
Support for Problem Solving	
ps1	Teacher poses a problem to students
ps2	Teacher gives hints, suggestions, feedback
ps3	Students try different solutions
Support for Exploration	
e1	Teacher gives students exposure to something before showing how to use it
e2	Teacher uses multiple methods to help students learn a concept
e3	Symbolic play
Support for Agency	
a1	Students choose who plays each role
a2	Teacher allows students freedom in approaching an academic task
a3	Students express ideas or contribute without prompting
a4	Students interact without specific direction
a5	Teacher allows students freedom in movement
Support for Participation	
p1	Students practice a skill introduced by the teacher
p2	Teacher gives students opportunity to express opinions
p3	Teacher invites student questions
Social Connectedness	
sc1	Students assist each other in need
sc2	Students demonstrate togetherness/teamwork
sc3	Teacher creates a sense of student/class togetherness
sc4	Teacher gives student or group of students a responsibility
Positive Emotional Climate	
pc1	Teacher uses mode of instruction that is explicitly positive
pc2	Teacher gives or encourages praise
pc3	Teacher uses energizers
pc4	Teacher shows awareness of student emotions
pc5	Teacher includes students who did not volunteer to answer
pc6	Teacher provides risk free environment for participation