ENDLINE REPORT

THE "SUPPORTING CODING AMONG RWANDAN ADOLESCENTS & TEACHERS THROUGH THE CURRICULUM & CLUBS HEADING (SCRATC^{2}H) FOR RWANDA 2050" PROJECT

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Table of Contents

Acronyms

CBC	Competency-based curriculum
CPD	Continuous Professional Development
DDE	District Director of Education
ICT	Information and Communication Technology
IDI	In-Depth Interview
KAP	Knowledge Attitudes and Practices
KII	Key Informant Interview
LTLT	Leading, Teaching and Learning Together project
MINEDUC	Ministry of Education
MSC	Most Significant Change
OERs	Open Education Resources
RCA	Rwanda Coding Academy
REB	Rwanda Basic Education Board
RAWISE	Rwanda Association for Women in Science and Engineering
SCRATC²H	Supporting Coding Among Rwandan Adolescents & Teachers Through The Curriculum & Clubs Heading (pilot project) *Note: Throughout this report the SCRATC²H project is noted in all capital letters to differentiate between the Scratch coding language*
SEI	School Education Inspector
SET	Science and Elementary Technology
STEM	Science Technology Engineering and Mathematics
TSI	Three Stones International
TVET	Technical and Vocational Education and Training
VVOB	Flemish Association for Development Cooperation and Technical Assistance
YBE	Year Basic Education

Executive Summary

VVOB Rwanda, in partnership with Rwanda Basic Education Board (REB) and the Rwanda Coding Academy (RCA), under Rwanda TVET Board, piloted a project over two years in Kayonza district with the financial support of the Belgian Government through the WEHUBIT programme from ENABEL. The aim of the SCRATC²H 2050 pilot project was to equip ICT and STEM teachers with the competences needed to initiate and facilitate after school SCRATC²H 2050 coding clubs for secondary school learners and to integrate Scratch into ICT and STEM lesson plans. To this end, VVOB trained 158 secondary school STEM and ICT teachers from 54 secondary schools in Kayonza district on coding and its benefits through blended learning. After training, they continued to develop professionally through participation in face-to-face ScratchEd Meetups facilitated by sector education inspectors (SEIs), a virtual Scratch community platform, monitoring and support visits, exposure visits for students, and hackathon competitions.
The project is built around four pillars:

1. Development of a SCRATC²H 2050 pedagogical guide, complemented by ICT and STEM lesson plans and Open Education Resources (OERs)
2. Continuous Professional Development (CPD) trajectory for ICT and STEM teachers
3. Professional learning communities of ICT and STEM teachers
4. Establishment of after school SCRATC²H 2050 coding clubs

A mixed-method research design was determined most applicable to comprehensively assess the evaluation questions, learning questions, the question of scalability, and, ultimately, evidence the SCRATC²H 2050 pilot project. Data collection took place during two phases: at baseline and endline, with student digital literacy assessments conducted during the project implementation phase. The mixed methods approach included a quantitative Knowledge, Attitude, and Practice (KAP) survey of teacher knowledge, attitudes and practices regarding digital literacy, Scratch and SCRATC²H clubs at baseline and endline to determine factors associated with the pilot project outcomes as well as teacher-led assessments of student digital literacy skills. For both the student assessments and the KAP survey, digital literacy assessments were created based on UNESCO's Global Framework for Digital Literacy Skills (UNESCO, 2018) and informed by VVOB's existing digital literacy assessment. Additionally, a series of MSC, IDI, and KII Interviews were conducted with teachers, learners, district level, and national level education stakeholders.

Ultimately, the endline evaluation of the SCRATC²H pilot noted the project was relevant, coherent, and efficient by providing evidence that the project was compatible with REB priorities, national strategic objectives, and other STEM initiatives; the projects met the needs of male and female learners and teachers; and the project was effectively coordinated and efficiently operated.

Additionally, the project was effective as evidenced by the achievement of all expected results per the project's logical framework (Table1).

- The SCRATC²H 2050 pedagogical guide, which was endorsed by REB, and open education resources were widely used, resulting in over 6,200 views of OERs, and valued by teachers when implementing SCRATC²H coding clubs.
- The attendance rate for the SCRATC²H Learning Trajectory was over 90% for Face-to-Face sessions and nearly 80% for Online Sessions. The CPD trajectory was valued by teachers as evidenced by an average attendance rate of 88% across all three ScratchEd Meetups and trends that demonstrated the importance of school visits, SCRATC²H events, and the utilization of collaborative support spaces (i.e., ScratchEd online platform).
- Over 3,700 learners participated in over 270 SCRATC²H coding clubs, with equal participation amongst male and female learners, resulting in an estimated combined total of 26,000 Scratch stories, games, and animations.

The endline evaluation identified a clear impact of the SCRATC²H pilot on teachers, learners, and the wider school environment. Evidence found that after participating in the SCRATC²H pilot:

- 91% of respondents to the endline survey met the minimum level of proficiency across digital literacy skills and 11% reached high proficiency in content creation (coding). According to the baseline report, prior to participation in the pilot, only 72% of teachers had a similar level of proficiency in digital literacy skills and fewer than 1% of teachers for content creation (coding).
- 98% learners met minimum level proficiency in digital literacy skills in teacher-led post-club assessments as compared to 63% in pre-cub assessments.
- 74% of respondents reported confidence to facilitate SCRATC²H coding clubs as compared to 28% of the same respondents in their baseline surveys.
- Two-thirds of teachers reported confidence to integrate Scratch into STEM/ICT lesson plans as compared to 23% of the same respondents in their baseline surveys.

Quantitative analysis demonstrated the project had a considerable impact for closing the gender gap when it came to digital literacy skills of teachers and learners and self-efficacy of teachers. For example, for both teachers and students, the gap in digital literacy scores narrowed considerably when looking at digital literacy assessments. In endline assessments, there was a less than 2 percentage point difference between male and female teachers that met minimum level of digital proficiency and no difference between male and female learners who met minimum level proficiency.

Both teachers and learners reported significant changes in themselves, their peers, and their schools as a result of the SCRATC²H pilot project. Teachers described improvement in their basic computer skills, more motivation to use Scratch in the classroom, and perceived support amongst fellow teacher, school leaders, and other stakeholders. Teachers linked these outcomes to a greater ability to engage learners in STEM/ICT and learning overall.

> *"Scratch opened a way to motivate our students. Scratch helped students to increase interests of studying ICT and doing research. Again, through the competition, Scratch improved self-confidence and winning spirit of our students, which is helping them to succeed in their studies." – Benon Karuhanga, Selected MSC Story, Teacher*

Learners reported that participating in SCRATC²H clubs gave them a fun way to learn coding with a team of peers, increased their problem-solving skills, and opened their eyes to more possibilities for professional advancement in STEM/ICT fields.

> *"I am more open-minded compared to before as now I am even willing to innovate, think outside the box, explore and learn…Participation in SCRATC²H club increased my curiosity to know more not only in the technology world, but also in academics, which led to positive results where my academic performance increased remarkably." – Alice Niyomukiza, Selected MSC Story, Learner*

The endline evaluation found evidence that, due to the high relevance and demand for the digital literacy and Scratch knowledge, the SCRATC²H coding clubs are likely to sustain, and teachers will continue to integrate Scratch/coding into their classrooms. Reported challenges to sustainability were teacher attrition and the inability of trained teachers to continue practicing and building their skills related to Scratch, club facilitation, and the integration of Scratch/coding into the curriculum due to limiting school environmental factors such as technological infrastructure, the lack of time for teachers to prepare lessons/clubs and club participation, and the incomplete adoption of Scratch/coding concepts into all STEM subjects.

When considering sustainability and scalability, this project identified several key recommendations such as continuing to select multiple teachers from the same school while targeting teachers who enjoy digital learning with relatively lower levels of digital literacy for training participation; keep the blended learning model while focusing in-person training opportunities on problem solving, keeping school visits and meet-ups for sustainable support, and offering online CPD platforms for independent learning; continuing to offer additional resources to schools with limited physical school enabling environment; continuing to prioritize female learner participation in Scratch coding clubs while starting to intentionally engage learners with disabilities.

Introduction

VVOB – *education for development* has been sustainably improving education systems worldwide in partnership with ministries of education for over 35 years. VVOB works towards improving the quality of education in nine partner countries (Belgium, Cambodia, Ecuador, Kenya, Rwanda, South Africa, Vietnam, Zambia, and Uganda). For VVOB, quality education implies ensuring equal opportunities for learners to become economically productive, develop sustainable livelihoods, contribute to peaceful and democratic societies, and enhance individual wellbeing.

To realize these objectives, VVOB focuses on capacity development of its operational partners: ministries of education, teacher training institutions and organizations focusing on professional development. Partners range from national and regional governments to institutions, individual schools, school leaders, teachers, and students. VVOB aligns its interventions with the local education policy and developing education expertise based on strong partnerships.

VVOB Rwanda, in partnership with Rwanda Basic Education Board (REB) and the Rwanda TVET Board through Rwanda Coding Academy (RCA) piloted a project to be implemented in 2 years in Kayonza district with the financial support of the Belgian Government through the WEHUBIT programme under ENABEL. The aim of the SCRATC²H 2050 pilot project[1] was to equip ICT and STEM teachers with the competences needed to initiate and facilitate after school SCRATC²H 2050 coding clubs for secondary school learners and to integrate Scratch, the block-based coding language, into ICT and STEM lesson plans. To this end, VVOB trained 158 secondary school STEM and ICT teachers from 54 secondary schools in Kayonza district on coding and its benefits through blended learning. After training, they continued to develop professionally through participation in face-to-face ScratchEd Meetups facilitated by sector education inspectors (SEIs), a virtual Scratch community platform, monitoring and support visits, exposure visits for students, and hackathon competitions.

The project is built around four pillars:

1. Development of a SCRATC²H 2050 pedagogical guide, complemented by ICT and STEM lesson plans and Open Education Resources (OERs),
2. Continuous Professional Development (CPD) trajectory for ICT and STEM teachers,
3. Professional learning communities of ICT and STEM teachers,
4. Establishment of after-school SCRATC²H 2050 coding clubs.

In the framework of SCRATC²H 2050, learners' digital journey starts in the classroom as STEM and ICT teachers integrate Scratch in STEM and ICT courses, triggering their interest. The coding clubs then provide the opportunity to truly develop digital skills in an enjoyable environment, combining fun with learning the programming language. Once learners know the basics of Scratch, the learning curve continues to go up: soon, learners will be able to digitally recreate a board game they played or create stories using their own storyline and characters. Gaining digital fluency, they will become part of a vibrant online community, where they can exchange ideas and materials, chat and continue to design and create their own projects.

Trained teachers facilitated two cycles of coding clubs (140 in Cycle 1 and 134 in Cycle 2) supporting over 3,700 learners through coding clubs and develop and strengthen the digital, creative and problem-solving skills of approximately 14,750 learners in the classroom.

This mixed methods endline evaluation provides evidence demonstrating the extent to which the project achieved expected results, outcomes, and impacts, as per the logical framework below. Additionally, the evaluation identifies key influencing factors on the performance of the project to identify recommendations and lessons learned that will be useful for the scaling up of the project to other districts in Rwanda.

[1] Throughout this report, the SCRATC²H 2050 pilot project is referred to in all capital letters to differentiate between the Scratch coding language.

Table 1: VVOB Scratch Logical Framework

Intervention Logic	Objectively Verifiable Indicators	Sources and Means of Verification	Assumptions
General Objective			
To support the upscaling or replication of initiatives that close the digital divide for vulnerable groups (youth, women, unemployed, refugees and migrants) by improving digital literacy and skills through D4D initiatives in education, training, and the world of work	Percentage of vulnerable groups who have achieved at least a minimum level of proficiency in digital literacy skills, as proposed in the Digital Literacy Global Framework	Questionnaire: In the absence of any local measure to assess digital literacy, VVOB will adapt its own digital literacy assessment that was developed previously and expand it to include coding competencies informed by the EU's SELFIE questionnaire. Each term, trained teachers will conduct the questionnaire among learners.	* Computer labs are functional; * School leaders support STEM and ICT teachers to integrate Scratch in their classes (e.g., enabling use of computer labs).
Specific Objective			
Equip 135 ICT & STEM teachers of 45 secondary schools in Kayonza district with the competences needed to initiate and facilitate after school SCRATC²H2050 coding clubs for secondary school learners and to integrate Scratch into STEM/ICT lesson plans.	* Percentage of trained teachers who have achieved at least minimum level of proficiency across digital literacy skills, as proposed in the Digital Literacy Global Framework, and high proficiency in terms of digital content creation (coding).	* Pre- and post-training Knowledge-Attitude-Practice (KAP) survey based on VVOB's digital literacy assessment and complemented by EU's SELFIE questionnaire	External conditions: * REB endorses the SCRATC²H 2050 pedagogical guide and blended learning trajectory; * RCA trainers are available to facilitate trainings. Risks: * Theft of or damage to tablets hinders teachers' participation in learning trajectory; * Instable internet connection hinders teachers' participation in online sessions.
	* Percentage of trained teachers who report to feel competent to facilitate after school SCRATC²H 2050 coding clubs.	* Pre- and post-training Knowledge-Attitude-Practice (KAP) survey based on VVOB's digital literacy assessment and complemented by EU's SELFIE questionnaire	
	* Percentage of trained teachers who report to feel competent to integrate Scratch into STEM/ICT lessons plans	* Pre- and post-training Knowledge-Attitude-Practice (KAP) survey based on VVOB's digital literacy assessment and complemented by EU's SELFIE questionnaire	
	* Percentage of interviewed teachers that mention SCRATC²H as a Most Significant Change (MSC) story.	* Interviews using MSC theory	
Expected Results			
1. Development & design of SCRATC²H 2050 pedagogical guide	1.1. Endorsement by REB of SCRATC²H2050 pedagogical guide.	* Endorsement report	External conditions: * Internet connection required to view OERs. * Teachers have time to participate in SCRATC²H 2050 blended learning trajectory. * Teachers are willing to integrate Scratch in STEM/Computer Science classes. * Sufficient ICT infrastructure is available to host SCRATC²H 2050 coding clubs.
	1.2. Number of views of 10 Open Education Resources (OERs) on teaching and learning coding & programming with Scratch in Rwandan context.	* OERs clicks, views & shares	
2. Development and implementation of SCRATC²H 2050 blended learning trajectory (including 2 F2F sessions, 3 online learning sessions, ScratchEd Community Platform & ScratchEd Meetups)	2. Teacher attendance rate in (1) Face-to-Face (F2F) sessions, (2) in online sessions, (3) in biannual ScratchEd Meetups; and participation on ScratchEd Community Platform.	* Attendance registers	
3. 135 after school SCRATC²H coding clubs are running in 45 schools in Kayonza district	3.1. Number of learners (F:M) participating in Scratch coding clubs.	* Club registries * Club visits by SEIs	
	3.2. Number of Scratch stories, games and animations created by learners in Kayonza.	* Scratch clips produced	
	3.3. Percentage of interviewed learners that mention Scratch as a Most Significant Change (MSC) story.	* Interviews using MSC theory	

Methodology

Key Research Questions

At the inception phase VVOB and TSI developed an evaluation framework and research design to assess the extent to which the project achieved expected results, outcomes, and impacts, as per the logical framework (Table 1). The OECD DAC criteria informed the development of evaluation questions which focused the endline evaluation on determining the relevance, coherence, effectiveness, efficiency and sustainability of the pilot project (Table 2).

Table 2: Evaluation Questions by OECD/DAC Criteria

OECD/DAC Criteria	Evaluation Questions
Relevance: the extent to which the intervention objectives and design respond to beneficiaries', global, country and partner/institution needs, policies, and priorities, and continue to do so if circumstances change.	1. To what extent is the project designed to meet the needs of STEM/ICT teachers to incorporate coding into the curriculum? 2. To what extent is the project designed to meet REB priorities for STEM/ICT and national strategic objectives? 3. To what extent does the project meet the needs of learners, both male and female?
Coherence: How well does the intervention fit with other interventions in Rwanda and Kayonza District (External coherence)	1. To what extent is the SCRATC²H 2050 pilot project compatible with REB priorities and other projects to further STEM/ICT instruction in secondary schools?
Effectiveness: the extent to which the intervention achieved, or is expected to achieve, its objectives and its results, including any differential results across groups	1. To what extent did the project achieve its expected results? 2. What factors were associated with achievement or non-achievement of the expected results? 3. How effective was communication between VVOB and partners (REB and RCA) for achievement of expected results? 4. How effective was the blended learning trajectory for teacher trainings?
Efficiency: the extent to which the intervention delivers or is likely to deliver results in an economic or timely way.	1. To what extent were inputs managed in a cost-efficient way? 2. To what extent were activities implemented in line with the project time frame?
Impact: the extent to which the intervention has generated or is expected to generate significant positive or negative, intended or unintended, higher-level effects.	1. To what extent did the intervention achieve the intended impact? Was there any unintended impact as a result of the project? Was there any differential impact (male vs. female teachers, male vs. female students, school type, etc.)
Sustainability: the extent to which the net benefits of the intervention continue or are likely to continue.	1. To what extent are SCRATC²H 2050 coding clubs expected to continue beyond the pilot project? 2. To what extent will teachers continue to incorporate Scratch in the STEM/ICT curriculum.

At the inception phase, three additional learning questions were identified to inform the implementation of the project and it was evaluated at the endline to what extent learning questions were addressed:

1. To what extent, if at all, did the extent to which participation in the SCRATC²H training and coding clubs influence how teachers teach STEM/ICT in the classroom?
2. How can Scratch coding can be adapted for students with disabilities?
3. To what extent, if at all, do teachers continue to access learning opportunities and resources beyond the course?

Lastly, the endline evaluation assesses the potential for project scalability in order to determine actionable recommendations to be included at the end of this report.

Study Design

A mixed-method research design was determined most applicable to comprehensively assess the evaluation questions, learning questions, the question of scalability, and, ultimately, evidence the SCRATC²H 2050 pilot project. Data collection took place during two phases: at baseline and endline, with student digital literacy assessments conducted during the project implementation phase. The mixed methods approach included a quantitative Knowledge, Attitude, and Practice (KAP) survey of teacher knowledge, attitudes and practices regarding digital literacy, Scratch, and SCRATC²H clubs at baseline and endline to determine factors associated with the pilot project outcomes as well as teacher-led assessments of student digital literacy skills. For both the student assessments and the KAP survey, digital literacy assessments were created based on UNESCO's Global Framework for Digital Literacy Skills (UNESCO, 2018) and informed by VVOB's exisiting digital literacy assessment. The teacher assessment was created at the baseline phase and the student assessment was created in anticipation of the pilot program. The full assessment can be found in Annex 3.

Qualitative interviews with teachers and learners, incorporating the Most Significant Change (MSC) methodology, and other stakeholders at endline further assessed project impact and the factors associated with successful club initiation and facilitation and integration of Scratch in the STEM/ICT curriculum.

Evaluation findings were presented in two phases. The Baseline Report, shared in May 2021, presented an overview of findings from the Baseline KAP survey and provided a foundation for the quantitative findings presented in the Endline Report. The Endline Report was shared with VVOB in June 2022.

Data Collection and Analysis

This section provides an overview of the key data sources for the project including quantitative sources (the KAP Survey, Student Assessments) and qualitative sources (Most Significant Change, In-depth Interviews, and Key Informant Interviews). In addition to the data sources outlined in this section, this evaluation also relied on administrative data provided by VVOB to assess the achievement of expected results (i.e., the number of OERs and page views, student and teacher attendance registers).

Knowledge, Attitude, and Practices (KAP) Survey

A KAP survey is designed to be a representative survey of the target population and aims to elicit what is known (knowledge), believed (attitude), and done (practiced) in the context of the topic of interest. These surveys have been adapted for use in the education setting to assess teacher knowledge, attitudes, practices and beliefs associated with various educational pedagogies. As there may be gaps between reported and actual practices, at endline, findings from the KAP survey were combined with qualitative research to verify and further explore findings from the KAP survey, including interviews with a sub-sample of teachers, sector education inspectors (SEIs), RCA staff, REB and VVOB to further explore factors associated with uptake in practices and develop recommendations for project scale-up.

In order to assess the extent to which teachers are able to initiate and facilitate after-school coding clubs and integrate Scratch into the STEM/ICT lesson plans, there was a need to further explore the factors associated with a teacher's ability to adopt the practices. Bandura (1986) believes that behavior (or practice) can be more effectively predicted by a belief in capabilities, or self-efficacy, than what they are actually able to accomplish. This self-efficacy can be further defined as the teacher's "judgement of his or her capabilities to bring about desired outcomes of student engagement and learning" (Tschannen-Moran & Hoy, 2001). Teachers with high self-efficacy are more likely to experiment with methods of instruction, seek improved teaching methods and experiment with instructional materials (Allinder, 1994) (Guskey, 1988) (Wang & Stein, 1988). Efficacy beliefs also influence a teacher's persistence and resilience when things do not go smoothly (Webb & Ashton, 1986).

Another significant determinant of one's behaviors or practices are an individual's attitude toward the topic (Fishbein & Ajzen, 1969) as well as the background characteristics of the individual, including experiences, education training and environment (Xie, Talin, & Sharif, 2014) (Wilkins, 2008). In order to fully understand a teacher's technology integration practices, it is important to understand both the resources that they possess (or enabling environment), but also how and why they use these resources (attitudes) (Ertmer, Ottenbreit-Leftwich, & Tondeur, 2016).

The model in Figure 1 reflects the importance of environmental factors, especially the teacher's background, school environment, and school leadership support, on a teacher's ability to have the capacity (including knowledge, belief in self-efficacy and attitude) to facilitate SCRATC²H 2050 clubs and integrate Scratch in the classroom. The model also reflects the continued learning and problem solving expected during the implementation of the SCRATC²H 2050 project through on-going engagement with students during the practice of facilitating clubs and integration of Scratch in the classroom.

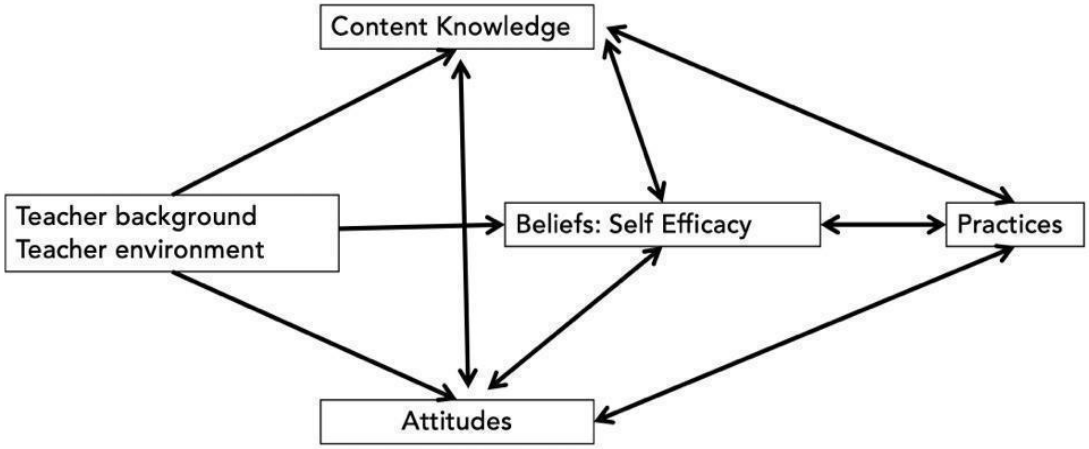


Figure 1: Study Design (Developed During the Inception Phase)

Based on the model in Figure 1, the SCRATC²H 2050 pilot KAP survey was designed to capture the following at baseline for comparison with endline data collected at project completion:

KNOWLEDGE: Teacher knowledge of both digital literacy and Scratch coding (as per the VVOB SCRATC²H 2050 Pedagogical Guide).[2]

ATTITUDES: Teacher attitudes regarding the perceived benefits of SCRATC²H clubs for learners and personal enjoyment of using Scratch.

BELIEFS OR SELF EFFICACY: Teacher's beliefs in their ability to use Scratch, lead SCRATC²H 2050 coding clubs, and integrate Scratch in the classroom.

PRACTICES: Teacher practices, including leading SCRATC²H clubs (as per the VVOB SCRATC²H 2050 Pedagogical Guide) and incorporating Scratch into the STEM/ICT curriculum.

TEACHER ENVIRONMENT: External factors that may influence the knowledge, attitudes, beliefs and practices of teachers including the school-enabling environment for use of ICT, both in terms of school ICT infrastructure and capacity as well as school leadership support for use of digital technology and Scratch in

[2] The digital literacy knowledge component is based on the UNESCO's Global Framework for Digital Literacy Skills (UNESCO, 2018) and the European Commission's SELFIE tool (European Commission) and is a self-assessment of knowledge.

the classroom (based on the SELFIE tool), the school-enabling environment for clubs, and school environment (i.e., school location, status, type, and academic designation).

TEACHER DEMOGRAPHICS: Teacher demographics, including education background, number of years teaching, age and gender influence teacher knowledge, attitudes and practices to initiate and facilitate clubs and integrate Scratch into the STEM/ICT curriculum.

The KAP survey provided baseline and endline values to respond to the following indicators as per the project's logical framework (See Table 1):

1. Percentage of trained teachers who have achieved at least minimum level of proficiency across digital literacy skills, as proposed in the Digital Literacy Global Framework
2. Percentage and number of trained teachers who have achieved a high proficiency in terms of content creation (coding),
3. Percentage and number of trained teachers who report to feel competent to facilitate after school SCRATC²H coding clubs, and
4. Percentage and number of trained teachers who report to feel competent to integrate Scratch into STEM/ICT lesson plans.

KAP Survey Administration

The Knowledge, Attitudes and Practices (KAP) survey was administered at baseline and endline with STEM and ICT secondary school teachers selected to participate in the pilot project.[3] The KAP survey was translated from English into Kinyarwanda and both versions were loaded into Kobo Collect for administration and teachers had the choice to take the survey in the language of their choice. Before administration, the survey was shared with a group of teachers to validate and finalize the survey.

The Baseline KAP survey was administered to teachers in April - May 2021 prior to their participation in the digital literacy course or the SCRATC²H course. 160 survey responses were received (Table 4).

In May 2022, STEM and ICT teachers that participated in the SCRATC²H course repeated the KAP Survey. The survey was administered during school visits while VVOB staff were available to provide technical support if needed. 135 survey responses were received, although one respondent could not be matched to VVOB attendance records. Thus, 134 survey responses were used in full descriptive analysis and achievement of endline indicators (Table 4).

Table 3: KAP Survey Sample

	Administration Timeline	% Male Teachers	% Female Teachers	Total Respondents
Baseline KAP Survey	April - May 2021	77%	23%	160
Endline KAP Survey	May 2022	74%	26%	134
Baseline & Endline KAP Matched Surveys		75%	25%	130

Baseline and endline survey responses were matched for 130 teachers using National Teacher ID numbers, names, and, when necessary, other descriptive details (Table 4). Thus, 130 survey responses were used to evaluate changes from baseline to endline and to determine relationships between baseline responses and endline responses.

[3] Schools in Kayonza district report having three science teachers per school, one trained in ICT and two in STEM. Schools were responsible for selecting the teachers who participated in the pilot project and wherever possible, at least one female teacher was selected. However, this was not always possible in every school and 36 female teachers were selected.

KAP Analysis

The KAP analysis was divided into six broad categories: teacher background, teacher environment, content knowledge, attitudes, self-efficacy, and practices. These categories were distributed across 4 main topics including Digital Literacy, Scratch, School Clubs and Scratch/ Coding in the Classroom. Each category and topic were grouped to use as a reference for assessing change between KAP at baseline and endline. At the baseline correlation analysis was conducted to determine the consistency of questions within a topic and identify if any unrelated questions should be removed. The endline evaluation followed the same grouping across categories and topics to ensure baseline and endline evaluations were comparable.

Endline research showed the progress made towards project indicators by comparing the results from individual teachers during the baseline research with their answers to the endline research using teacher national ID numbers. Two separate analyses were conducted on the final KAP survey. First, the analysis provided responses to each question and then compared changes for the combined variables between baseline and endline. Second, a regression model was developed to illustrate the relationships between different variables and teacher likelihood of leading a SCRATC²H coding club and integrating Scratch in the STEM/ICT curriculum.

Analysis 1: Comparison on combined variables or individual questions

The results of the endline survey were combined into combined variables with the same definitions as found in the baseline. Combined variables determined two primary goals, improvement in digital literacy skills and level of confidence after training, and two secondary goals, change in teachers' mindset and change in environment (Table 7). Across primary and secondary variables, links to other combined variables identified through the baseline analysis were explored including:

- Teacher Background: Age, Gender, Teaching Experience
- School Environment: School factors, ICT enabling environment, Club enabling environment
- Content Knowledge: Digital literacy, Scratch
- Attitudes: Importance of Scratch/coding, enjoyment of Scratch/coding
- Self-Efficacy: Use/Learn Scratch, Lead coding clubs, Integrate Scratch/coding into the classroom
- Practices: Current involvement in clubs, extent to which teachers are incorporating Scratch/Coding into the curriculum

Descriptive statistics determined overall distribution of responses related to outcome indicators at both baseline and endline. Inferential statistics, including independent sample t-tests, paired sample t-tests, and Pearson's R, determined links to combined variables. Significance was determined at the $p<.05$ level.

Table 4: Evaluation of Primary and Secondary Goals

Primary	**Outcome Indicator 1:** Distribution of digital literacy skills and Scratch competencies before and after the intervention	1.a. Digital Literacy Skill 1.b. Digital Content Creation
	Outcome Indicator 2: Overview of confidence levels after training	2.a. Self-Efficacy to Lead Clubs 2.b. Self-Efficacy for Coding in the Classroom 2.c. Self-efficacy to use/learn Scratch
Secondary	**Outcome Indicator 3:** Change in teachers' mindset	3.a. School Club Practices 3.b. Practices around Scratch/Digital Technologies 3.c. Attitudes about Scratch/Coding in the classroom
	Outcome Indicator 4: Change in Environment	4.a. Change in school enabling environment: Digital Learning Elements 4.b. Change in school enabling environment for school clubs

Analysis 2: Comparison on combined variables or individual questions

A logistic regression model was created to identify which elements improved or reduced the ability of teachers to (1) feel confident to conduct a SCRATC²H coding club and (2) integrate Scratch into the STEM/ICT lesson plans. This was done by building two logistic regression models that predicted whether a teacher (1) reported confidence to conduct a SCRATC²H coding club (confident or not confident) and (2) incorporated Scratch into lesson plans (reports incorporating or reports not incorporating Scratch into lesson plans).

The models related the various data points of teachers such as demographics (sex, age, highest level of education), school details (school status, school type, school academic designation, school gender breakdown (i.e., co-ed vs. single-sex), school enabling environment, subject taught), professional development activities, and digital literacy skill level (before and after intervention) with the successful adoption variables to predict which variables seem to impact the chance of successful adoption. Only coefficients that were statistically significance at the $p<.05$ level were included in the model.

For the logistic regression model, successful adoption was defined as self-efficacy related to leading SCRATC²H clubs or incorporating digital technologies/Scratch into lesson plans. A successful adoption metric was created by combining affirmative responses (i.e., completely, and moderately agree, strongly agree or agree) to two identified survey questions ("I can lead a SCRATC²H Club at my school"; "I incorporate digital technologies/Scratch into lesson plans). The logistic regression model of self-efficacy related to leading SCRATC²H clubs was run on a adoption rate of 74% and the logistic regression model of incorporating digital technologies/Scratch into lesson was run on an adoption rate of 64%.

Student Assessments

In order to measure the objective level indicator of the percentage and number of learners who achieved at least a minimum level of proficiency in digital literacy skills, as proposed in the Digital Literacy Global Framework, teachers conducted an assessment of club members at both club start and completion to determine change in skills. Teacher led assessments also provided the opportunity for teachers to monitor their student's progress.

As no existing framework or assessment for student digital literacy exists in Rwanda, an assessment was created based on expected skills acquisition as a result of participation in SCRATC²H Clubs. The student assessment consisted of an assessment of 5 skills demonstrating the following 3 competencies as per the Digital Literacy Global Framework (Table 3). Five different easily observable actions were identified to evaluate the successful adoption of each skill. Teachers were asked to rate students on a two-point scale where being able to complete the task with some difficulty was awarded one point and being able to complete the task easily without support was awarded two points. Thus, student digital literacy was assessed on a ten-point scale.

Table 5: Digital Literacy Global Framework

0. Devices and software operations	0.1 Physical operations of digital devices 0.2 Software operations in digital devices
1. Information and data literacy	1.1 Browsing, searching, and filtering data, information and digital content
3. Digital content creation	3.1 Developing digital content 3.2 Integrating and re-elaborating digital content 3.4 Programming

At the inception phase, minimum proficiency was determined to be a score of 50% or being able to complete, on average, all observed tasks with some difficulty. Thus, to achieve 50% minimum proficiency, students were observed to be able to turn on a computer, open a blank word document and type their

name, open an internet browser and search "Scratch coding help," open Scratch and code a sprite to say "Hello Teacher," and create a story in Scratch with some difficulty or complete some tasks easily and others with difficulty. High proficiency was set at 70% proficiency or being able to achieve at least two observed tasks easily. Achieving minimum level proficiency provided the endline value to respond to the following indicator as per the project's logical framework (see Table 1):

1. Percentage of vulnerable groups who have achieved at least a minimum level of proficiency in digital literacy skills, as proposed in the Digital Literacy Global Framework

Teachers were provided with Excel templates to help them track student progress for each coding cycle and student demographic details, like gender. The Excel templates provided clear details on the observable behaviors associated with each skill and scores were automatically summed, giving teachers real-time support tracking learner progress. Teachers also could note in the Excel templates if students were "club members" or if they dropped out of the club.

In the first cycle, 243 pre-post assessments were shared with TSI out of 1832 learners (13%) in the aggregate. Since attendance, which was also tracked by VVOB during school visits and aggregated separately, was evidenced to stay high throughout Cycle 1, the low rate of completed pre-post assessments most likely an indicator of unsuccessful adoption of the Excel template in Cycle 1. Since Cycle 1's coding clubs were also shorter, teachers may have had less time to fully complete assessments and share results with VVOB and, in turn, TSI. Since pre-post assessments were shared in the aggregate, there was no indication club members who dropped out of the club.

In the second cycle, 1,321 full Excel templates were shared with TSI out of 1892 learners (70% of all learners). From those assessments, teachers described 43 students as dropouts and 52 post assessments were not completed. Therefore, when evaluating Cycle 2 pre-post assessments for the development of indicators or to analyze change, 1226 total responses were considered. Since so few students were described as drop-outs (3%) or did not successfully complete post assessments (4%), the number of full Excel templates received at the endline also was not determined to be a proxy measurement for learner attendance at clubs.

In total, 1469 student assessments were considered in the analysis of pre-post digital literacy, representing 39% of learners. The incomplete sample of pre-post assessments represents a significant limitation on the evaluation of this metric due to the potential for a skewed sample. Similarly, due to the variation of samples between Cycle 1 and Cycle 2, the outcomes of each club cycle could not be compared.

Interviews

A total of 75 interviews with learners, teachers, school leaders, Sector Education Inspectors (SEIs), DDE, RCA trainers, External SCRATCH trainers, REB and VVOB were carried out by TSI to provide context for KAP findings, explore factors associated with the successful adoption of the project, and determine the relevance, coherence, effectiveness, efficiency, impact, and sustainability of the pilot project (Table 6). Interviews were conducted in the respondent's preferred language (Kinyarwanda or English). Transcripts from interviews were entered into a TSI developed Excel database for analysis and storage.

10 teachers from 5 project schools were invited to participate in in-depth interviews (IDIs) to assess factors related to successful club implementation and the integration of Scratch into the curriculum and assess the DAC criteria and additional learning questions where relevant. Schools were purposively selected based on discussion with VVOB to select schools that external trainers considered to have a strong Scratch coding culture, schools with weaker coding cultures, and others which participated in the exposure visits and/or Scratch-days. School selection balanced for urban and rural areas and one ICT, and one STEM teacher was randomly selected from each project school. Out of the five project schools selected for IDIs, only one school had a female teacher who participated in the project, and she was not selected for an IDI through the

aforementioned selection criteria. Across the entire study, 30 out of 54 selected schools had female teachers with a total of 36 female teachers who participated in the project.[4]

Table 6: Endline Evaluation Interviews

Teacher Interviews								
Interview Format	Schools	Rural	Urban	ICT Teachers	STEM Teachers	Male Teachers	Female Teachers	Total Respondents
MSC	10	4	6	10	10	19	1	20
IDI	5	3	2	6	4	10	0	10

Learner Interviews						
Interview Format	Schools	Rural	Urban	Male Learners	Female Learners	Total Respondents
MSC	10	4	6	19	21	40

Key Informant Interviews (KIIs)						
School Leader	Sector Education Inspector	District Director of Education (Kayonza)	RCA (National Level)	External Trainer (National Level)	REB (National Level)	VVOB (National Level)
5	5	1	1	1	1	1

Key Informant Interviews (KIIs) were conducted with project stakeholders, including school leaders, SEIs, the District Director of Education in Kayonza, SCRATCH Trainers, RCA trainers, REB, and VVOB staff. Interviews assessed the relevance, coherence, effectiveness, efficiency, impact, and sustainability of the pilot project and support the formulation of recommendations for project improvement and scale-up.

IDI and KII interviews were thematically analyzed around the evaluation questions to explore potential factors that were associated with successful coding club facilitation and integration in Scratch/coding in the curriculum. Iterative qualitative coding analysis was conducted in three phases. First, a team of coordinators coded each question response (phase 1). Then, coordinators categorized and summarized identified codes to determine themes (phase 2). These themes were then theoretically coded to the primary research questions (phase 3). Relevant quotes were identified during qualitative analysis for inclusion in the final report.

Most Significant Change

In order to assess the impact and relevance of the training and the SCRATC²H coding clubs for both STEM/ICT teachers and learners, the project incorporated the Most Significant Change (MSC) methodology. The MSC technique is a participatory form of monitoring developed in 1996 by Rick Davis (Davies & Dart, 2005) for use in complex programs with many potential outcomes. Unlike traditional MSC, in which stories collected are directly related to the project under evaluation, MSC stories were collected without mention of SCRATC²H so as to not influence responses. Therefore, the MSC story for teachers and learners were asked the most significant change (either positive or negative) that took place during the school year to date.

In addition to the five schools selected to provide in-depth interviews, an additional five schools were selected to participate in Most Significant Change (MSC) interviews using similar selection criteria outlined for IDIs, resulting in 10 total schools contributing to MSC interviews. There was a higher representation of schools in rural areas selected for most significant change interviews. Across the 10 schools that provided MSC interviews, only two had a female teacher who participated in the project, and one provided an MSC interview. Each teacher interviewed selected coding club members that had participated in the group from formation and attended most club meetings to provide a learner MSC interview. Learners interviewed were balanced for equitable gender representation. No learners with known disabilities were included in MSC interviews.

[4] Across the whole study, only one female teacher participated in an interview. To protect the anonymity of interviewed teachers, gender is not included in quote attributions.

MSC interviews were analyzed to determine the number of stories for Teachers and Learners that mentioned SCRATC²H as a positive MSC story. During interviews, interviewers determined if SCRATC²H was identified as Most Significant Change in the school year to date to determine the resulting interview framework. Interviews that followed the interview framework resulting from SCRATC²H mentioned as a most significant change were coded to categorize the change as positive or negative.

Those that mentioned SCRATC²H as a positive MSC story contributed to outcome indicators as per the project's logical framework (Table 1):

1. Percentage and number of interviewed teachers that mention SCRATC²H as a Most Significant Change story and
2. Percentage and number of interviewed learners that mention SCRATC²H as a Most Significant Change story.

In addition to leveraging MSC responses as a quantitative outcome metric, a full MSC process was also completed. First, all MSC interviews were shared with external trainers to select the first round of most significant change stories. Teacher and Learner MSC rubrics were created to support external trainers in determining significance of changes based on the ability to attribute the change to Scratch, the sustainability of the change, and the association of the change to different domains informed by evaluation and learning questions (Annex 3).

The next round of the MSC process was conducted VVOB and TSI staff in a two-hour long workshop on May 30, 2022. Five members both VVOB and TSI attended the workshop and through discussion and participatory methods, 2 teacher and 2 learner interviews were selected. These interviews were drafted into case studies, which can be found in Annex 4.

Findings

Endline findings are grouped by key research questions which evaluate the relevance, coherence, effectiveness, efficiency, and sustainability of the pilot project as per the OECD DAC criteria.

Section 1: Relevance and Coherence

This section presents findings on the relevance and coherence of the SCRATC²H 2050 pilot project by evaluating the following evaluation questions:

- **Relevance:** the extent to which the intervention objectives and design respond to beneficiaries', global, country and partner/institution needs, policies, and priorities, and continue to do so if circumstances change.
    1. To what extent is the project designed to meet REB priorities for STEM/ICT and national strategic objectives?
    2. To what extent does the project meet the needs of learners, both male and female?
    3. To what extent is the project designed to meet the needs of STEM/ICT teachers to incorporate coding into the curriculum?
- **Coherence:** How well does the intervention fit with other interventions in Rwanda and Kayonza District (External coherence)
    1. To what extent is the SCRATC²H 2050 pilot project compatible with REB priorities and other projects to further STEM/ICT instruction in secondary schools?

Additionally, this section contributes to the learning question, "how can Scratch coding can be adapted for students with disabilities?" by considering to what extent, if at all, did the project meet the needs of learners with disabilities.

Project was Relevance to and Compatible with REB Priorities, National Strategic Objectives, and STEM/ICT Educational Initiatives

Of the three pillars of the National Strategy for Transformation 2017 – 2024 (NST1), the Social Transformation pillar entails strategic interventions for Improved Access to Quality Education through strategic investments in all levels of education (pre-primary, basic and tertiary), and through improved teachers' welfare and increasing the number of qualified teachers. Strategic interventions are geared towards laying a strong foundation for quality education for Rwandan children.

ICT is a priority to Rwanda's vision 2050 and in education, it is one of the core pillars of the country to achieve its economic objectives. In 2015 REB integrated Scratch in the upper primary school curriculum of Science and Elementary Technology (SET) and in the lower secondary school curriculum of ICT through the new competency-based curriculum (CBC). In 2019 the Ministry of Education (MINEDUC) announced its plans to integrate coding lessons into the new school curriculum and encouraged schools to form coding clubs, while RCA opened with its first cohort of 60 students.

The SCRATC²H 2050 pilot project complemented educational initiatives across Rwanda by encouraging learner engagement with Scratch and the greater integration of coding/Scratch into daily education practice. Exposing learners to coding at a young age was perceived as crucial for encouraging a longer-term STEM career trajectory for students. For these reasons, across stakeholder IDIs, there was a consistent trend demonstrating the project's relevance to National Strategic Objectives, NST-1, and the Rwanda's Education Sector Strategic Plan 2018/19-2023/24 (ESSP).

> *"The project meets the needs of teachers and students at 100%. Because both teacher and student had ambition to learn Scratch and use it in their day-to-day activities." – National Stakeholder*

"It's very relevant because teaching coding at this young age is important to help them choose wisely their career. It's also an advantage because with their fresh mind, [learners] take up skills very quickly." – National Stakeholder

"Teaching secondary students to code using Scratch is very relevant for schools in the district because of how it improves computer skills in learners, and they become more interested in coding using the block-based language" – District Stakeholder

In 2013, REB introduced Scratch in Rwanda by hosting annual Scratch competitions (Scratch Days) for primary schools to promote digital literacy and prepare future engineers. The SCRATC²H 2050 project complements this national initiative by promoting the active involvement in Scratch Days. These events gave key national stakeholders a way to directly interact with beneficiaries of the SCRATC²H 2050 project.

"I personally interacted with some learners at [Scratch Day or exposure visit] events and I showed them some companies they can apply for which has ICT. It was good career guidance for them, especially learners." – National Stakeholder

These events also were a primary motivator for teachers and students, which demonstrated the compatibility of the SCRATC²H 2050 project with pre-existing education initiatives.

"Through the [Scratch Day and Scratch Hackathon events], teachers and students saw the application of Scratch in real life. Secondly, the events motivated teachers and students" – External Trainer

Teachers found Scratch events and exposure visits provided themselves and learners with a deeper understanding of the practical application of coding/STEM, the opportunity to advance their technology skills, and increased their motivation to engage with STEM/ICT.

Table 7: Scratch Day and Exposure Visit Outcomes from Qualitative Analysis

Qualitative Analysis Theme	*Illustrative Quote*
Exposure to applied technology (5 out 10 IDIs)	• *"Our students did an exposure visit on how robots work using Scratch in the Zorabots in Kigali. This opened their mind by showing them the Scratch coding applicability in real life situation." – Teacher*
Technology skill improvement (5 out of 10 IDIs)	• *"We learned additional skills related to coding and technology after attending the event like using the robot. We also learned professional skills of public speaking and presentation of the project in front of many people." Teacher*
Increased ICT/STEM motivation for teachers and learners (4 out of 10 IDIs)	• *Through the competition, you get the opportunity to see where others are, the level of other schools, and you get motivated to also go work harder to increase your school coding level." Teacher*

Project Design was Relevant to Learner's Needs

The SCRATC²H project met the needs of learners by exposing them to coding/Scratch and providing access to support and resources in an enjoyable atmosphere. Trends across IDI and KII interviews demonstrated that students had a high level of interest and motivation to incorporate Scratch into their everyday learning. Students readily signed up for clubs, maintained high levels of attendance, and their interest continued after clubs finished. Five out of ten teacher in-depth interviews specifically linked student interest as a driver for high attendance rates in clubs and four out of ten teachers described concrete examples of how student motivation remained high even after clubs finished. Four out of five Sector Inspector interviews attributed the success of the program to the high levels of participation rates of students. Eight out of ten teachers found that clubs met the needs of learners by increasing their STEM abilities and increasing their interest in developing their skills further. Themes of high levels of student engagement, interest, and motivation, which led to a sustainable interest in STEM as a field, were echoed in all five school leader interviews.

"Before the SCRATC²H project, in the after-lunch break, you would find students under trees discussing and others in groups of prayers, but today a big group of students after taking lunch are asking teachers …to open the smart classroom for them to take computer and continue their Scratch activities. Moreover, even in their learning you see that more students are now more interested in ICT courses since through Scratch they witnessed how technology can help and be used in important things like how it is used in Robots." - School Leader, Male

"Scratch has helped me to do something meaningful in my free time, because I no longer get to do useless things. it means that when you are in the Scratch coding club and you get some free time, in that time you can go and start coding, so at any time you can use Scratch here at school." - Learner, Female

Although access to computers, electricity, and internet was a consistent perceived barrier for learners across interviews, even in cases where there was low access to digital resources, students were highly motivated to engage with the project.

"It is worth noting that the situation in schools demotivates teachers but not students as we never heard of any student's dropouts from the club and many students shows interest to join clubs even though not all get the chance to be selected." – External Trainer

Project Design Meets the Needs of Female Learners

Trends across interviews indicate that the project met the needs of female learners by providing them with an entry point to develop their interest and engagement with STEM/ICT, especially in cases where there were greater perceived barriers for female learners due to gender bias.

"Girls still feel that they are inferior compared to boys. Some are affected by their backgrounds where they come from families who think boys are smarter than them, but with time, we keep encouraging and supporting them." - Teacher

"Students benefit a lot, especially girls, because girls used to feel like it's only boys who should join these ICT things, but girls, we have today understood the importance of ICT and how they should use it in their everyday life. Girls are now much more confident in performing ICT tasks" - School Leader

"Participating in Scratch clubs opened me to the idea of pursuing computer science in university. Before, this was not among my options as I thought Computer science was hard and complicated…With more advanced skills in technology, I believe I will have different opportunities in the future as technology quickly evolves." - Learner

SCRATC²H clubs especially were a tool to mobilize the interest of female students. In cases where female learners were initially less engaged in the project, teacher and school leader interviews noted that increased exposure to STEM/ICT through the project resulted in greater female involvement as the project continued. Student assessments substantiated this finding since in there was a twenty percent increase of female students participating in coding clubs in Cycle 2 when compared to Cycle 1.

"Female students are still shy [when it comes to STEM/ICT] compared to males. But, in the clubs, we have females who are participating in the SCRATC²H coding clubs. That's why we still have a job to do in terms of mobilizing our females to participate in the SCRATC²H coding clubs." - School Leader

"When we started, males participated in a big number compared to females, but small by small, we are increasing the number of females through mobilization" - Teacher

Ensuring gender parity or a greater representation of female students was a strong theme across all interviews. Teachers representing all five schools noted they intentionally selected more or equal numbers of female students when compared to male students. There was a strong trend across interviews demonstrating that once females began engaging with STEM/ICT through the project, they remained highly involved, demonstrated STEM/ICT proficiency, and were equally as excited as their male peers (Table 10). This was substantiated by student attendance records and assessments. In teacher reported student assessments, the 3% of learners who were reported to have dropped out of Cycle 2 was equally balanced for male and female learners. Additionally, male and female learners reached minimum and high digital literacy proficiency at a similar rate.

Table 8: Qualitative Outcomes on Female Learner Engagement

Qualitative Analysis Theme	*Illustrative Quotes*
Female learners as more involved or equally as involved (7 out of ten teacher IDIs)	● *"Females acted more than their fellow males"* ● *"When girls master, they do better than boys"*
Female learners demonstrate more or equal excitement (7 out of ten teacher IDIs)	● *"The interest was the same for female and male students"* ● *"The project that won at the school level was a project done by a male and female student"*

Since the project intentionally encouraged and, in many cases, required high participation of female learners, the project fulfilled a critical need by giving female students a point of entry into STEM activities.

Project Design Meets the Needs of Students with Disabilities

Qualitative analysis found no clear evidence that the project met the needs of students with disabilities. Only half of teacher in-depth interviews mentioned learners with disabilities most consistently to state their school had no learners with disabilities. In the few cases teachers, school leaders, or other stakeholders acknowledged students with disabilities, it was most often noted that students with disabilities were not excluded and that there were no perceived barriers for entry, but did not describe active engagement amongst these learners. One teacher identified a learner with a disability increased their confidence or willingness to engage with STEM/ICT after direct encouragement from teachers or other school staff. IDIs from two teachers and one school leader representing three different schools specifically tied the selection criteria to the lack of participation amongst learners with disabilities. In the case of the two teacher IDIs, it was noted that because prioritizing students with disabilities was not a direct part of club selection criteria, there were no learners with disabilities. The school leader reported that because there was a selection criteria beyond interest, there were no learners with disabilities who participated in the SCRATC²H clubs.

Project Design was Relevance to Teachers' Needs

The project design met the needs of teachers through the development of basic technology, coding, and Scratch skills (7/10). Qualitative analysis demonstrated a clear link between the training and the development of minimum Scratch proficiency.

> *"The SCRATC²H training gave an introduction to Scratch and a foundation on how to do things on Scratch. Actually, I did not know anything on Scratch, but at the end of the training, I was able to know the foundation of Scratch, and how to do programming using Scratch" Teacher*

Several teachers also drew a distinct connection between the training and their confidence engaging students with coding/Scratch (5/10), which was echoed across stakeholder interviews.

> *"The training put me on a good standard regarding the use of Scratch and other technology skills that helped me to teach to the students, and I am confident about what I am teaching." - Teacher*

"Teachers now have the confidence to use Scratch and computers in general, in their activities. For learners, Scratch boosted their willingness to learn coding, and from different testimonies, they have enjoyed and loved learning Scratch. There wasn't a difference for male and female [students]." – National Stakeholder

The project also met the needs of teachers by offering them sustained support after the initial intervention through meetups, school visits, and online resources. The project emphasized that teachers should not "always wait for trainers to come teach them," which encouraged teachers to develop their own skills through online research and continued engagement with online platforms (External Trainer). Additionally, the project encouraged collaboration amongst fellow teachers which helped develop a community of continuous learning amongst educators. Teacher IDIs demonstrated that project resources and support after the initial training enabled teachers to continue practicing their skills while incorporating training outcomes into SCRATC²H clubs and to a lesser extent the classroom.

Although qualitative analysis demonstrated the project met the basic needs of teachers by giving them basic digital literacy skills and increasing their confidence, in cases where schools had less technological resources, there were concerns that teachers could successfully implement what they learned in the intervention. These concerns were exacerbated by other compounding barriers to full implementation, such as the lack of time for projects like coding clubs or ability to incorporate applied coding concepts when not explicitly built into the curriculum for non-ICT subjects (i.e., chemistry, physics, biology).

"They have at least basic knowledge about Scratch as the time of their training was not enough, but how can they even share what they have to students with that low collaboration with school's administration, and lack of resources like computers. Moreover, even working in those situations demotivates teachers." –Trainer

Section 2: Effectiveness and Efficiency

This section presents findings on the effectiveness and efficiency of the SCRATC²H 2050 pilot project by assessing the following evaluation questions:

- Effectiveness: the extent to which the intervention achieved, or is expected to achieve, its objectives and its results, including any differential results across groups
    1. To what extent did the project achieve its expected results?
    2. What factors were associated with the achievement or non-achievement of the expected results?
    3. How effective was communication between VVOB and partners (REB and RCA) for achievement of expected results?
    4. How effective was the blended learning trajectory for teacher trainings?
- Efficiency: To what extent did the intervention deliver or is likely to deliver results in an economic and timely way
    1. To what extent were inputs managed in a cost-effective way?
    2. To what extent were activities implemented in line with the project time frame?

This section also contains findings related to the learning question, "to what extent, if at all, do teachers continue to access learning opportunities and resources beyond the course?"

First, this section describes the overall effectiveness and efficiency of the project by assessing the coordination, communication, cost effectiveness, and adherence to project timeline. Then, this section is grouped by expected result, as defined in the project's logical framework (Table 1). For each expected result, the factors associated with successful achievement and the efficiency of inputs that yielded said results were explored. Finally, this section explores the intended impacts, unintended impacts, and differential impacts of achieved expected results associated with various inputs.

The SCRATC²H 2050 Pilot was Effectively Coordinated and Efficiently Operated

The administration of the SCRATC²H 2050 project was effective with clear and professional communication. All stakeholders found that resources were delivered in a timely manner and VVOB provided the necessary support for the project to proceed smoothly. Coordination was "very smooth" and "very effective" with no noted areas of improvement (National Stakeholder).

> *"The coordination with VVOB was very wonderful. They were always on time in delivering and they were the ones to reminder us sometimes on some of the joint scheduled activities. They were professional at 100%." – National Stakeholder*

Project administration was described as timely and efficient by the interviewed VVOB staff member. The pedagogical guide and OERs were developed efficiently while incorporating inputs from all stakeholders. Stakeholders were also engaged in the administration of the SCRATC²H training for teachers helping to build stakeholder capacity at each stage of the intervention. Project outputs were met in line with the intended project timeframe (VVOB stakeholder).

Expected Result 1: The Development and Endorsement of the SCRATC²H Pedagogical Guide and the Use of Open Education Resources

The development of a SCRATC²H 2050 pedagogical guide, complemented by a suite of ICT and STEM lesson plans and Open Education Resources (OERs), was one of the four pillars of the project. The pedagogical guide was developed together with RCA and Rwanda Association for Women in Science and Engineering (RAWISE) trainers. The guide was first piloted together with the online environment with 14 STEM and ICT teachers. After the pilot, a validation workshop was organized with REB, RCA and RAWISE. The pedagogical guide was endorsed by REB and printed copies were distributed to teachers at the start of the learning trajectory. Use of the pedagogical guide was a consistent trend across teacher interviews (eight of out of ten teacher IDIs referenced some use of the guide), most often to facilitate SCRATC²H clubs. Five teachers noted they used the pedagogical guide at least half of the time when planning for clubs and four teachers said it was their most frequently referenced resource when preparing for directing students during the clubs.

> *"We use [the pedagogical guide] in SCRATC²H sessions as [it] guides us step-by-step as we facilitate SCRATC²H coding clubs. It is very useful as we can't facilitate without this resource." – Teacher*

At the end of 2021, 39 OERs were developed including 27 instructional videos, 16 sample lesson plans, 6 teaching guides, a video demonstrating the relevance of coding to the world of work (robotics) and a poster with QR codes to show examples of SCRATC²H projects to learners and teachers. Over the course of the project, these resources had over 6,200 views.

Table 9: Open Education Resources and Views

Product(s)	Total Views
Instruction videos (27)	147
Scratch day video	340
Short exposure visit video	97
Long exposure visit video	99
Unplugged activities videos	249
Sample lesson plans (16) and teaching guides (6)	3476 (158 views per product)
Scratch projects	1990

The high use of tutorial videos was a consistent trend across teacher in-depth interviews. Teachers found that showing the videos could be used to introduce students to a new topic.

> *"We use [instructional videos] at the beginning of sessions – before we introduce anything to students in SCRATC²H coding clubs we often show them an instructional video that will help them to easily and quickly understand what you want them to know that day. This*

resource is very useful as students understand easily when they are able to see things than when they are theories." – Teacher

Several teachers found other resources, especially the coding club lesson plan, was helpful for leading coding clubs. Fewer teachers referenced using the coding club PowerPoint (three out of ten teachers). Teachers who did not use tutorial videos, coding club lesson plans, or PowerPoints cited a lack of infrastructure, like electricity, or time to sufficiently incorporate these tools (2 out of 5).

In the REB Stakeholder interview, the development of the pedagogical guide was referenced in consideration of the overall achievement of project results. For teachers, these resources were also tied to the perceived sustainability of clubs after the initial pilot program. Few teachers also noted where additional resources, such a guide for learners to self-study Scratch, would also lead to sustained project outcomes.

"We have computers, pedagogical guides, contents on Moodle, and with access to all those resources, we will be motivated to continue without even the project funding," – Teacher

Expected Result 2. The Development and Implementation of the SCRATC²H Blended Learning Trajectory to 158 Teachers

In total, 158 teachers from all 54 schools in Kayonza district participated in the SCRATC²H Learning Trajectory. The blended learning trajectory was a series of five sessions, including two Face-to-Face sessions and three online sessions. Trainers hoped to achieve three core principles through the SCRATC²H 2050 training: "the spirit of continuous learning," the importance of practicing coding skills, and the promotion of collaboration amongst teachers. These three principles guided the decision to use online training in order to provide teachers with "space, content, and resources for them to figure out everything themselves" (External Trainer). Two key stakeholders also reported that the increased exposure to technology through the blended learning trajectory furthered teachers' professional growth.

"For the blended learning, it was a good trajectory and [the] best method to use because it helped teachers to understand that learning isn't only in-person in the modern world" – National Stakeholder

Table 10: Blended Learning Trajectory Session Attendance

Session Number	Number of Attendees	Attendance Rate
Session 1 (in-person)	157	99%
Session 2 (online)	107	68%
Session 3 (online)	136	86%
Session 4 (online)	121	77%
Session 5 (in-person)	132	84%

Face-to-Face sessions "introduced the SCRATC²H 2050 pilot project to teachers to explain to them how to use and navigate the online learning platforms" (External Trainer). Face-to-Face sessions saw a greater average attendance rate and teachers perceived in-person sessions as more productive for their learning. They described higher levels of comfort in person, a greater opportunity to ask questions freely, and practice alongside other teachers. Several teachers were challenged by low internet connectivity when engaging with online training sessions. Despite a lower attendance rate, some teachers also perceived greater flexibility in online sessions, describing a greater ability to access resources, research on their own, and fit training into their schedule even when there were significant time constraints, like during exams.

Table 11: Blended Learning Trajectory Attendance by Session Type

Session Type	Average Number of Attendees	Average Attendance Rate
Face-Face Sessions	145	91%
Online Sessions	121	77%

In addition to the five initial sessions, there were three biannual ScratchEd Meetups, facilitated by Sector Education Inspectors (SEIs). Teachers perceived these meetups as a valuable place to engage with peer teachers, receive advice from SEIs, and share issues about SCRATC²H clubs, such as how to overcome the issue of limited electricity at school by utilizing solar energy (SEI). SEIs saw hosting meetups as their primary role in the SCRATC²H 2050 project.

> *"Our role in this project is to organize and facilitate the meetups and discuss the challenges teachers and clubs face. We try to find solutions to those challenges and do advocacy if they are beyond our capability. As I facilitated the meetups, I found that it is a support system because it helps the teachers learn from each other and to discuss the challenges they are facing and work together to find solutions." – SEI*

Table 12: Meetup Attendance by Session

Biannual SCRATC²H Meetup	Number of Teachers	Attendance Rate	Number of Female Teachers	Number of Schools
Session 1	160	100%	33	53
Session 2	122	76%	29	48
Session 3	140	88%	28	51

Trainers and SEIs also visited schools to provide on the ground support to teachers and SCRATC²H coding clubs. Teachers associated these visits with higher levels of motivation amongst their students. They also noted these visits were valuable for keeping them engaged and offering them ad-hoc support throughout the year.

> *"SEI and trainers visited us, and they provided little trainings during the SCRATC²H club. Their support was more effective because they discussed with the students to encourage them to participate more in the SCRATC²H club, and they helped us learn more about the questions we had during that time." – Teacher*

Additionally, teachers had access to the ScratchEd Community platform, which allowed them to engage with their trainers and other teachers on an ad-hoc basis.

> *"For the platform, they were effective because they helped them to connect with their trainers constantly and helped them to ask question/queries and got responses smoothly." – National Stakeholder*

While teachers perceived their basic digital literacy needs were met through the training by providing them with a foundational Scratch knowledge, there was a consistent trend amongst teacher IDIs of the training not meeting their expectations. Teachers found their skills were not as advanced as they had expected after completing the program. The length of the training and the lack of network connectivity were primary reported barriers to the training reaching teachers' full expectations. Teachers' concerns were echoed by the interviewed external trainer.

> *"[Before the training, my Scratch skill was] about 3%, but today I am on the high level of 70% meaning my expectation has been met to a good level, however, I still need more to meet 100% from the training." – Teacher*

> *"[The training met my expectation] at the level of 70%...I have not met my expectations 100% - I didn't meet all I needed to teach Scratch in school. The time was short." – Teacher*

> *"However, I feel that teachers are averagely capable to offer coding lessons to students… because I feel like teachers didn't grasp all we taught them as the time of training for teachers was not enough, the teaching processes wasn't fully effective, these teachers needed more in-person sessions to be capable." – External Trainer*

Expected Result 3. The Participation of Over 3,700 Learners in More Than 270 SCRATC²H Clubs

SCRATC²H coding clubs were administered in 54 schools in Kayonza district over the course of two cycles. In cycle 1, there were 140 coding clubs and there were 134 in cycle 2. In the first cycle there were 1832 learners while in the second cycle there were 1892 learners resulting in a total of 3724 learners. In total, there were 1845 male learners and 1879 female learners. Although there was a higher representation of male learners in cycle 1, cycle 2 saw the reverse gender distribution. Across both cycles there was an even distribution of male and female learners (Table 15).[5]

Table 13: Learner Attendance by Session

Cycle	Total number of Schools	Total Number of Clubs	Avg Learners per club	Total Learners	Female	Male
Cycle 1	54	140	13	1832	843 (46%)	989 (54%)
Cycle 2	54	134	14	1892	1036 (55%)	856 (45%)
Total	54	274	13	3724	1879 (50%)	1845 (50%)

Each learner participated in seven modules in total. At the end of each module, learners were asked to code a story, game, or animation after every module activity. Therefore, learners created a combined total of approximately 26,068 stories, games, and animations.

Section 3: Impact

This section presents findings on the impact of the SCRATC²H 2050 pilot project by assessing the following evaluation questions:

- Impact: the extent to which the intervention has generated or is expected to generate significant positive or negative, intended or unintended, higher-level effects
    1. To what extent did the intervention achieve the intended impact? Was there any unintended impact as a result of the project? Was there any differential impact (male vs. female teachers, male vs. female students, school type, etc.)

Additionally, this section explores findings related to the learning question "to what extent, if at all, did the extent to which participation in the SCRATC²H training and coding clubs influence how teachers teach STEM/ICT in the classroom?"

Ultimately, this section demonstrates that the SCRATC²H achieved its specific objective by equipping 158 ICT and STEM teachers of 54 secondary schools with the competencies needed to initiate and facilitate after school SCRATC²H coding clubs for secondary school learners and to integrate Scratch into STEM/ICT lesson plans, as defined in the project's logical framework. This section also looks at factors associated with the achievement of the specific objective before describing the general impact on teachers, learners, and the school environment.

Teacher Proficiency in Digital Literacy Skills and Content Creation in Scratch

This section presents the results of two impact indicators, the percentage of teachers who achieved at least a minimum level of proficiency in digital literacy skills and the percentage of trained teachers who have achieved a high proficiency in terms of content creation (coding). Throughout this section, findings are presented for the entire sample of endline survey responses (134) and, thus, cannot be directly compared to the baseline findings (160 responses). However, baseline percentages are included as a point of reference for consideration.

In order to measure the percentage and number of teachers who have achieved at least a minimum level of proficiency in digital literacy skills as proposed in the Digital Literacy Global Framework, a series of questions

[5] There were some clubs with repeat learner participation, so there is the possibility learners were double counted.

on digital literacy skills were asked to teachers. The digital literacy assessment was designed in line with the UNESCO's Global Framework for Digital Literacy Skills (UNESCO, 2018) and VVOB's existing digital literacy assessment. The assessment measured five competencies:

- Competency 0: Devices and Software Operation
  - Competency 0.1: Device Operations
  - Competency 0.2 Software Operations
- Competency 1: Information and Data Literacy
- Competency 2: Communication and Collaboration
- Competency 4: Safety
- Competency 6: Career Related Competences[6]

Minimum competency was set at 50% for digital literacy skills. At the time of endline assessment, 91% of teachers surveyed met the minimum competency (Table 19). At the baseline, only 72% of all teachers had achieved the same level of proficiency.

Table 14: Impact Indicator 1: Minimum level of Proficiency in Digital Literacy Skills

Indicator	Total	Female	Male
Percentage and number of vulnerable groups who have achieved at least a minimum level of proficiency in digital literacy skills as proposed in the Digital Literacy Global Framework (TEACHERS).	91% (122/134)	89% (31/35)	92% (91/99)

70% of teachers met high level of proficiency, as defined as a score of 70% or higher on the digital literacy assessment. Male teachers were slightly more likely to have achieved high proficiency (72% vs. 69%) (Table 15).

Table 15: Teachers Meeting High Proficiency (70%) in Digital Literacy Skills

Teachers meeting high proficiency (70%) in digital literacy	Total	Female	Male
Percentage and number of vulnerable groups who have achieved at least a high level of proficiency in digital literacy skills as proposed in the Digital Literacy Global Framework (TEACHERS).	71% (95/134)	69% (24/35)	72% (71/99)

Additionally, a Scratch assessment was developed and administered to teachers to determine the percentage and number of trained teachers who have achieved a high proficiency in terms of content creation (coding). The assessment covered both computation concepts and computational practices. Computational practices assessed teacher's understanding of the use of Scratch through multiple choice questions to test expected competences as per the modules in the SCRATC²H curriculum, including Module 1: Scratch Interface Elements and Using Math Operator Blocks, Module 2: Motion and Direction in XY Coordinates, Modules 3 and 4: Story Creation and Animation in Scratch, Module 5: Polygons and Flowers, Modules 6 and 7: Games.

Thirty- one (31) teachers met the minimum in content creation or coding with Scratch (or those scoring 50% or higher on the assessment or a score of 17 or higher) for a total of 23% of respondents. Teachers' Scratch knowledge at the end of the intervention was correlated to their digital literacy assessment score both before and after the intervention.

Table 16: Minimum Proficiency in Content Creation (Coding)

Indicator	Total	Female	Male
Percentage of trained teachers who have achieved a minimum proficiency in terms of content creation (coding).	23%	26%	22%

[6] The digital literacy questions were identified in the baseline survey. A correlation analysis was conducted on digital literacy questions to validate the assessment. The endline analysis utilized the same metric as the baseline to ensure compatibility with findings.

High proficiency in content creation or coding with Scratch was set at 70% (or a score of 24 or higher). Few teachers met high proficiency (11%). When compared to the baseline surveys, fewer than 1% of all teachers had achieved a similar of proficiency. Endline scores were substantiated through qualitative analysis which demonstrated that, while teachers noted significant increases in their Scratch skills, they felt they had not reached high proficiency levels.

Table 17: Impact Indicator 2: High Proficiency in Content Creation (Coding)

Indicator	Total	Female	Male
Percentage of trained teachers who have achieved a high proficiency in terms of content creation (coding).	11%	6%	12%

Teachers' Change in Digital Literacy, Coding, and Scratch Knowledge

This section explores how teachers' digital literacy, coding, and Scratch knowledge changed as a result of participation in the SCRATC²H training and coding clubs. Throughout this section, findings from the 130 teachers whose baseline surveys were matched to endline surveys are presented. Thus, changes in scores can be directly compared. The full digital literacy assessment had a total score of 100 with certain competencies weighted differently. For that reason, a four-point scale was developed so scores could be presented comparatively across different competencies. Throughout this section, findings are first presented on the 100-point full assessment scale before demonstrating the changes by competency area.

The average score for teachers for the endline digital literacy assessment was 78 out of 100 compared to 66 out of 100 at the baseline. On average, teachers increased their digital literacy scores by 12 points from baseline to endline. While female teachers demonstrated lower levels of digital literacy overall, they also had a greater relative increase in score from baseline to endline. By the end of the intervention, the gap between male and female teachers lessened from a seven-point difference to less than a two-point difference (Table 18).

Table 18: Comparison in Teachers' Average Digital Literacy Scores on the Full 100-Point Scale

	Baseline Score	Endline Score	Average Change in Score
All Teachers	66	78	12
Male Teachers	68	79	11
Female Teachers	61	77	16

On average, all teachers saw the greatest increase in competencies related to communication and collaboration and software operations. On a four-point scale, female teachers increased these competencies by one point. On average, male teachers did not report as significant of an increase in any one competency (Table 19).

Table 19: Comparison Digital Literacy Competencies by Gender on a Comparative Competency 4-Point Scale

Digital Literacy Assessment Average Score by Category (Out of 4)	Average Total Score			Female			Male		
	Baseline	Endline	Change	Baseline	Endline	Change	Baseline	Endline	Change
Average Across All Competencies	2.6	3.1	0.51	2.4	3.1	0.72	2.7	3.2	0.44
Competency 0.1: Devices Operations	3.7	3.9	0.15	3.7	3.8	0.12	3.7	3.9	0.15
Competency 0.2: Software Operations	2.8	3.5	0.70	2.5	3.5	0.95	2.9	3.5	0.61
Competency 1: Information and Data Literacy	2.6	3.1	0.53	2.3	3.1	0.80	2.7	3.1	0.44
Competency 2: Communication and Collaboration	2.5	3.2	0.74	2.1	3.1	1.08	2.6	3.2	0.62
Competency 4: Safety	2.1	2.6	0.48	1.8	2.5	0.71	2.2	2.6	0.41
Competency 6: Career Related Competences	2.5	2.9	0.39	2.5	2.8	0.36	2.5	2.9	0.40

Age also influenced how teachers advanced their digital literacy skills. Younger teachers, who started the program with high levels of digital literacy (composite scores of over 80), had relatively low change in digital literacy scores with an average change in score of 6. Teachers older than 35 had the greatest relative skill improvement with an average increase in score of 15. By the end of the program, teachers younger than 30

had an average score of 88, teachers 30 - 35 had an average score of 75, and teachers older than 35 had an average score of 78.

Teachers under 35 had the greatest increase in competencies related to communication and collaboration. Teachers who were older than 35 reported the greatest improvement in software operations (Table 20).

Table 20: Comparison Digital Literacy Competencies by Age

Digital Literacy Assessment Average Score by Category (Out of 4)	Younger than 30			30 - 35			Older than 35		
	Baseline	Endline	Change	Baseline	Endline	Change	Baseline	Endline	Change
Average Across All Competencies	3.3	3.5	0.24	2.5	3.0	0.54	2.5	3.1	0.61
Competency 0.1: Devices Operations	3.9	3.9	0.04	3.7	3.9	0.25	3.7	3.8	0.07
Competency 0.2: Software Operations	3.3	3.8	0.42	2.7	3.4	0.65	2.6	3.5	0.91
Competency 1: Information and Data Literacy	3.2	3.6	0.37	2.3	2.9	0.57	2.5	3.1	0.56
Competency 2: Communication and Collaboration	3.1	3.7	0.61	2.2	3.0	0.76	2.4	3.2	0.78
Competency 4: Safety	3.1	3.1	0.04	1.9	2.4	0.56	1.8	2.5	0.63
Competency 6: Career Related Competences	3.3	3.1	-0.24	2.3	2.9	0.62	2.4	2.9	0.44

Teachers from public, private, and government aided schools saw similar rates of improvement with an average change in score of about 12 across all three school types. Teachers from private schools, who started with a higher relative score at the baseline, ended with an average score of 88. Teachers from public and government aided schools ended the program with average scores of 78 and 77.

Teachers from public, private, and government aided schools reported relative improvements in various competencies. For example, teachers from government aided schools reported the greatest improvement in communication and collaboration, teachers from private schools had greatest improvement in information and data literacy, and teachers from public schools had greatest improvement in both software operations and communication and collaboration.

Table 21: Comparison Digital Literacy Competencies by School Type

Digital Literacy Assessment Average Score by Category (Out of 4)	Government Aided			Private			Public		
	Baseline	Endline	Change	Baseline	Endline	Change	Baseline	Endline	Change
Average Across All Competencies	2.5	3.1	0.54	3.0	3.5	0.47	2.6	3.1	0.50
Competency 0.1: Devices Operations	3.8	4.0	0.19	3.8	3.9	0.10	3.7	3.8	0.13
Competency 0.2: Software Operations	2.7	3.4	0.67	3.1	3.8	0.66	2.8	3.5	0.71
Competency 1: Information and Data Literacy	2.5	2.9	0.43	2.8	3.5	0.67	2.6	3.1	0.55
Competency 2: Communication and Collaboration	2.3	3.2	0.87	2.9	3.5	0.56	2.5	3.2	0.71
Competency 4: Safety	2.0	2.5	0.55	2.9	3.2	0.28	2.0	2.5	0.48
Competency 6: Career Related Competences	2.4	2.9	0.42	2.8	3.3	0.47	2.5	2.9	0.37

Non-ICT STEM Teachers had relatively higher gains in digital literacy skills when comparing scores before and after the program when compared to ICT teachers ($p<.05$). While ICT Teachers reported a half-point improvement (on a four-point scale) of one competency (communication and collaboration), physics, biology, and mathematics teachers saw a similar or greater level of improvement across four different competencies. Chemistry teachers, who had the greatest relative gains, reported at least a half-point improvement across five out of six competencies (Table 22).

Table 22: Comparison Digital Literacy Competencies by Subject

Digital Literacy Assessment Average Score by Category (Out of 4)	ICT		Physics		Biology		Mathematics		Chemistry	
	Endline	Change	Endline	Change	Endline	Change	Endline	Change	Endline	Change
Average Across All Competencies	3.2	0.24	3.1	0.56	3.0	0.55	3.1	0.48	3.1	0.74
Competency 0.1: Devices Operations	3.9	0.05	3.9	0.13	3.9	0.17	3.8	0.13	3.9	0.26
Competency 0.2: Software Operations	3.5	0.35	3.5	0.87	3.3	0.69	3.5	0.71	3.4	0.89
Competency 1: Information and Data Literacy	3.2	0.34	3.0	0.40	2.9	0.65	3.0	0.50	3.1	0.76
Competency 2: Communication and Collaboration	3.3	0.55	3.2	0.76	3.0	0.79	3.2	0.62	3.1	0.99
Competency 4: Safety	2.7	0.10	2.6	0.59	2.3	0.52	2.5	0.45	2.5	0.76
Competency 6: Career Related Competences	2.9	0.13	3.0	0.56	2.9	0.36	3.0	0.55	2.8	0.56

Teacher experience had no significant impact on change in digital literacy score. A teacher's level of digital literacy at the start of the program was associated with their improvement at the endline. Teachers who did not meet minimum proficiency at the baseline (28% of all teachers) scores increased by 127%.

Table 23: Comparison of Digital Literacy Competencies by Baseline Level

	Teachers (N, %)	Change in score	Percent Change	Endline Score
High proficiency at baseline (70 - 100 composite score)	69 (28%)	-2	-1%	85
Minimum proficiency at baseline (50 - 69 composite score)	24 (18%)	20	35%	79
Less than minimum proficiency at baseline (1 - 49 composite score)	37 (53%)	33	127%	66

There was no significant correlation between the school-enabling environment for digital learning, enjoyment of Scratch, participation in the Continuous Professional Development Certificate Program in Educational Mentoring and Coaching for STEM Teachers provided by the UR-CE and VVOB, or perceived access to coding/Scratch support and change in composite digital literacy scores at the p<.05 level.[7]

Content creation in Scratch

Teachers saw significant improvement in Scratch knowledge when compared to baseline scores. The average score for teachers more than tripled demonstrating how teachers overall Scratch content knowledge progressed since the start of the project. Previous engagement with Scratch had no perceivable impact on score improvement, although enjoyment of coding with Scratch was significantly associated with improvements in Scratch coding scores.[8]

Table 24: Scratch Knowledge Assessment Scores

	Total Score (Out of 34)		Computational Concepts (Out of 5)		Computational Practices (Out of 8)		Modules 1 – 7 (Out of 21)	
	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
Average Score	4	13	1	2.7	1	1.8	1	8.3
Maximum Score	21	25	5	5	6	7	13	17
	(Out of 19 Questions)		(Out of 5 Questions)		(Out of 8 Questions)		(Out of 6 Questions)	
% Correct	12%	38%	20%	53%	11%	30%	7%	45%

Qualitative analysis suggested that teachers in school environments with little support for digital technology faced a greater barrier mobilizing their motivation to learn Scratch into concrete coding skills although this relationship could not be substantiated through inferential statistics. Although there was a weak correlation between the school's enabling environment for digital literacy and endline Scratch knowledge (significant at the p<.05 level), there was no statistically significant correlation between school enabling environment and *change* in Scratch scores.

[7] The absence of statistical significance at the p<.05 level indicates that any association between the described factors and expected outcomes (i.e., increased digital literacy scores) cannot be directly attributed or correlated to the described factors through inferential statistics. Thus, a hypothesis is not proven, but also, cannot proven to be false.

[8] At the time of the endline survey, all but three teachers either agreed or strongly agreed they enjoy coding using Scratch, representing 98% of the total survey population. Teachers who strongly agreed they enjoyed coding using Scratch (80 teachers or 62% of the total sample) had an average change in score that was 2.4 points higher out of 34 when compared with teachers who did not enjoy coding using Scratch (47 teachers or 36% of the sample, p<.05).

Teachers' Coding/Scratch Self-Efficacy

To further assess teachers' change in Scratch knowledge, the baseline and endline survey asked teachers to rate their self-efficacy as it related to applied coding/Scratch concepts, specifically digital content creation and problem solving in Scratch. At the baseline survey, a composite score was developed by averaging individual questions to provide a comparative metric for the endline assessment by competency (Coding/Scratch Self-Efficacy, Digital Content Creation, Problem Solving). First, this section explores comparative change by competency on a four-point scale before displaying the distribution of responses by each individual question.

At the baseline, teachers had slight to no self-confidence in applied coding/Scratch skills like content creation and problem solving. In their endline responses, teachers reported significantly higher levels of self-efficacy. There was a moderate correlation between endline digital literacy assessment scores and self-efficacy in applied coding/Scratch skills. There was no meaningful relationship between baseline composite digital literacy and endline self-efficacy. Similarly, there was little perceived relationship between school enabling environment or perceived Scratch/coding support and self-efficacy in applied coding/Scratch skills.

Both male and female teachers reported similar improvements in self-efficacy as it related to coding/Scratch Self-Efficacy.

Table 25: Coding/Scratch Self-Efficacy by Gender

Coding/Scratch Self-Efficacy Assessment Average Score by Category (Out of 4)	Average Total Score		Female		Male	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
Total Coding/Scratch Self-Efficacy (Competency 3 and 5)	0.4	2.4	0.4	2.4	0.4	2.4
Compentency 3: Digital Content Creation	0.5	2.6	0.5	2.7	0.5	2.6
Competency 5: Problem Solving	0.3	2.1	0.4	2.1	0.3	2.2

Teachers younger than 30 at the time of the survey reported a slightly higher composite score (Table 26).

Table 26: Coding/Scratch Self-Efficacy by Age

Coding/Scratch Self-Efficacy Assessment Average Score by Category (Out of 4)	Younger than 30		30 - 35		Older than 35	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
Total Coding/Scratch Self-Efficacy (Competency 3 and 5)	0.6	2.6	0.5	2.3	0.2	2.4
Compentency 3: Digital Content Creation	0.7	2.8	0.5	2.5	0.3	2.6
Competency 5: Problem Solving	0.5	2.3	0.4	2.0	0.2	2.2

Although there was variation in endline coding/Scratch self-efficacy based on school status, the differences between school types were relatively low (Table 27).

Table 27: Coding/Scratch Self-Efficacy by School Status

Coding/Scratch Self-Efficacy Assessment Average Score by Category (Out of 4)	Government Aided		Public		Private	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
Total Coding/Scratch Self-Efficacy (Competency 3 and 5)	0.3	2.5	0.5	2.3	0.2	2.6
Compentency 3: Digital Content Creation	0.4	2.7	0.6	2.5	0.2	2.8
Competency 5: Problem Solving	0.2	2.2	0.4	2.1	0.1	2.4

Similarly, there was some variation between school subject taught and self-efficacy to apply coding/Scratch concepts. For example, ICT teachers and chemistry teachers ended the program with the highest level of self-efficacy in all three core concepts. Mathematics teachers ended with the lowest level of self-efficacy, although, the variation between teacher by school subject was relatively low (Table 28).

Table 28: Coding/Scratch Self-Efficacy by School Subject

Coding/Scratch Self-Efficacy Assessment Average Score by Category (Out of 4)	ICT		Physics		Biology		Mathematics		Chemistry	
	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
Total Coding/Scratch Self-Efficacy (Competency 3 and 5)	0.7	2.5	0.4	2.3	0.4	2.3	0.3	2.2	0.3	2.5
Compentency 3: Digital Content Creation	0.8	2.7	0.4	2.4	0.4	2.5	0.3	2.5	0.3	2.7
Competency 5: Problem Solving	0.5	2.3	0.3	2.0	0.3	2.0	0.3	1.9	0.3	2.2

At the baseline, teachers had slight to no self-confidence in their ability for digital content creation. Teachers across the board were not confident in their ability to apply mathematical concepts, develop simple games, stories or animations in Scratch or explain basic concepts of coding. In their endline responses, the majority of teachers (78%) were completely or moderately confident in at least one skill related to digital content creation. Across all digital content skills, at least half of teachers reported moderate to complete confidence.

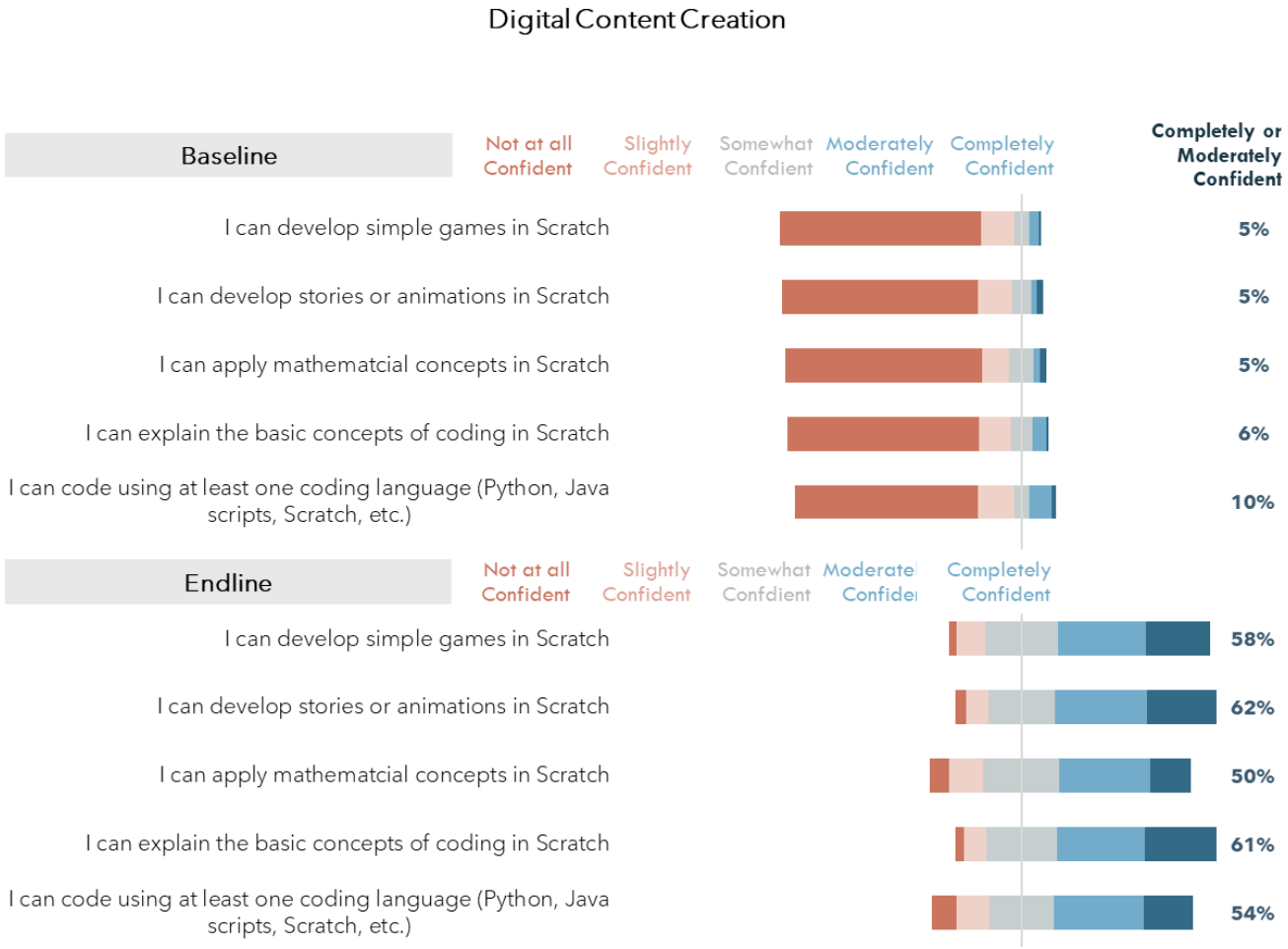


Figure 2: Digital Content Distribution at Baseline and Endline

At the baseline, teachers had slight to no self-confidence in problem solving. In their endline responses, over half of teachers (54%) were completely or moderately confident in at least one skill related to problem solving in Scratch. Across all problem-solving competency skills, over one-third of reported moderate to complete confidence. There was a moderate correlation between average digital literacy score and self-efficacy for digital content creation. There was a weak correlation between the digital content creation composite score and endline Scratch knowledge.

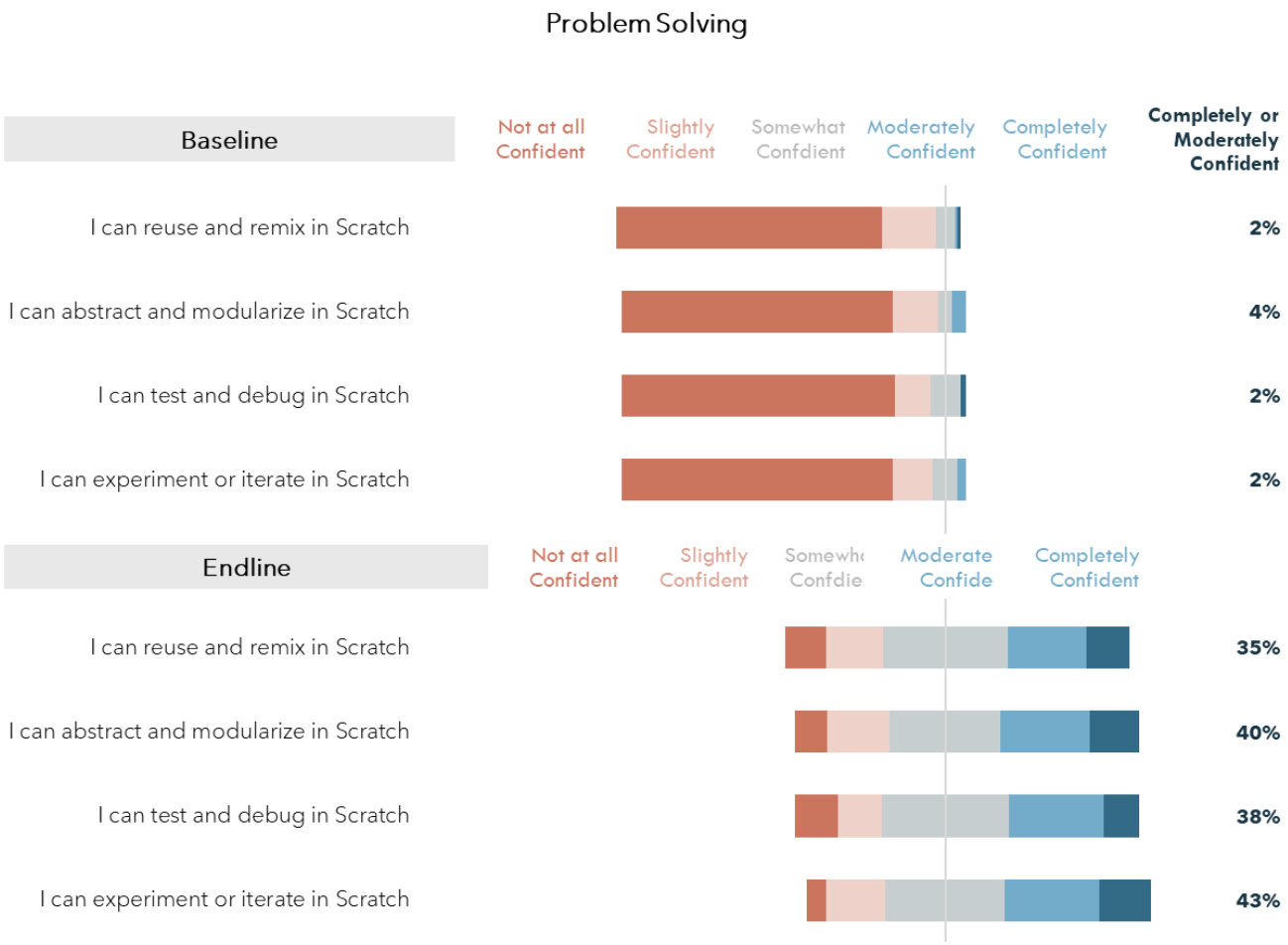


Figure 3: Digital Problem-Solving Distribution at Baseline and Endline

There was a moderate correlation between average digital literacy score and self-efficacy for applied Scratch problem-solving. There was a weak correlation between the problem-solving composite score and endline Scratch knowledge.

Teachers' Competency to Facilitate SCRATC²H coding clubs

This section presents the results of one impact indicator, the percentage of teachers who report to feel competent to facilitate after school SCRATC²H coding clubs.[9]

The percentage and number of trained teachers who report to feel competent to facilitate after school SCRATC²H coding clubs was measured as those teachers reporting to feel moderately and completely confident in their ability to lead a SCRATC²H club at their school. In total, 74% of teachers feel confident in their ability to lead a SCRATC²H coding club (Table 29). In the baseline survey, only 28% of teachers felt a similar level of self-confidence in relation to lead SCRATC²H coding clubs. Over one-third of teachers reported complete confidence when leading SCRATC²H clubs compared to fewer than 20% of teachers at the baseline.

[9] Throughout this section, findings are presented from surveys where baseline responses were matched to endline responses.

Table 29: Impact Indicator - Competency to facilitate after-school SCRATC²H coding clubs

Indicator	Total	Female	Male
Percentage of trained teachers who report to feel competent to facilitate after school SCRATC²H coding clubs.	74%	72%	75%

Although male teachers exhibited slightly higher levels of self-confidence for leading SCRATC²H clubs, the gap between male and female teachers' scores decreased considerably since the baseline survey. At the baseline, there was a 14% percentage point gap between male and female teachers' who felt confident leading SCRATC²H coding clubs. This difference between male and female students lessened to less than a five-percentage point difference.

Confidence to lead SCRATC²H coding clubs was one of two successful adoption metrics in the endline evaluation. A logistic regression model was run on this variable to identify factors associated with successful project adoption. Due to the relatively high adoption of SCRATC²H coding clubs amongst the program sample, there were no factors that had significant associations with the successful adoption of SCRATC²H coding clubs with the exception of overall digital literacy at both the baseline and endline which had coefficients of .024 and .05 respectively, yielding odds ratios of 1.0512 and 1.0244 even when holding age, gender, and previous club involvement constant. Age, gender, and previous club involvement were not significantly correlated with successful adoption and, thus, should not be treated as predictor variables. Therefore, for each unit increase in digital competence score assessment at the baseline increased the odds of successful adoption of an expected 2.4%. Similarly, the odds of successful adoption increased by 5% for each unit increase of digital literacy at the endline. All other combined variables did not have associations with significance at the $p<.05$ level.

At the baseline, teachers had relatively low general self-efficacy to lead clubs. By the end of the intervention, teachers' self-efficacy had shifted significantly with over 75% of teachers completely or moderately confident competencies associated with leading school clubs.

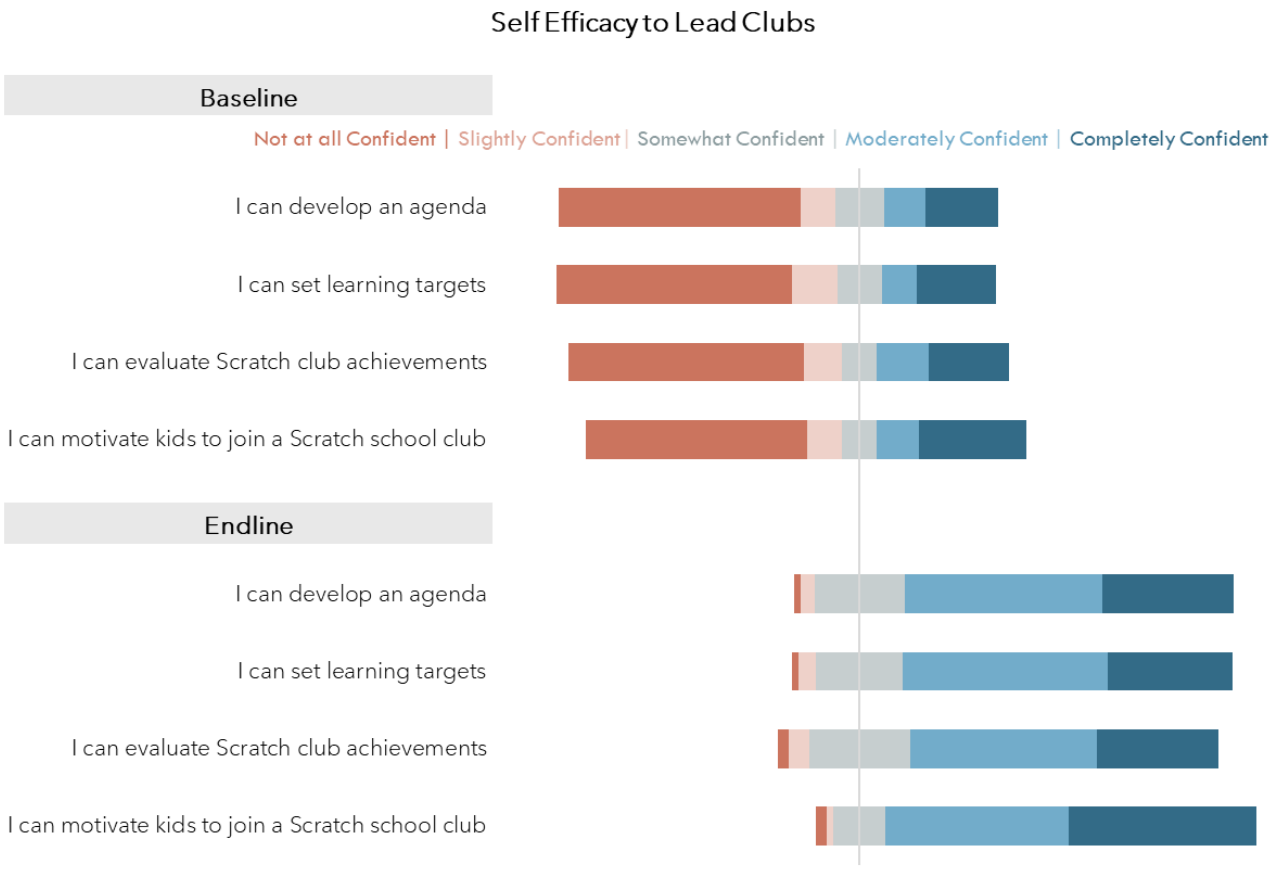


Figure 4: Self-Efficacy to Lead Scratch Clubs at Baseline and Endline

Teachers' perceptions of their school club practices also shifted when comparing baseline and endline survey responses. 57% of teachers strongly agreed they actively encourage girls to join STEM/ICT clubs whereas only 32% reported similar levels of agreement at the baseline survey. Similarly, teachers reported greater agreement that they give students active roles and agency over decisions in the clubs to give students a sense of pride and to motivate other students to join clubs.

Teachers' Competency to Integrate Scratch into STEM/ICT Lesson Plans

This section presents the results of one impact indicator, the percentage of teachers who report to feel competent to facilitate after school SCRATC²H coding clubs.[10] Percentage and number of trained teachers who report to feel competent to integrate Scratch into STEM/ICT lesson plans was assessed by asking teachers to what extent they agree with the following statement "I have the skills to incorporate Scratch into my lesson plans". Those that agreed or strongly agreed with the statement were included as those who felt competent to integrate Scratch.

Table 30: Indicator 4: Competency to Integrate Scratch into STEM/ ICT Lesson Plans

Indicator	Total	Female	Male
Percentage trained **teachers** who reported competency when integrating Scratch into STEM/ICT lesson plans.	66%	63%	67%

Overall, 66% of teachers reported that they can integrate Scratch into lesson plans, 63% of females and 67% of males. This represented a large, reported shift in mindset since the baseline where only 22% of teachers agreed they had the skills to incorporate Scratch into lesson plans (Figure 5).

[10] Throughout this section, findings are presented from surveys where baseline responses were matched to endline responses.

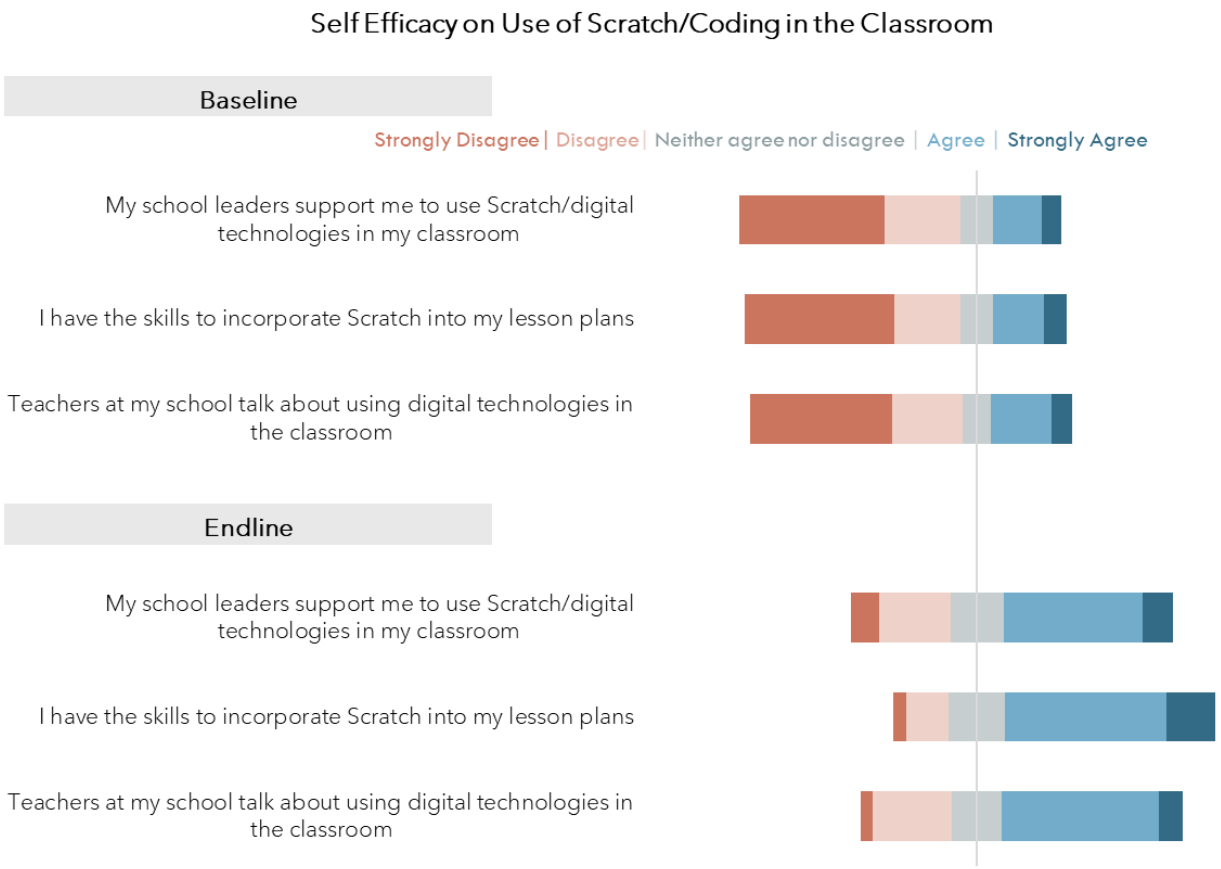


Figure 5: Self-Efficacy on Use of Scratch/Coding in the Classroom at Baseline and Endline

Teacher agreement with the statement "I incorporate digital technologies/Scratch into my lesson plans" was the second successful adoption metric in the endline evaluation. A logistic regression model identified self-perceived confidence when integrating Scratch into STEM/ICT lesson plans, enjoyment of coding when using Scratch, and level of career-related digital literacies were associated with successful adoption of Scratch into lesson plans. Each unit increase in the table below resulted in relatively higher odds of successful adoption.

Table 31: Coefficients from Logistic Regression Model on the Successful Adoption of Digital Technologies/Scratch into Lesson Plans

Factors for influencing successful adoption of digital technologies/Scratch into lesson plans	Coefficient	Odds Ratio
Competency when integrating Scratch into STEM/ICT lesson plans (Scale of 4)	1.0379	2.8233
Enjoyment of coding using Scratch (Scale of 4)	.7442	2.1047
Career-related digital literacy competencies at endline (Scale of 4)	.6181	1.8556

Other strong predictors of greater odds of success when run independently, but not combined with the model above, included perceived ability to resolve challenges when using Scratch with a co-efficient of .6965 and teachers' engagement with other teachers in-person, online, or through digital learning communities as a form of professional development (coefficient of .7885). One unit increase in perceived ability to resolve challenges in scratch on a 4-point scale increased the likelihood of successful adoption by 101% and reaching out to other teachers increased the odds of successful adoption by 120%. Problem-solving as a coding/ Scratch competency was also a statistically significant predictor with a coefficient of .21. Each unit increase in the composite score of problem-solving out of 16 total units as an applied coding/Scratch competency was associated with a 23% increase of odds of successful adoption.

Scratch use prior to the program and having pre-existing Scratch/digital literacy skills was not a statistically significant predictor of successful adoption. All other combined variables did not have associations with significance at the p<.05 level.

Teacher's Practices and Attitudes around Scratch/Coding

This section presents teacher's practices and attitudes around Scratch/Coding after the intervention, in comparison to their baseline responses, in order to present evidence as to how the shifts in teachers' digital literacy, scratch knowledge, and self-efficacy led to changes in practice and attitudes around Scratch/coding.[11]

In Most Significant Change interviews, 75% of interviewed teachers identified a positive significant change due to SCRATC²H in their past school year.[12]

Table 32: Impact Indicator 5: Percent of teachers who mentioned SCRATC²H as a most significant change

Indicator	Total	Rural	Urban
Percent of teachers who mentioned SCRATC²H as a most significant change in their past school year	75% (15/20)	79% (11/14)	67% (4/6)

During the Most Significant Change workshop, consistent themes of significant changes noted by teachers included the impact of Scratch on their digital literacy and teaching practice. Especially for the teachers without a background in ICT, learning Scratch was highly enjoyable and there were consistent trends of leveraging OERs. Teachers reported strong beliefs that using Scratch in their classrooms would spark student interest in ICT and leveraging Scratch in the classroom increased student focus.

> *"The most significant change that has happened to me in this school year is the Scratch project helped us to get training on the use of Scratch, which helped us also to teach it to students." - Teacher*

> *"I learnt a new programming language and also saw that [Scratch] could be used in teaching. When you are explaining a topic to students using animation, they will be much more interested than writing on the blackboard. In short,* ***I can say that [the training] created much awareness to me on how technology can be used in teaching.*** *Now that I am able to make short stories, If there is an important message I want to share with my students, I use animation." - Teacher*

Almost all teachers (98%) agreed or strongly agreed in their endline evaluation that they enjoyed coding using Scratch. This shift in attitude was strongly associated with other outcome variables, such as successful adoption of Scratch in lesson plans and endline Scratch knowledge.

Teachers demonstrated greater resourcefulness when it came to developing their own digital literacy or solving their own problems. The majority of teachers reported that they were moderately or completely confident in their ability to resolve any challenges they may face with Scratch (70%). Although online discussion forums were not a place where most teachers went for answers to their Scratch questions, some teachers noted a considerable increase in how they leveraged online discussion platforms. While less than 10% of teachers asked questions on discussion forums "always" or "very often" in baseline responses, at the endline, discussion forums were a frequently used resource for 15% of teachers. In qualitative responses, teachers also noted they remained engaged with peer teachers through WhatsApp and other forms of communication as well.

[11] Throughout this section, findings are presented from surveys where baseline responses were matched to endline responses.

[12] The sample of teachers was not a statistically significant sample. Almost all interviews were provided by male teachers and there was a higher representation of schools from rural areas.

"For us, we used to discuss with other trained teachers in the WhatsApp groups. Again, we had an online platform where we meet with our trainer and discuss with him every concern we have." – Teacher, Male,

Teachers' practices around Scratch/coding in the classroom shifted considerably from the baseline to endline responses. In their endline surveys, most teachers (over 80%) agreed or strongly agreed that they transferred concrete skills to students through their practices such as by teaching them how to give credit to the digital work of others and use safe behaviors when navigating the internet. Additionally, the majority of teachers (70% or more) reported leveraging digital technologies to foster student creativity, collaboration, or to engage their students. At the baseline survey, fewer than half of teachers demonstrated a similar level of agreement in relation to these Scratch practices in the classroom.

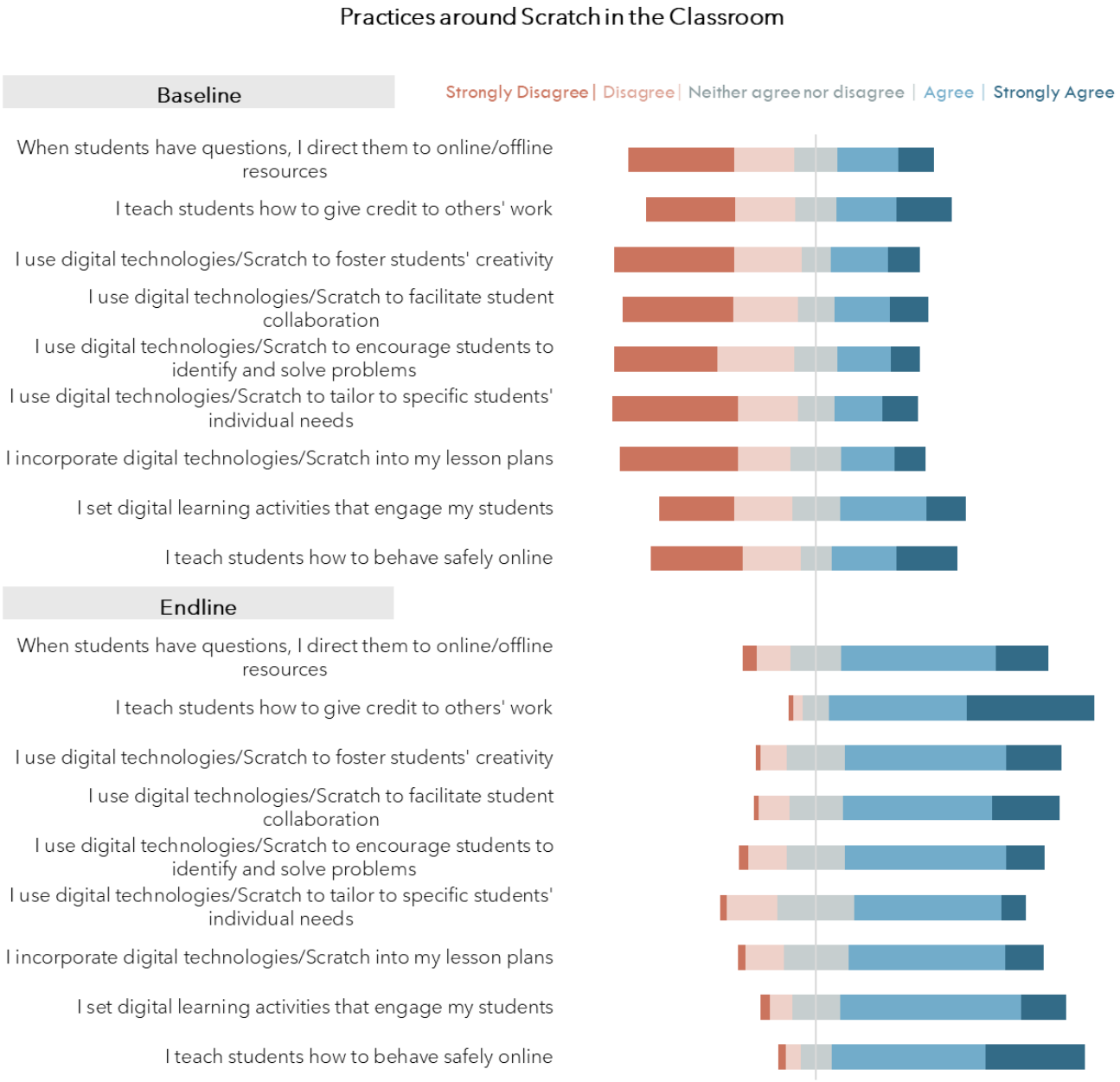


Figure 6: Distribution of Scratch/Coding Competencies at Baseline and Endline

Leaving the training with incomplete Scratch content knowledge was a challenge for teachers when transferring their knowledge to other students. There was the possibility of teachers only transferring what they felt the most comfortable teaching or had the greatest interest in, rather than all Scratch competencies, to students. Qualitative analysis suggested that teachers in school environments with little support for digital technology faced a greater barrier mobilizing their motivation to learn Scratch into concrete coding skills, although there was no concrete link between school environmental factors and overall Scratch programming scores.

> *"It is so challenging for teachers to deliver lessons they don't understand well. Teacher's when teaching SCRATC²H coding lessons, they focus on teaching students the parts they understood well. Teachers are not fully equipped with SCRATC²H coding lessons, and this is a huge challenge for them causing them to focus on topics they understood and loved when teaching students. They have at least basic knowledge about Scratch, but the time of their training was not enough. How can they even share what they have to students with low collaboration with school's administration, and lack of resources like computers? Working in those situations demotivates teachers." – Trainer*

Teachers also had considerable changes in attitudes as a result of their participation in the SCRATC²H 2050 project. 94% of teachers strongly agreed or agreed that both boys and girls could benefit from learning coding, whereas only 54% of teachers reported a similar level of agreement at the baseline. Similarly, while only half of teachers agreed or strongly agreed that coding/Scratch could help students learn problem-solving skills at the baseline, 91% of teachers reported agreement at the endline. Teachers were also far more likely to report that they agreed that learning coding/Scratch could help students better understand future career opportunities, whereas just over half of teachers reported agreement at the baseline (52%).

Learners' Increased Digital Literacy Skills, 21st Century Skills, and Connection to the Working World

This section presents evidence related to impacts on learners, such as the development of digital literacy skills, 21st century skills, and a connection to the working world.

At the end of each coding cycle, teachers conducted assessments of club members at both the start and completion of SCRATC²H clubs in order to measure percentage and number of vulnerable groups (learners) who achieved at least a minimum level of proficiency (50%) in digital literacy skills.[13] Results from the teacher-led assessments found that 63% of learners met the minimum competency before participation in clubs. After participating in the clubs, 98% met the minimal level of proficiency. While there were slightly more male students who demonstrated minimum competency prior to participation in the club (66% vs. 62%), there was no difference between male and female students who met the minimum proficiency after participation (98% for both genders). 86% of learners achieved high level of proficiency (70%) in digital literacy skills. A slightly higher percentage of male students achieved high level of proficiency when compared to female students (88% vs. 84%).

Table 33: Impact Indicator 1 - Minimum Level of Proficiency in Digital Literacy Skills in Vulnerable Groups

Indicator	Total	Female	Male
Percentage of vulnerable groups who have achieved at least a minimum level of proficiency in digital literacy skills as proposed in the Digital Literacy Global Framework (LEARNERS)	98%	98%	98%

[13] As noted in the methodology, a teacher-led digital literacy assessment was created based on UNESCO's digital literacy framework. To achieve 50% minimum proficiency, students were observed, on average, to be able to turn on a computer, open a blank word document and type their name, open an internet browser and search "Scratch coding help," open Scratch and code a sprite to say "Hello Teacher," and create a story in Scratch with some difficulty or complete some tasks easily and others with difficulty. High proficiency was set at 70% proficiency or being able to achieve at least two observed tasks easily.

Students who had lower levels of proficiency prior to participation in the club saw the greatest increase in skills as a result of their participation (Table 34).

Table 34: Change in Learners' Digital Literacy Score by Digital Literacy Level in Pre-Club Assessment

Digital Literacy Level in Pre-Club Assessment	Average Change in Score (out of 10 points)	% of Learners
Lowest proficiency (Score of less than 30%)	6.8	13%
Low proficiency (Score of 30% - 49%)	4.7	24%
Minimum level proficiency (Score of 50% - 69%)	2.9	32%
High level proficiency (Score of more than 70%)	.8	32%

In addition to increased digital literacy skills, qualitative analysis demonstrated that learners developed 21st Century Skills through the SCRATC²H 2050 project. For example, learners demonstrated improvement in self-confidence, problem-solving, and a greater ability to contextualize their learning. Additionally, teachers observed that students learned differently due to the program, demonstrating higher levels of motivation or engagement.

> *"Students are much more interested and have more benefits in Scratch participation. This helps them either in the course or in their daily lifelong learning because of the need for Scratch in many other courses. Like ICT and other sciences courses because this project is very much connected to ICT, and children like ICT the most therefore using Scratch in learning motivates them very much." Teacher, Male*

Teachers also saw shifts in students' long-term professional goals, which they attributed to their exposure to coding/Scratch. These observations were anecdotally substantiated through the RCA stakeholder interview who noted a higher level of interest and increased number of applicants from Kayonza to RCA since the SCRATC²H 2050 pilot project's inception.

In Most Significant Change interviews, 70% of interviewed learners perceived SCRATC²H as a most significant change during their school year unprompted. Slightly more male students noted a positive change due to SCRATC²H unprompted when compared to female students (71% vs. 68%).

Table 35: Percent of learners who identified SCRATC²H as a Most Significant Change in their past school year

Indicator	Total	Male	Female
Percent of learners who identified SCRATC²H as a most significant change in their past school year	70% (28/40)	71% (15/21)	68% (13/19)

During the Most Significant Change workshop, there were consistent themes noted in change stories for learners demonstrating strong interest in and enjoyment for learning Scratch. SCRATC²H clubs also permit them to interact with digital devices and most of them believe that now they more comfortable in using digital devices like computers. Some mentioned their interest in continuing their careers and studies in ICT. Learners highlighted non-ICT/STEM skills gained by participating in coding clubs, such as communication skills, public speaking, and confidence. The two stories selected demonstrated a clear link between the SCRATC²H pilot and the development of 21st century skills.

> *"Scratch has made me feel more interested in coding… it enabled me to gain new skills in using Scratch as an easy way to code without many processes. Moreover, through Scratch, I was able to attend an exposure visit which made me see all the things you can do with it…. The way that I view opportunities for my future has also changed as I have decided to never take any opportunity for granted or judge it, regardless of how simple it may look." - Learner, Female*

> *"I am more open-minded compared to before as now **I am even willing to innovate, think outside the box, explore, and learn**…Participation in Scratch club increased my curiosity to know more not only in*

the technology world, but also in academics, which led to positive results where my academic performance increased remarkably." - Learner, Female

Changes in School Environment

Qualitative analysis demonstrated how physical resources from VVOB changed their school environments by providing teachers and learners with greater access to laptops, internet access, and other needed technological supplies. These physical resources filled a critical gap in certain schools where access to computers was a strong limitation to the full implementation of the SCRATC²H project.

Changes in learners, teachers, and school leaders also influenced the school environment. Students' engagement and motivation led to higher attendance in computer labs, even in school breaks. Teachers were more likely to engage their peers on topics of digital literacy. For example, over half of teachers agreed or strongly agreed that teachers in their school talk about digital technology in the classroom as compared to less than a quarter at the baseline survey. Furthermore, 52% of teachers agreed their school leaders supported their use of Scratch/digital technologies in the classroom compared to 21% at the baseline.

Finally, teachers reported access to support at their school. At the baseline survey, 76% of teachers reported there was never someone at their school to talk to when they had a question about coding/Scratch. At the endline survey, 12% of teachers always or often had someone to talk to at their school when they had questions on coding, 16% sometimes had support, and 47% rarely had support. Only 26% of teachers reported there was never support. School leader support, as well as visits from external trainers and SEIs offered teachers on-the-ground support to advance their digital skills.

"The way the school leaders encourage students to use Scratch is that they encourage them to use ICT in general. So, as Scratch is part of ICT, this motivates students to participate in the SCRATC²H coding clubs." Teacher, Male

Section 4: Sustainability

The sustainability of SCRATC²H clubs was a strong trend in qualitative analysis across all stakeholder interviews. School leaders and other stakeholders especially linked the critical need of the clubs to their ability to last after the initial intervention.

"We have a goal that the students learn coding to the extent of 90%. So, I think we will continue SCRATC²H club as it will help us reach our goals. In addition, we need our students to improve in computer literacy even if they are not enough to serve many students, but we will continue to take a small group and teach them until we have a big number of students." – School Leader

Students were seen as a primary driver for the long-term sustainability of SCRATC²H clubs. In many schools, students took on the role of mentors and auxiliary trainers which helped expand clubs and contribute to their longevity. Students were able to maintain high levels of excitement, even in less-than-ideal conditions, which teachers and other stakeholders felt would promote clubs even after the initial intervention. Consistent trends in qualitative analysis noted that external engagement and incentives would also help the long-term sustainability of clubs. While pre-existing incentives, like participation in SCRATC²H day events and visits from school leaders, were noted as a good start for club sustainability, some stakeholders referenced additional incentives could also contribute to continued engagement. Continued support through physical resources (i.e., laptops), financial support like scholarships, and certificates were all suggested resources to drive sustainability.

"For me, I think to start was very difficult. But, for now, I think things are easy. This is because we have trained students who will help us to facilitate other clubs, and this will keep clubs to be continuous. Something that will motivate teachers is that REB can put effort in this project by providing Certificates to teachers. For students, the Rwanda Coding Academy can put effort in terms of providing scholarship to the most performers in the SCRATC²H coding clubs. This can play a big role in getting a big number of students to enroll in the SCRATC²H coding clubs." Teacher

Teachers also noted that school environment played a role in club sustainability. Even during the clubs, schools with fewer resources had a harder time promoting sustained club engagement amongst learners. For example, schools with limited numbers of computers intentionally did not allow repeat learners from Cycle 1 to Cycle 2, leaving students with limited opportunities to continue developing their Scratch skills. Similarly, without SCRATC²H coding clubs built into the timetable or without providing teachers with more time to prepare for clubs, teachers felt limited in their abilities to sustain clubs.

"The motivation of teachers to continue to facilitate the clubs without project funding is that Scratch is a normal course that we need to teach our students. The only thing we need is to get enough time, and more training on Scratch and do the remaining activities." - Teacher

"It is difficult to continue the SCRATC²H coding clubs. We will keep the SCRATC²H coding clubs when there are some projects to work on or there are competitions to attend. But if there are not these activities, it can be hard to continue these clubs because there are adding extra load to our tasks. Frankly speaking, there are no motivation for teachers. Something that can help us is that these clubs can be added to the working hours (timetable) so that they cannot be extra tasks to teachers. Again, if this extra time can be paid for teachers, this can motivate teachers to continue supporting these clubs." - Teacher

Teacher attrition was also noted as a potential barrier to club sustainability. This theory was supported during the SCRATC²H project. There were examples of schools that were unable to maintain clubs after teachers relocated. Without a high rate of teachers with coding/Scratch knowledge across the district and country, one teacher relocating could leave a school without someone with sufficient competencies to lead a SCRATC²H club.

Barriers to club sustainability were echoed when teachers, school leaders, and other stakeholders considered the sustained integration of STEM/ICT into the classroom and curriculum. Access to basic technological resources like computers and resources was seen as a primary barrier to sustainable integration of Scratch into the classroom. Similarly, without Scratch integrated into STEM subjects across the board, teachers felt limited in their ability leverage resources like the pedagogical guide when teaching.

"Not all teachers are integrating Scratch coding in their lessons due to limited technological equipment, limited time and also there is an already an existing curriculum (way to teach) that teachers have to follow when teaching their lessons. Meaning that changing the way the lessons are normally conducted according to the curriculum is not easy and also hinders the integration of Scratch in teaching. If Scratch is not integrated in the curriculum – it will always be challenging for teachers to use Scratch in their lessons." – Trainer

Student engagement, school leader support, support from REB, and educational initiatives across Rwanda helped mitigate these challenges, leaving interviewees hopeful for the long-term sustainability of school clubs and integration of Scratch into classrooms.

"Students were very interested in Scratch. During school visits, we could see that even students not part of Scratch clubs were very interested in ICT and coding. With students' fresh minds, curiosity, and innovations they are even more creative than their teachers! Students are promising– you could see they took time to prepare their projects with concentration and passion as their projects were amazing. The interest is the same for both genders; and overall females are performing much better. "– Trainer

Conclusions and Recommendations

Conclusions

The endline evaluation provides clear evidence that the SCRATC²H 2050 pilot achieved expected results, outcomes, and impacts, as per the logical framework (Table 1), while maintaining relevance, coherence, effectiveness, efficiency, and sustainability. Additionally, the endline evaluation explored learning outcomes related to the extent to which participation in the SCRATC²H training and coding clubs influenced how teachers teach STEM/ICT in the classroom, Scratch coding can be adapted for students with disabilities, and if teachers continued to access learning opportunities and resources beyond the initial intervention. Finally, the endline evaluation assessed the potential for project scalability in order to determine actionable recommendations to be included at the end of this report.

The SCRATC²H 2050 project demonstrated high relevance and coherence with REB strategic objective, the NST-1, ESSP, and other educational initiatives across Rwanda. Exposing learners to coding at a young age was perceived as crucial for encouraging a longer-term STEM career trajectory for students. Qualitative findings across the endline evaluation demonstrated the project's relevance to National Strategic Objectives, NST-1, and the Rwanda's Education Sector Strategic Plan 2018/19-2023/24 (ESSP), ultimately meeting the needs of both learners, by exposing them to a coding/digital learning in a fun and engaging environment, and teachers, by providing them with basic digital literacy skills.

The SCRATC²H 2050 was effective, as evidence by the achievement of all expected results as per the logical framework (Table 1).

- The SCRATC²H 2050 pedagogical guide, which was endorsed by REB, and open education resources were widely used, resulting in over 6,200 views of OERs, and valued by teachers when implementing SCRATC²H coding clubs.
- The attendance rate for the SCRATC²H Learning Trajectory was over 90% for Face-to-Face sessions and nearly 80% for Online Sessions. The CPD trajectory was valued by teachers as evidenced by an average attendance rate of 88% across all three ScratchEd Meetups and trends that demonstrated the importance of school visits, SCRATC²H events, and the utilization of collaborative support spaces (i.e., ScratchEd online platform).
- Over 3,700 learners participated in over 270 SCRATC²H coding clubs, with equal participation amongst male and female learners, resulting in an estimated combined total of 26,000 Scratch stories, games, and animations.

The initial training was noted as effective for providing teachers with exposure to Scratch and very basic digital literacy skills. Face-to-face sessions and school visits provided a greater opportunity for discussion-based learning and the ability to ask questions as they arose. Resources associated with the SCRATC²H 2050 project were also generally effective for providing teachers with the ability to further develop their skills.

The training effectively provided teachers with digital literacy skills with 91% of teachers having met the minimum level of proficiency for digital literacy and 71% achieving high proficiency. There was demonstrated room for improvement in developing Scratch computational concepts and practices with 23% of teachers meeting the minimum level in content creation or coding with Scratch. 91% of Teachers met minimum level of proficiency in digital literacy skills after the intervention and most teachers (70%) achieved high level of proficiency.

However, qualitative evidence suggests that teachers develop their abilities in a few core concepts and are challenged when they reach the limitations of their basic skills, explaining the relatively low scores in Scratch computational concepts and practices. Meet-ups, the online ScratchEd learning platform, and visits from SEIs and trainers help mitigate these issues by providing teachers with direct support. Generally, teachers perceived greater levels of support and engagement at their schools since their baseline assessments.

The SCRATC²H 2050 was efficient, as evidenced by qualitative results demonstrating effective communication, thoughtful engagement of stakeholders, and timely project administration. Across various stakeholders, communication and coordination was noted to be clear, professional, and efficient.

The endline evaluation identified a clear impact of the SCRATC²H pilot on teachers, learners, and the wider school environment. Evidence found that after participating in the SCRATC²H pilot:

- 91% of respondents to the endline survey met the minimum level of proficiency across digital literacy skills and 11% reached high proficiency in content creation (coding). According to the baseline report, prior to participation in the pilot, only 72% of teachers had a similar level of proficiency in digital literacy skills and fewer than 1% of teachers for content creation (coding).
- 98% learners met minimum level proficiency in digital literacy skills in teacher-led post-club assessments as compared to 63% in pre-cub assessments.
- 74% of respondents reported confidence to facilitate SCRATC²H coding clubs as compared to 28% of the same respondents in their baseline surveys.
- Two-thirds of teachers reported confidence to integrate Scratch into STEM/ICT lesson plans as compared to 23% of the same respondents in their baseline surveys.

While the relative number female teachers in STEM/ICT in Rwanda remains low, the project demonstrated a high ability to overcome pre-existing differential self-efficacy and content knowledge. The SCRATC²H 2050 project observed similar outcomes in relation to female learners. While female learners sometimes had greater barriers for initial engagement, with exposure to coding/Scratch through the SCRATC²H 2050 project, female learners were perceived to be as interested and engaged as their male peers. For example, for both teachers and students, the gap in digital literacy scores narrowed considerably when looking at digital literacy assessments. In endline assessments, there was a less than 2 percentage point difference between male and female teachers that met minimum level of digital proficiency and no difference between male and female learners who met minimum level proficiency. When exploring how Scratch learning could be adapted for students with disabilities, the only learning outcome identified was that greater engagement is needed for learners with disabilities.

The SCRATC²H 2050 project had a strong influence on teachers' self-efficacy to lead clubs and integrate coding/Scratch into their teaching practices. Scratch content knowledge did not directly predict successful adoption of project core principles. Instead, teacher's enjoyment of Scratch, problem-solving capabilities, and confidence when troubleshooting was most strongly associated with expected outcomes and successful adoption.

Both teachers and learners reported significant changes in themselves, their peers, and their schools as a result of the SCRATC²H pilot project. Teachers described improvement in their basic computer skills, more motivation to use Scratch in the classroom, and perceived support amongst fellow teacher, school leaders, and other stakeholders. Teachers linked these outcomes to a greater ability to engage learners in STEM/ICT and learning overall.

Learners reported that participating in SCRATC²H clubs gave them a fun way to learn coding with a team of peers, increased their problem-solving skills, and opened their eyes to more possibilities for professional advancement in STEM/ICT fields.

Evidence suggests that teacher and learner motivation, school leader support, and general district support will drive the sustainability of Scratch coding clubs and other outcomes from the SCRATC²H 2050 project. At the baseline survey, school-based environmental factors were a noted challenge for the project in achieving its key objectives. Endline survey results demonstrated that school environment influenced endline Scratch content knowledge, but not overall digital literacy and teacher self-efficacy. Additionally, school-based environmental factors were not significantly associated with successful adoption of project outcomes. Qualitative findings suggest the potential differential impact due to school-environmental impact was mitigated through VVOB's logistical and financial support such as offering laptops to schools in need. Additional support, such as offering more teacher training with a continuous professional development model, and engagement with other Scratch initiatives, like the hackathon and exposure events, would also be helpful for sustaining project outcomes and impacts.

Recommendations

Teacher Selection

- **Continue to select multiple teachers from the same school.** Teachers noted the support of their peers at their schools helped them continue their learning and shifted their school environment, enabling them to be able to ask each other questions.
- **Target teachers who enjoy digital learning with relatively lower levels of digital literacy.** Teachers with lower levels of digital literacy scores had relatively higher increases through the SCRATC²H 2050 project. Previous Scratch knowledge, practices leading clubs, and self-efficacy prior to the program was not a key influence on successful adoption of clubs, Scratch into the lessons plans, or general digital literacy after the program. Enjoyment of digital learning, however, was associated with higher outcomes and should be part of the selection process if possible.

Training and Support

- **Focus in-person opportunities on problem solving and continue to provide collaborative and independent learning resources for additional advanced Scratch learning.** The initial training was reported to be effective for transferring minimum digital proficiency and basic Scratch knowledge, but teachers were far from advanced Scratch users. Since the program model focused on learner exposure to basic concepts, however, the relatively low levels of Scratch content creation amongst teachers did not result in a barrier to success. For that reason, continuing to focus in-person opportunities on problem solving, answering teacher questions, and perhaps allowing for practice facilitation will continue to expose teachers to the value of Scratch and provide them with self-efficacy to change their practice. Both collaborative CPD resources (i.e., ScratchEd community platform) and independent learning resources could help teachers further their skills beyond the basic level needed to facilitate Scratch coding clubs and integrate coding into the classroom.
- **Keep the blended learning trajectory with an increased focus on the CPD model of school visits, exposure visits, and other events or interventions after the initial training**. Events, like Scratch Day, school visits by SEIs, and support after the initial training was influential for keeping teachers motivated in promoting project outcomes. School visits gave teachers the opportunity to ask questions, but also demonstrated the importance of coding and SCRATC²H clubs and practice for learners and school leaders. While the project may be limited by the ability of schools to integrate clubs into the school timetable or pedagogical resources into pre-defined national curriculum, continued support helps integrate the project into the overall school environment to provide greater relevance for teachers after the initial training.
- **Continue to offer additional resources like computers to schools with limited physical school enabling environment.** It is challenging to isolate the impact of VVOB offering computers and resources on the successful implementation of the project. That school enabling environment had little to no influence on successful adoption, however, suggests pairing teacher training with the necessary resources to practice skills is a critical part of project success.

Club Administration

- **Continue to select proportionally more female students for school clubs.** Exposure to Scratch and coding is important for female learners who may face greater barriers for entry but clear progress after engaged with SCRATC²H clubs. Intentionally selecting more female learners helps the project reach more female students.
- **Intentionally select learners with disabilities for participation in coding clubs whenever possible.** There was no clear evidence that the SCRATC²H pilot reached learners with disabilities. Asking teachers to prioritize learners with disabilities in a similar manner as female learners would enable a larger proportion of learners with disabilities to be reached.
- **Provide self-study resources for learners.** Since many teachers leave the SCRATC²H training without advanced coding concepts, it is challenging for them to heighten student coding skills beyond their own abilities. For that reason, developing OERs specifically for learners to self-study would help learners build capacity even without direct teacher support. It is recommended that these resources be available in a variety of formats outside of only video to enable utilization in schools without computers or electricity.

Sustainable Adoption of Outcomes and Impacts

- **Consistently integrate applied coding/Scratch concepts into all STEM subjects.** Disseminate findings and lessons learned with key education stakeholders for consideration and inclusion of applied coding/Scratch concepts in the national curriculum for non-ICT TEM subjects.
- **Expand the program to more districts outside of Kayonza.** Since teacher attrition is a primary challenge to project sustainability, having a greater pool of trained teachers across Rwanda would help ensure a baseline level of staff with coding/Scratch confidence across a wider range of schools. Once Scratch projects are introduced, motivation from learners and support from school leaders is expected to drive project sustainability as long as there is some staff who can lead coding clubs, drive the integration of coding/STEM into classrooms, and promote engagement with wider events like hackathons.

Evaluation Recommendations

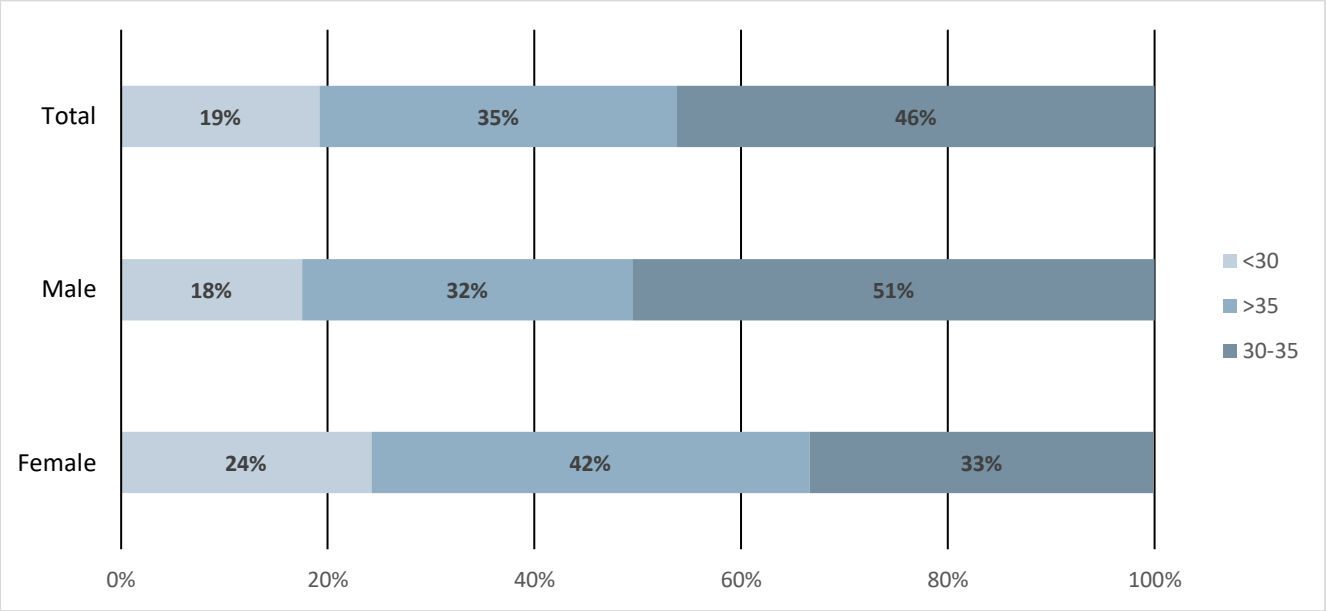
- **Ensure that all trained teachers successfully adopt pre-post assessment templates.** The evaluation was limited by the ability to compare cycle 1 and cycle 2 learner outcomes because of the incomplete adoption and sharing of pre-post assessments.
- **When selecting teachers for interviews, ensure representation of female teachers.** The differential impact of the program on female teachers could not reasonably be explored because few female teachers participated in qualitative interviews.
- **Consider adjusting the assessment of minimum level proficiency in content creation (coding).** The evaluation metric of content creation (coding) was an outlier when compared to relatively high levels of digital literacy and self-efficacy for content creation and problem-solving in Scratch. For that reason, the metric should be further explored and validated.

Annex 1. Demographic and School Data (KAP Survey)[14]

Gender and Age

Table: Gender and Age

Age range	Female		Male		Total	
<30	8	24.2%	17	17.5%	25	19.2%
>35	14	42.4%	31	32.0%	45	34.6%
30-35	11	33.3%	49	50.5%	60	46.2%



Education

Level of education - gender

Level of Education	Female		Male		Total	
A2 in Education	0	0.0%	1	1.0%	1	0.8%
Any other specify	1	3.0%	4	4.1%	5	3.8%
Bachelor's degree	16	48.5%	62	63.9%	78	60.0%
Diploma in Education	9	27.3%	23	23.7%	32	24.6%
Master's degree	2	6.1%	1	1.0%	3	2.3%
Post-Graduate Diploma in Education	5	15.2%	6	6.2%	11	8.5%

School

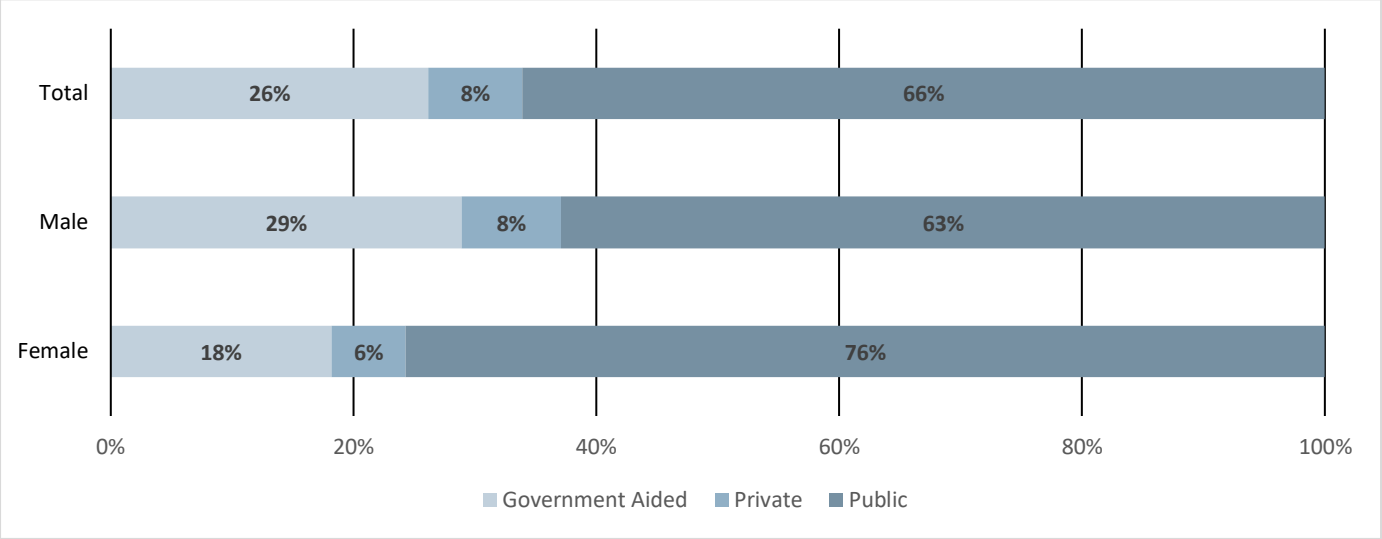
School status and designation

School status	12YBE		9YBE		Secondary only		Total	
Government Aided	21	33.9%	9	20.9%	4	16.0%	34	26.2%
Private	1	1.6%	2	4.7%	7	28%	10	7.7%
Public	40	64.5%	32	74.4%	14	56%	86	66.2%

[14] Data in this section presents matched survey responses (N=130).

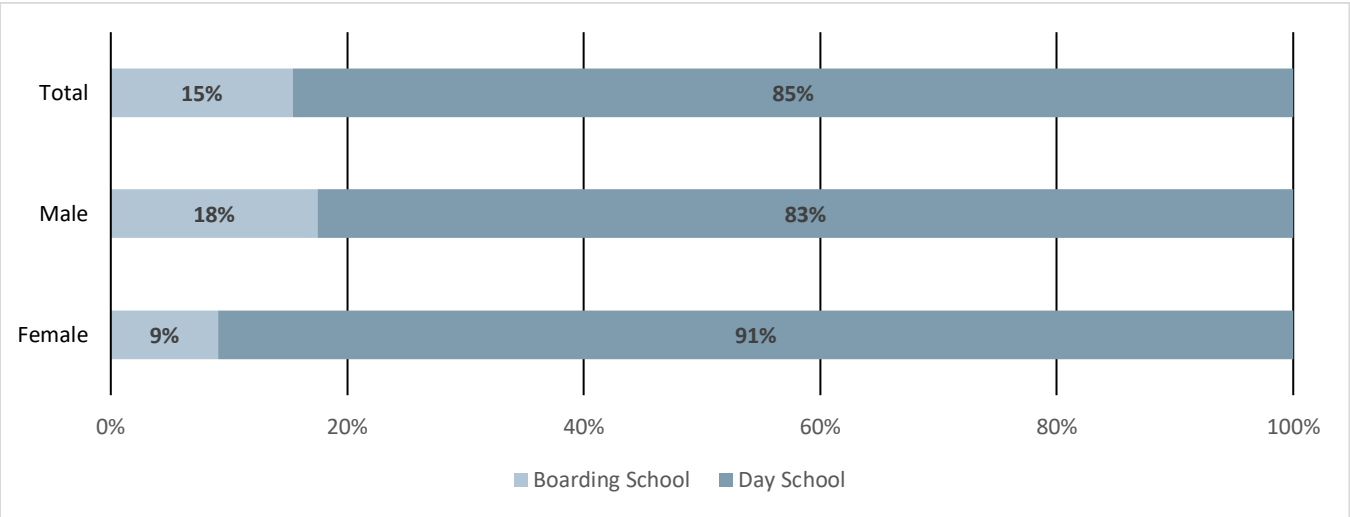
School status and gender

School Status	Female		Male		Total	
Government Aided	6	18.2%	28	28.9%	34	26.2%
Private	2	6.1%	8	8.2%	10	7.7%
Public	25	75.8%	61	62.9%	86	66.2%

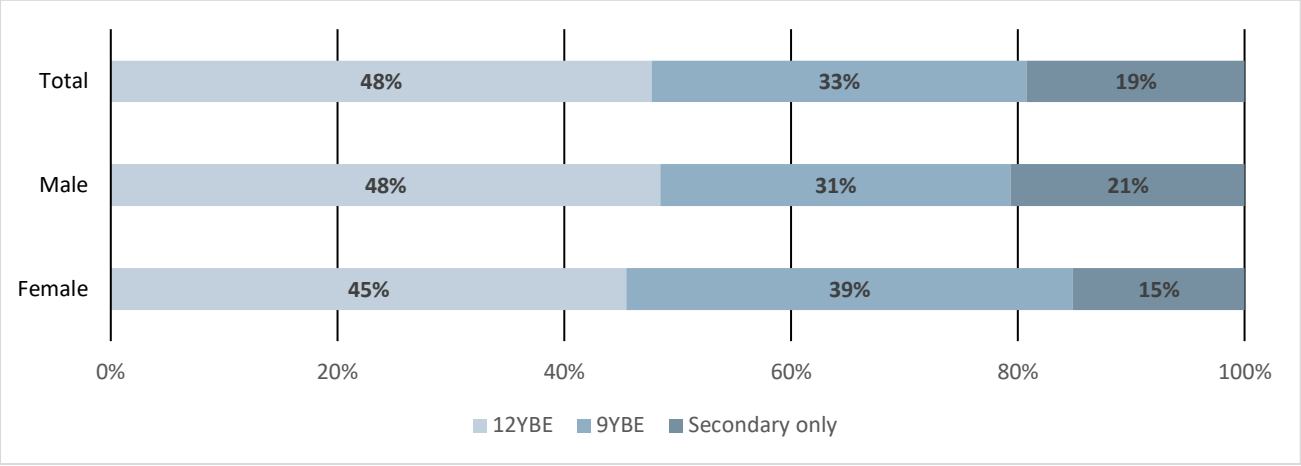


School type and Gender

School Type	Female		Male		Total	
Boarding School	3	9.1%	17	17.5%	20	15.4%
Day School	30	90.9%	80	82.5%	110	84.6%



School Designation	Female		Male		Total	
12YBE	15	45.5%	47	48.5%	62	47.7%
9YBE	13	39.4%	30	30.9%	43	33.1%
Secondary only	5	15.2%	20	20.6%	25	19.2%



Teaching experience

Teaching subject by gender

Year of teaching at school	Female		Male		Total	
ICT	14	42.4%	35	36.1%	49	37.7%
STEM	19	57.6%	62	63.9%	81	62.3%

Years of teaching at school – Gender

Year of teaching at school	Female		Male		Total	
< 2 years	7	21.2%	10	10.3%	17	13.1%
2 or 3	14	42.4%	40	41.2%	54	41.5%
4 or 5	4	12.1%	6	6.2%	10	7.7%
6 to 9	3	9.1%	21	21.6%	24	18.5%
10 or more	5	15.2%	20	20.6%	25	19.2%

Years of teaching at school – School type

Year of teaching at school	Government Aided		Private		Public		Total	
< 2 years	3	9%	1	9%	15	17%	19	14%
10 or more	10	29%	2	18%	16	18%	28	21%
2 or 3	13	38%	5	45%	36	40%	54	40%
4 or 5	1	3%	2	18%	7	8%	10	7%
6 to 9	7	21%	1	9%	16	18%	24	18%

Year of teaching cumulative – Gender

Years of teaching (Total)	Female		Male		Total	
< 2 years	5	15.2%	2	2.1%	7	5.4%
2 or 3	7	21.2%	24	24.7%	31	23.8%

4 or 5	2	6.1%	7	7.2%	9	6.9%
6 to 9	6	18.2%	29	29.9%	35	26.9%
10 or more	13	39.4%	35	36.1%	48	36.9%

Year of total teaching experience by school status

Years of teaching (Total)	Government Aided		Private		Public		Total	
< 2 years	0	0.0%	0	0.0%	7	8.1%	7	5.4%
2 or 3	6	17.6%	4	40.0%	21	24.4%	31	23.8%
4 or 5	1	2.9%	1	10.0%	7	8.1%	9	6.9%
6 to 9	13	38.2%	1	10.0%	21	24.4%	35	26.9%
10 or more	14	41.2%	4	40.0%	30	34.9%	48	36.9%

Participation in UR-CE/VVOB CPD program

CPD program	Female		Male		Total	
Blended course	14	42.4%	23	23.7%	37	28.5%
In-person course	6	18.2%	18	18.6%	24	18.5%
Online course	0	0.0%	3	3.1%	3	2.3%
No	12	36.4%	41	42.3%	53	40.8%
Don't know	1	3.0%	12	12.4%	13	10.0%

CPD program	Government Aided		Private		Public		Total	
Blended course	7	20.6%	5	50.0%	25	29.1%	37	28.5%
In-person course	8	23.5%	1	10.0%	15	17.4%	24	18.5%
Online course	0	0.0%	0	0.0%	3	3.5%	3	2.3%
No	13	38.2%	3	30.0%	37	43.0%	53	40.8%
Don't know	6	17.6%	1	10.0%	6	7.0%	13	10.0%

School Enabling Environment

Physical Environment

School Physics environment for digital literacy

	Always	Very Often	Sometimes	Rarely	Never
Electricity	24%	1%	47%	10%	19%
Digital device for teacher use	11%	1%	26%	16%	46%
Internet	18%	1%	22%	19%	40%
Technical support	35%	2%	11%	17%	35%
Computer for student to use	19%	4%	28%	19%	30%
Need of speacial support	39%	4%	6%	23%	28%

Number of classrooms

Number of classrooms	Total
1	25%
2	26%
3	4%

No/Don't know	44%

Number of classrooms and school status

Number of classrooms	Government Aided	Private	Public	Total
1	29%	55%	20%	25%
2	24%	27%	27%	26%
3	0%	0%	7%	4%
No/Don't know	47%	18%	47%	44%

Number of computers

Number of Computer	Total
0	1%
<10	48%
10-99	24%
100+	27%

CPD for digital technology

	Female	Male	Total
Face-to-face courses, seminars or conferences outside of school	47%	53%	51%
Online courses, webinars or online conferences	28%	38%	36%
Learning from other teachers within the school through online or offline collaboration	50%	33%	38%
Learning from other teachers through online teachers' networks or communities of practic	14%	17%	16%
School-based mentoring or coaching, as a part of a formal school arrangement	36%	27%	30%
Other in-house training sessions organized by the school	28%	33%	32%
Study visits (to other schools, businesses or organizations)	6%	6%	6%
Accredited programs (short accredited courses, degree programs)	14%	6%	8%
Other	6%	2%	3%

Enabling Environment for School Clubs

Frequency of School Clubs

Frequency of classroom	Baseline	Endline
More than 1 time per week	18.3%	33.3%
Weekly	35.9%	50.0%
Every 2 weeks	1.5%	4.8%
Monthly	3.1%	2.4%
Other	6.1%	9.5%
No school clubs	35.1%	*N/A*

Duration of School Clubs

Frequency of classroom	Baseline	Endline
Less than 1 hour	20.6%	31.0%
1 hour	26.0%	40.5%
1-2 hours	16.0%	25.0%
More than 2 hours	2.3%	3.6
There are no school clubs	35.1%	*N/A*

Annex 2. Teacher Knowledge, Skills, and Attitudes (KAP Survey

Digital Literacy, Coding, and Scratch Knowledge

Composite scores	Total		Male		Female		ICT		STEM	
	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
Digital Literacy (100-pt scale)	66	78	68	79	61	77	75	80	61	77
Digital Literacy (4-pt scale)	2.6	3.1	2.7	3.2	2.4	3.1	3.0	3.2	2.5	3.1
Competency 0.1: Device Operations	3.7	3.9	3.7	3.9	3.7	3.8	2.9	3.9	3.7	3.9
Competency 0.2: Software Operations	2.8	3.5	2.9	3.5	2.5	3.5	3.2	3.5	2.6	3.5
Competency 1: Info & Data Literacy	2.6	3.1	2.7	3.1	2.3	3.1	2.9	3.2	2.4	3.0
Competency 2: Comm. and Collab.	2.5	3.2	2.6	3.2	2.1	3.1	2.8	3.3	2.3	3.1
Competency 4: Safety	2.1	2.6	2.2	2.6	1.8	2.5	2.6	2.7	1.8	2.5
Competency 6: Career-related	2.5	2.9	2.5	2.9	2.5	2.8	2.8	2.9	2.4	2.9
Coding/Scratch Self-Efficacy (4-pt scale)	0.4	2.4	0.4	2.4	0.4	2.4	0.7	2.5	0.3	2.3
Competency 3: Content Creation	0.5	2.6	0.5	2.6	0.5	2.7	0.8	2.7	0.3	2.5
Competency 5: Problem Solving	0.3	2.1	0.3	2.2	0.4	2.1	0.5	2.3	0.2	2.1
Scratch Know. Assess. (34-pt scale)	4	13	4	13	3	13	5	14	3	12

Composite scores	Government aided		Public		Private	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
Digital Literacy (100-pt scale)	64	77	76	88	66	78
Digital Literacy (4-pt scale)	2.5	3.1	3.0	3.5	2.6	3.1
Competency 0.1: Device Operations	3.8	4.0	3.8	3.9	3.7	3.8
Competency 0.2: Software Operations	2.7	3.4	3.1	3.8	2.8	3.5
Competency 1: Info & Data Literacy	2.5	2.9	2.8	3.5	2.6	3.1
Competency 2: Comm. and Collab.	2.3	3.2	2.9	3.5	2.5	3.2
Competency 4: Safety	2.0	2.5	2.9	3.2	2.0	2.5
Competency 6: Career-related	2.4	2.9	2.8	3.3	2.5	2.9
Coding/Scratch Self-Efficacy (4-pt scale)	0.3	2.5	0.5	2.3	0.2	2.6
Competency 3: Content Creation	0.4	2.7	0.6	2.5	0.2	2.8
Competency 5: Problem Solving	0.2	2.2	0.4	2.1	0.1	2.4
Scratch Know. Assess. (34-pt scale)	3	14	3	12	10	15

Composite scores	Younger than 30		30 – 35		Older than 35	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
Digital Literacy (100-pt scale)	82	88	63	75	62	78

Digital Literacy (4-pt scale)	3.3	3.5	2.5	3.0	2.5	3.1
Competency 0.1: Device Operations	3.9	3.9	3.7	3.9	3.7	3.8
Competency 0.2: Software Operations	3.3	3.8	2.7	3.4	2.6	3.5
Competency 1: Info & Data Literacy	3.2	3.6	2.3	2.9	2.5	3.1
Competency 2: Comm. and Collab.	3.1	3.7	2.2	3.0	2.4	3.2
Competency 4: Safety	3.1	3.1	1.9	2.4	1.8	2.5
Competency 6: Career-related	3.3	3.1	2.3	2.9	2.4	2.9
Coding/Scratch Self-Efficacy (4-pt scale)	0.6	2.6	0.5	2.3	0.2	2.4
Competency 3: Content Creation	0.7	2.8	0.5	2.5	0.3	2.6
Competency 5: Problem Solving	0.5	2.3	0.4	2.0	0.2	2.2
Scratch Know. Assess. (34-pt scale)	4	14	3	12	4	13

Self-efficacy to lead clubs

% Moderately or completely confident	Total		Male		Female		ICT		STEM	
	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
I can lead a SCRATC²H coding club at my school	28%	74%	31%	75%	19%	72%	40%	76%	24%	72%
I can develop an agenda	27%	74%	29%	73%	21%	76%	38%	76%	21%	73%
I can set learning targets	31%	74%	30%	75%	18%	70%	38%	71%	21%	75%
I can evaluate SCRATC²H club achievements	31%	69%	34%	69%	21%	70%	42%	73%	24%	67%
I can motivate kids to join a SCRATC²H club	34%	83%	36%	85%	30%	79%	44%	82%	29%	84%

% Moderately or completely confident	Government aided		Public		Private	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
I can lead a SCRATC²H coding club at my school	28%	76%	32%	71%	21%	80%
I can develop an agenda	22%	74%	32%	74%	14%	70%
I can set learning targets	22%	76%	31%	73%	21%	70%
I can evaluate SCRATC²H club achievements	26%	68%	34%	70%	29%	70%
I can motivate kids to join a SCRATC²H club	35%	82%	37%	84%	21%	80%

% Moderately or completely confident	Younger than 30		30 – 35		Older than 35	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
I can lead a SCRATC²H coding club at my school	35%	80%	33%	65%	22%	80%
I can develop an agenda	31%	80%	32%	68%	18%	78%
I can set learning targets	35%	76%	30%	67%	18%	82%
I can evaluate SCRATC²H club achievements	35%	76%	37%	62%	20%	76%
I can motivate kids to join a SCRATC²H club	46%	84%	38%	82%	22%	84%

Attitudes and Practices around leading clubs and Scratch Use in the Classroom

% Agree or strongly agree	Total		Male		Female		ICT		STEM	
	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
I incorporate digital technologies/Scratch into my lesson plans	27%	64%	31%	66%	18%	58%	29%	65%	27%	63%
My school leaders support me to use Scratch/digital technologies in my classroom	21%	52%	22%	55%	15%	45%	22%	56%	20%	50%
I have the skills to incorporate Scratch into my lesson plans	22%	65%	23%	66%	18%	64%	27%	69%	20%	63%
Teachers at my school talk about using digital technologies in the classroom	24%	56%	28%	56%	15%	58%	24%	54%	24%	57%
Both boys and girls can benefit from learning how to code	54%	94%	54%	92%	55%	100%	69%	94%	47%	94%
Coding/Scratch can help students learn problem solving skills	51%	91%	51%	91%	52%	91%	62%	92%	45%	90%
Learning coding/Scratch and participation in Scratch clubs can help students better understand future career options	52%	88%	52%	87%	52%	94%	62%	92%	24%	87%
I set digital learning activities that engage my students	40%	75%	44%	74%	30%	76%	44%	79%	27%	72%
I use digital technologies/Scratch to tailor my teaching to students' individual needs	27%	56%	31%	59%	15%	48%	31%	58%	24%	55%
I use digital technologies/Scratch to encourage my students to identify and solve problems	26%	65%	30%	68%	15%	58%	29%	71%	24%	62%
I use digital technologies/Scratch to facilitate student collaboration	30%	71%	35%	71%	15%	70%	36%	73%	27%	70%

I use digital technologies/ Scratch to foster students' creativity	28%	71%	33%	73%	15%	64%	36%	69%	24%	72%
I teach my students how to behave safely online	40%	83%	42%	84%	36%	82%	47%	82%	37%	85%
I teach my students how to give credit to others' work	37%	87%	41%	87%	24%	88%	42%	88%	34%	85%
When my students have questions about digital technologies/Scratch , I direct them to online/offline resources to find their answers	31%	68%	33%	66%	24%	73%	36%	71%	28%	63%

% Agree or strongly agree	Government aided		Public		Private	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
I incorporate digital technologies/Scratch into my lesson plans	22%	74%	32%	59%	21%	70%
My school leaders support me to use Scratch/digital technologies in my classroom	17%	41%	24%	56%	14%	60%
I have the skills to incorporate Scratch into my lesson plans	22%	71%	23%	62%	21%	80%
Teachers at my school talk about using digital technologies in the classroom	22%	44%	27%	62%	21%	50%
Both boys and girls can benefit from learning how to code	48%	94%	59%	93%	50%	100%
Coding/Scratch can help students learn problem solving skills	50%	91%	52%	91%	50%	90%
Learning coding/Scratch and participation in Scratch clubs can help students better understand future career options	50%	88%	54%	88%	50%	90%
I set digital learning activities that engage my students	37%	74%	42%	74%	43%	80%
I use digital technologies/Scratch to tailor my teaching to students' individual needs	22%	59%	31%	53%	21%	70%
I use digital technologies/Scratch to encourage my students to identify and solve problems	22%	74%	30%	60%	21%	80%
I use digital technologies/Scratch to facilitate student collaboration	30%	68%	31%	69%	21%	100%
I use digital technologies/ Scratch to foster students' creativity	24%	74%	32%	67%	21%	90%
I teach my students how to behave safely online	41%	82%	39%	81%	43%	100%
I teach my students how to give credit to others' work	37%	88%	37%	85%	36%	100%
When my students have questions about digital technologies/Scratch, I direct them to online/offline resources to find their answers	26%	65%	34%	66%	29%	90%
I incorporate digital technologies/Scratch into my lesson plans	22%	74%	32%	59%	21%	70%

My school leaders support me to use Scratch/digital technologies in my classroom	17%	41%	24%	56%	14%	60%

% Agree or strongly agree	Younger than 30		30 – 35		Older than 35	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
I incorporate digital technologies/Scratch into my lesson plans	31%	72%	32%	65%	20%	58%
My school leaders support me to use Scratch/digital technologies in my classroom	31%	52%	23%	58%	11%	44%
I have the skills to incorporate Scratch into my lesson plans	35%	68%	27%	65%	9%	64%
Teachers at my school talk about using digital technologies in the classroom	38%	48%	28%	57%	11%	60%
Both boys and girls can benefit from learning how to code	77%	92%	45%	95%	53%	93%
Coding/Scratch can help students learn problem solving skills	69%	92%	45%	92%	49%	89%
Learning coding/Scratch and participation in Scratch clubs can help students better understand future career options	69%	92%	48%	88%	47%	87%
I set digital learning activities that engage my students	46%	84%	42%	75%	36%	69%
I use digital technologies/Scratch to tailor my teaching to students' individual needs	31%	68%	32%	57%	18%	49%
I use digital technologies/Scratch to encourage my students to identify and solve problems	35%	64%	28%	67%	18%	64%
I use digital technologies/Scratch to facilitate student collaboration	35%	76%	37%	75%	18%	62%
I use digital technologies/ Scratch to foster students' creativity	38%	76%	33%	75%	16%	62%
I teach my students how to behave safely online	54%	88%	38%	83%	36%	80%
I teach my students how to give credit to others' work	42%	84%	40%	88%	29%	87%
When my students have questions about digital technologies/Scratch, I direct them to online/offline resources to find their answers	42%	68%	35%	72%	18%	62%

Annex 3: Evaluation Instruments

KAP Survey

Section 1: Demographics		**Igice cya1: Imyirondoro**			
Question (English)	**Response Options (English)**	**Question (Kinyarwanda)**	**Response Options (Kinyarwanda)**	**Score**	**Question Notes**
__1.1. National ID__	TEXT	**1.1. Numero y'irangamuntu**			
1.2. First name	TEXT	**1.2. Izina**			
1.3. Last name	TEXT	**1.3. Izina ry'umuryango**			
1.4. Sex	1. Female 2. Male	**1.4. Igitsina**	1. Gore 2. Gabo		
1.5. Age	INTEGER	**1.5. Imyaka**			
1.6. Highest Level of Education	1. A2 in Education 2. Diploma in Education 3. Bachelor's degree 4. Post-Graduate Diploma in Education 5. Master's degree	**1.6. Amashyuri ahanitse mwize**	1. Impamyabumenyi y'amashuri y'isumbuye mu burezi 2. Impamyabumenyi mu burezi 3. pamyabumenyi y'icyiciro cya kabiri cya kaminuza 4. Impamyabumenyi ihanitse mu burezi (PGDE) 5. Impamyabumenyi y'icyiciro cya gatatu cya kaminuza		
Specify[Other]	TEXT	**Sobanura [Ibindi]**			
1.7. School Name	TEXT	**1.7. Izina ry'ishuri**			
1.8. Sector in which school is located	TEXT	**1.8. Umurenge ishuri rihererereyemo**			
1.9 School Status	1. Public 2. Government Aided 3. Private	**1.9 Imimerere y'ishuri**	1. Ishuri rya leta 2. Ishuri rifashwa na leta 3. Ishuri ryigenga		
1.10. School Type	1. Day School 2. Boarding School 3. Special Needs School	**1.10. Ubwoko bw'ishuri**	1. Aho biga bataha 2. Aho biga babayo 3. Amashuri y'abana bakenera ubufasha bwihariye		
1.11. School Academic Designation	1. 9YBE 2. 12YBE 3. Secondary only	**1.11. Imiterere y'ishuri**	1. Imyaka 9 y'ibanze 2. Imyaka 12 y'ibanze 3. Ishuri ry'isumbuye		
1.12 School Gender	1. Mixed gender 2. Girls only 3. Boys only	**1.12. Igitsina**	1. Harimo Ibitsina byombi 2. Abakobwa gusa 3. Abahungu gusa		
1.13. Teaching subject(s)	1. Chemistry 2. Physics 3. Biology 4. Mathematics 5. ICT	**1.13. Amasomo wigisha, hitamo ayo wigisha yose**	1. Ubutabire 2. Ubugenge 3. Ibinyabuzima 4. Imibare 5. Ikoranabuhanga		
Other[Specify]	TEXT	**Sobanura [Ibindi]**			

1.14. Number of years teaching at this school	INTEGER	**1.14. Imyaka umaze wigisha kuri rino shuri**			
1.15. Number of years teaching(if different from above)	INTEGER	**1.15. Imyaka umaze wigisha(niba itandukanye niyo wavuze haruguru)**			
1.16. Did you participate in or are you currently participating in the Continuous Professional Development Certificate Program in Educational Mentoring and Coaching for STEM Teachers provided by UR-CE and VVOB?	1. Yes: I participated in the in-person course 2. Yes, I participated in the course that had both in-person and online sessions 3. Yes, I participated in or I am currently participating in the online course 4. No 98. Don't know	**1.16. Ese waba waritabiriye cyangwa uri kwitabira gahundayo kongera ubumenyi n'ubushobozi mu mwuga itangaimpamyabushobozi mu bufashamyumvire n'ubutoza ku bayobozi b'ishami ry'amasomo ya siyansi itangwa na kaminuza y'u Rwanda ifatanyije na VVOB?**	1. Yego, nitabiriye amahugurwa y'imbonankubone 2. Yego nitabiriye amahugurwa yatanzwe imbonankubone hariharimo nayatanzwe hifashishijwe ikoranabuhanga 3. Yego nitabiriye cyangwa ndi kwitabira amahugurwa atangwa hifashishijwe ikoranabuhanga 4. Oya 98. Ntanarimwe		

Section 2: Digital Literacy		**Igice cya 2**			
Section 2A		**Igice cya 2A**			
Question (English)	**Response Options (English)**	**Question (Kinyarwanda)**	**Response Options (Kinyarwanda)**	**Score**	**Question Notes**
2.A.1. Does your school have electricity?	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**2.A.1. Ishuri ryanyu mufite umuriro w'amashanyarazi?**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	
2.A.2. Are there digital devices available to you at school to use when teaching?	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**2.A.2. Haba hari ibikoresho by'ikoranabuhanga biboneka kw'ishuri ryanyu mwifashisha igihe muri kwigisha?**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	Based on SELFIE Questionnaire Secondary Schools. Code B2: Digital Devices for Teaching
2.A.3.At school, do you have access to the Internet for teaching and learning?	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**2.A.3. Kw'ishuri, mujya mubona uburyo bwo gukoresha murandasi mu myigishirize no mu myigire?**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	Based on: SELFIE Questionnaire Secondary Schools. Code B3: Internet Access
2.A.4. Is there technical support available at the school in case of problems with digital technologies?	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**2.A.4. Mwaba mujya mubona ubufasha buri tekinike igihe muhuye n'ibibazo ku bikoresho by'ikoranabuhanga?**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	Based on SELFIE Questionnaire Secondary Schools. Code B4: Technical support
2.A.5. Are there school owned/ managed computers (either desktops or laptops) available for students to use when they need them?	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**2.A.5. Haba hari mudasobwa z'ikigo/zicungwa n'ishuri (yaba izitagendanwa cyangwa izigendanwa) zakoreshwa n'abanyeshuri mu gihe bazikeneye?**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	Based on SELFIE Questionnaire Secondary Schools. Code B6: Digital Devices for Learning
2.A.5.a. How many computers does your school have?	INTEGER	**2.A.5.a. Mufite mudasobwa zingahe kw'ishuri ryanyu?**			

2.A.6.Does your school have any Smart Classrooms?	1. Yes, sufficient 2. Yes, but not sufficient 3. No 98. Don't know	**2.A.6. Ese ishuri ryanyu rifite ibyumba by'ikoranabuhanga?**	Yego, birahagije Yego, ariko ntibihagije Oya Simbizi	1. Yes, sufficient (4 points) 2. Yes, but not sufficient (2 points) 3. No (0 points) 98. Don't know (0 points)	
2.A.6.a. How many Smart Classrooms does your school have?	INTEGER	**2.A.6.a. Ese ishuri ryanyu rifite ibyumba by'ikoranabuhanga bingahe?**			
2A.7. Do students in need of special support have access to assistive devices for use with technology such as text to speech, voice recognition, alternative key boards, etc.	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**2.A.7. Ese abanyeshuri bakenera ubufasha bwihariye babona ibikoresho bijyanye n'ikoranabuhanga byo kubafasha? Aha twavuga nk'akuma gafasha kumva amajwi, agafasha kwandika ibivuzwe, kibodi/kraviye y'ihariye…**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	Based on SELFIE Questionnaire Secondary Schools. Code B9OP: Assistive Technologies
2.A.8. Do school leaders support you to try out new ways of teaching using digital technologies?	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**2.A.8. Ese abayobozi b'ishuri bagushyigikira mu kugerageza gukoresha uburyo bushya mu kwigisha wifashishije ibikoresho by'ikoranabuhanga?**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	Based on SELFIE Questionnaire Secondary Schools. Code A3: new ways of teaching
2.A.9. Do school leaders discuss with you your CPD needs for teaching with digital technologies?	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**2.A.9. Ese abayobozi b'ishuri babaganiriza ku bijyanye n'ibyo mukeneye mu kongera ubumenyi n'ubushobozi mu mwuga (CPD) mu kwigisha mwifashishije ibikoresho by'ikoranabuhanga?**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	Based on SELFIE Questionnaire Secondary Schools. Code C1: CPD Needs
2.A.10. Do school leaders support you to share experiences within the school (with other teachers) about teaching with digital technologies?	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**2.A.10. Ese abayobozi b'ishuri babafasha gusangira ubunararibonye mu kigo (hamwe n'abandi barimu) uburwo bwo kwigisha wifashishije ibikoresho by'ikoranabuhanga?**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	Based on SELFIE Questionnaire Secondary Schools. Code C3: Sharing Experiences

2.A.11. Within the past year, have you participated in any of the following CPD activities, on the pedagogical use of digital technologies? Select all that apply.	1. Face-to-face courses, seminars or conferences outside of school 2. Online courses, webinars or online conferences 3. Learning from other teachers within the school through online or offline collaboration 4. Learning from other teachers through online teachers' networks or communities of practice 5. School-based mentoring or coaching, as a part of a formal school arrangement 6. Other in-house training sessions organized by the school 7. Study visits (to other schools, businesses or organizations) 8. Accredited programs (short accredited courses, degree programs) 99. Other	**2.A.11. Mu mwaka ushize, mwaba mwaritabiriye bimwe mu ibikorwa bya CPD bikurikira ku nyigisho zijyanye n'ikoreshwa ry'ibikoresho by'ikoranabuhanga? Hitamo ibisubizo wemera byose**	1. Inyigisho zitangwa imbonankubone, amahugurwa, inama hanze y'ishuri. 2. Inyigisho zitangirwa hifashishijwe ikoranaburanga,amahugurwa cyangwa inama zitangwa hifashishijwe ikoranaburanga 3. Kwigira ku bandi barimu bo mu kigo hifashishijwe ikoranaburanga cyangwa ubufatanye imbonankubone. 4. Kwigira ku bandi barimu mu mahuriro ahuza abarimu (CoP cyangwa PLCs) ahura hifashishijwe ikoranabuhanga 5. Ubujyanama cyangwa ubutoza bukorerwa kw'ishuri, nka zimwe muri gahunda zitegurwa n'ishuri. 6. Andi mahugurwa yateguwe n'ishuri anabera ku ishuri. 7. Ingendo shuri (ku yandi mashuri, ibigo by'ubucuruzi cyangwa ibindi bigo). 8. Porogaramu zemewe (inyigisho zemewe z'igihe gito, porogaramu zitanga 'impamyabumenyi. 99. Ibindi		Based on SELFIE Questionnaire Secondary Schools. Code C: CPD Activities
Other[Specify]	TEXT	**Sobanura[ibindi]**			

Section 2B		**Igice cya 2B**			

Question (English)	Response Options (English)	Question (Kinyarwanda)	Response Options (Kinyarwanda)	Score	Question Notes
2.B.1. Can you match the following term to the correct picture?		**2.B.1. Ese wahuza amagambo akurikira n'amashusho yayo?**		Each correct response is worth 1 point	
2.B.1.a Keyboard	1. cable.jpeg 2. cursor.jpg 3. ethernet_port.jpg 4. printer.jpeg 5. usb.jpeg 6. monitor.jpeg 7. mouse.jpeg 8. keyboard.jpeg	**2.B.1.a Karaviye/kibodi (Keyboard)**	cable.jpeg cursor.jpg ethernet_port.jpg printer.jpeg usb.jpeg monitor.jpeg mouse.jpeg keyboard.jpeg	8 	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.1)
2.B.1.b. Mouse	1. cable.jpeg 2. cursor.jpg 3. ethernet_port.jpg 4. printer.jpeg 5. usb.jpeg 6. monitor.jpeg 7. mouse.jpeg 8. keyboard.jpeg	**2.B.1.b. Imbeba ya mudasobwa (suri/mawusi) (mouse)**	cable.jpeg cursor.jpg ethernet_port.jpg printer.jpeg usb.jpeg monitor.jpeg mouse.jpeg keyboard.jpeg	7 	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.1)
2.B.1.c. Monitor	1. cable.jpeg 2. cursor.jpg 3. ethernet_port.jpg 4. printer.jpeg 5. usb.jpeg 6. monitor.jpeg 7. mouse.jpeg 8. keyboard.jpeg	**2.B.1.c. Ekara/Monita (monitor)**	cable.jpeg cursor.jpg ethernet_port.jpg printer.jpeg usb.jpeg monitor.jpeg mouse.jpeg keyboard.jpeg	6 	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.1)
2.B.1.d. Power cable	1. cable.jpeg 2. cursor.jpg 3. ethernet_port.jpg 4. printer.jpeg 5. usb.jpeg 6. monitor.jpeg 7. mouse.jpeg 8. keyboard.jpeg	**2.B.1.d. Urutsinga rujyana umuriro w' amashanyarazi muri mudasobwa (Power cable)**	cable.jpeg cursor.jpg ethernet_port.jpg printer.jpeg usb.jpeg monitor.jpeg mouse.jpeg keyboard.jpeg	1 	From VVOB Digital :eracy Survey GITAL LITERACY)mpetency 0: evices and ftware erations (0.1)
2.B.1.e. Printer	1. cable.jpeg 2. cursor.jpg 3. ethernet_port.jpg 4. printer.jpeg 5. usb.jpeg 6. monitor.jpeg 7. mouse.jpeg	**2.B.1.e. Impurimante (printer)**	cable.jpeg cursor.jpg ethernet_port.jpg printer.jpeg usb.jpeg monitor.jpeg mouse.jpeg keyboard.jpeg	4 	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.1)

	8. keyboard.jpeg				
2.B.1.f. Ethernet port	1. cable.jpeg 2. cursor.jpg 3. ethernet_port.jpg 4. printer.jpeg 5. usb.jpeg 6. monitor.jpeg 7. mouse.jpeg 8. keyboard.jpeg	**2.B.1.f. Aho bacomeka umugozi wa interineti (Ethernet port)**	cable.jpeg cursor.jpg ethernet_port.jpg printer.jpeg usb.jpeg monitor.jpeg mouse.jpeg keyboard.jpeg	3 	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.1)
2.B.1.g. Cursor	1. cable.jpeg 2. cursor.jpg 3. ethernet_port.jpg 4. printer.jpeg 5. usb.jpeg 6. monitor.jpeg 7. mouse.jpeg 8. keyboard.jpeg	**2.B.1.g. Kiriseri (Cursor)**	cable.jpeg cursor.jpg ethernet_port.jpg printer.jpeg usb.jpeg monitor.jpeg mouse.jpeg keyboard.jpeg	2 	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.1)
2.B.1.h. USB port	1. cable.jpeg 2. cursor.jpg 3. ethernet_port.jpg 4. printer.jpeg 5. usb.jpeg 6. monitor.jpeg 7. mouse.jpeg 8. keyboard.jpeg	**2.B.1.h. Aho bacomeka fulashi disike (flash disque) (USB port)**	cable.jpeg cursor.jpg ethernet_port.jpg printer.jpeg usb.jpeg monitor.jpeg mouse.jpeg keyboard.jpeg	5 	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.1)
2.B.2. I can perform the following basic edits in Word: bold, italics, underline, spell checks and grammar checks.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.2. Nshobora guhindura inyandiko zikurikira muri Word: gutsindagira amagambo, kuyaberamisha, kuyacaho akarongo, gukosora imyandikire y'amagambo n'ikibonezamvugo .**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.2)

2.B.3. I can perform the following formatting in Word: change font size and type, adjust margins, justify, and indent text.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.3. Nshobora gukora ibi bikurikira muri Word: guhindura ingano cyangwa imiterere y'inyuguti, guhindura ingano ya marije, kuringaniza inyandiko no guhindura aho interuro ya mbere ya buri gika itangirira.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.2)
2.B.4. I can insert images and tables into a Word document.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.4. Nshobora gushyiramo amashusho hamwe n'imbonerahamwe muri dokima ya wadi (Word). (Word document)**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.2)
2.B.5. I can develop a presentation in PowerPoint.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.5. Nshobora gutegura inyandiko mbwirwaruhamenkoresheje Porogaramu ya PowerPoint.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.2)
2.B.6. I can create and format a table in Excel.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.6. Nshobora gukora nka nahindura imiterere y'imbonerahamwe muri Excel.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.2)
2.B.7. I can use a formula in excel to calculate a sum.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.7. Nshobora gukoresha forumire muri Excel ndi gushaka igiteranyo.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.2)
2.B.8. I can connect my computer to the internet using wifi.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident	**2.B.8. Nshobora guhuza mudasobwa yange kuri murandasi nkoresheje Wifi.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.2)

	5. Completely confident			5. Completely confident (4 points)	
2.B.9. I know how to open a browser on the internet.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.9. Nzi gufungura ishakiro kuri murandasi.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 0: Devices and software operations (0.2)
2.B.10. I know how to use a search engine to find information and resources on the internet.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.10. Nzi gukoresha ishakiro kuri murandasi nshaka amakuru n'inkomoko yayo.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 1: Information and Data Literacy (1.1)
2.B.11. I can download and install applications from the internet on my computer	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.11. Nshobora gukura no gushyira aplicasiyo nkuye kuri murandasi kuri mudasobwa yange.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	DIGITAL LITERACY Competency 1: Information and Data Literacy (1.3)
2.B.12. I know how to evaluate the quality and validity of the source of information obtained from web-based resources.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.12. Nzi gusuzuma akamaro n'ireme by'amakuru yaba yaturutse kuri murandasi.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 1: Information and Data Literacy (1.2)
2.B.13. I can compose and send an email.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.13. Nshobora kwandika ndetse no kohereza imeri/email.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 2: Communication and Collaboration (2.1)
2.B.14. I can reply to or forward an email.	1. Not at all confident 2. Slightly confident 3. Somewhat confident	**2.B.14. Nshobora gusubiza cyangwa kohereza imeri/email	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 2: Communication

	4. Moderately confident 5. Completely confident	nakiriye ku bandi bantu**	4. Ndiyizeye 5. Ndiyizeye cyane	4. Moderately confident (3 points) 5. Completely confident (4 points)	and Collaboration (2.1)
**2.B.15. I can use digital technology (email, etc.) for school-related communication. **	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.15. Nshobora gukoresha ibikoresho by'ikoranabuhanga (imeri/email, ibindi) mw'ihererekanya kw'amakuru yerekeranye n'ishuri**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	Based on SELFIE Questionnaire Secondary Schools. D4 Communication with the school community DIGITAL LITERACY Competency 2: Communication and Collaboration (2.2)
2.B.16. I can post or reply to a message in the Moodle forum.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.16. Nshobora gushyira cyangwa gusubiza ubutumwa buri muri forum ya moodle.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 2: Communication and Collaboration (2.2)
2.B.17. I can upload a document in Moodle.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.17. Nshobora gushyira dokima muri moodle.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 2: Communication and Collaboration (2.2)
2.B.18. I can download and install a free anti-virus software program.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.18. Nshobora gukurura porogaramu irwanya virusi y'ubuntu nkayishyira muri mudasobwa.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	From VVOB Digital Literacy Survey DIGITAL LITERACY Competency 4: Safety (4.1)
2.B.19. I can ensure the privacy of my personal information when using digital technology.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.19. Nshobora kurinda/kubungabunga umutekano w'umwirondoro wanjye igihe ndi gukoresha ibikoresho by'ikoranabuhanga.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	DIGITAL LITERACY Competency 4: Safety (4.2)

2.B.20. I know when I should and shouldn't share information when online.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.20. Nzi igihe nshobora gusangiza cyangwa kudasangiza amakuru igihe ndi gukoresha murandasi.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	DIGITAL LITERACY Competency 4: Safety (4.2)
2.B.21. I can keep school related digital data secure.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.21. Nshobora kubika amakuru y'ishuri ajyanye nikoranabuhanga mu mutekano.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	Questionnaire Secondary Schools. D5 Keeping Data Secure DIGITAL LITERACY Competency 4: Safety (4.2)
2.B.22. I can use digital resources to support my teaching in the classroom.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.22. Shobora kwifashisha ibikoresho by'ikoranabuhanga mu gutanga inyigisho mw'ishuri.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	DIGITAL LITERACY Competency 6: Career-Related Competences (6.1)
2.B.23. I can search online for digital educational resources.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.23. Shobora gushakira kuri murandasi amakuru ajyanye n'ikoranabuhanga mu burezi.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	Based on SELFIE Questionnaire Secondary Schools. D1 Online educational resources DIGITAL LITERACY Competency 6: Career-Related Competences (6.1)
2.B.24. I can use digital resources to develop educational material for use in the classroom.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**2.B.24. Shobora gukoresha ibikoresho by'ikoranabuhanga mu gutegura ibya kwifashishwa mwi'ishuri.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	DIGITAL LITERACY Competency 6: Career-Related Competences (6.1)

Section 3: Coding/Scratch Competences		Igice cya 3: Kwandika code/ubumenyi kuri scratch			
Section 3A		**Igice cya 3A**			
Question (English)	**Response Options (English)**	**Question (Kinyarwanda)**	**Response Options (Kinyarwanda)**	**Score**	**Question Notes**

3.A.1. I can code using at least one coding language (Python, Java scripts, Scratch etc.)	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**3.A.1. Nshobora kwandika kode nkoresheje byibuze uburyo bumwe (Python, Java Script, Scratch, n'ibindi…)**		1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	DIGITAL LITERACY Competency 3: Digital Content Creation (3.4)
3.A.2. I can explain the basic concepts of coding in scratch	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**3.A.2. Nshobora gusobanura ibitekerezo by'ibanze bya kodingi muri Scratch**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	Expected Competency: Having the digital literacy skills and technical competences to explain basic concepts of coding in Scratch DIGITAL LITERACY Competency 3: Digital Content Creation (3.4)
3.A.3. I can develop stories or animations in Scratch.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**3.A.3. Nshobora gukora inkuru cyangwa inkuru ivuga muri Scratch.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	DIGITAL LITERACY Competency 3: Digital Content Creation (3.4)
3.A.4. I can develop simple games in Scratch.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**3.A.4. Nshobora gukora imikino muri Scratch.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	DIGITAL LITERACY Competency 3: Digital Content Creation (3.4)
3.A.5. I can apply mathematical concepts in Scratch (for example: drawing a polygon or solving a multiplication problem).	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**3.A.5. Nshobora gukora amahurizo y'imibare muri Scratch (urugero gushushanya ikinyampande cyangwa gusubiza ikibazo kirimo gukuba)**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	DIGITAL LITERACY Competency 3: Digital Content Creation (3.4)
3.A.6. I can experiment and iterate (or develop bit by bit) in Scratch.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**3.A.6. Nshobora gusuzuma cyangwa nkanasubiramo (cyangwa nkakora agace ku kandi) muri Scratch.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	Computational Thinking DIGITAL LITERACY Competency 5: Problem Solving (5.5)

3.A.7. I can test and debug (or find and solve problems) in Scratch.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**3.A.7. Nshobora gusuzuma nka na debuginga (gushaka cyangwa no gukemura ibibazo) muri Scratch.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	Computational Thinking DIGITAL LITERACY Competency 5: Problem Solving (5.5)
3.A.8. I can reuse and remix (or building on existing projects) in Scratch.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**3.A.8. Nshobora kongera gukoresha cyangwa kongera kuvanga (cyangwa kubakira kuri porogaramu isanzwe ikora) muri Scratch.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	Computational Thinking DIGITAL LITERACY Competency 5: Problem Solving (5.5)
3.A.9. I can abstract and modularize (or explore connections between the whole and parts) in Scratch.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**3.A.9. Nshobora gutandukanya cyangwa nkamenya byinshi (cyangwa nkasuzuma conegisiyo (connections) mu mpande zose) za Scratch.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	Computational Thinking DIGITAL LITERACY Competency 5: Problem Solving (5.5)
3.A.10. I enjoy coding using Scratch.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree 6. I have never used scratch	**3.A.10. Nishimira gu kodinga nkoresheje Scratch.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	ATTITUDE: Enjoyment of using scratch might be a predictor of Practices.

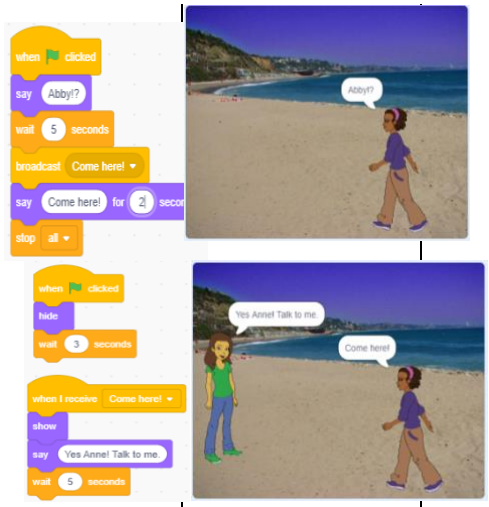
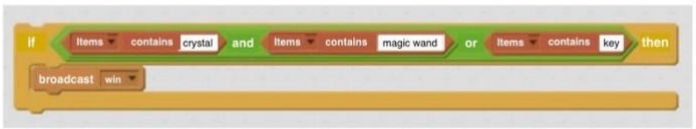
Section 3B		**Igice cya 3B**			
Please do not guess. If you do not know the answer, please select "Don't Know"		**Ntugereranye. Niba utazi igisubizo hitamo "Simbizi"**			
Question (English)	**Response Options (English)**	**Question (Kinyarwanda)**	**Response Options (Kinyarwanda)**	**Score**	**Question Notes**

3.B.1. In Scratch what is a sprite?	1. A coding language 2. An element or character to use in a story 3. Puzzle piece shapes that are used to create codes 4. An operating system 98. Don't know	**3.B.2. Muri Scratch, Sprite ni iki?**	1. ururimi rukoreshwa mu gukora kode 2. Ikintu cyangwa se umuntuy ukoreshwa mu nkuru 3. Uduce duto twamahuriza dukoreshwa mugukorea kode 4. Sisitemu y'imikorere 98. Simbizi	2. An element or character to use in a story (1 point)	Sprites Module 1, Lesson 1: Overview of Scratch Interface Elements
3.B.2. Match the computational concept to the description.		**3.B.2. Huza igitekerezo cyo kubara n'igisobanuro.**		Each correct response is worth 1 point	Computational Concepts (from Scratched.gse.harvard)
3.B.2.a. Sequence	1. Running the same sequence multiple times 2. One thing causing another thing to happen 3. Making decision based on conditions 4. Storing, retrieving and updating values 5. Identifying a series of steps for a task 6. Making things happen at the same time 7. Support for mathematics and logical expressions 98. Don't know	**3.B.2.a. Sequence (Urukurikirane)**	1. Running the same sequence multiple times (Gukoresha urutonde rumwe inshuro nyinshi) 2. One thing causing another thing to happen (Ikintu kimwe gitera ikindi kubaho) 3. Making decisions based on conditions (Gufata ibyemezo hakurikijwe ibisabwa) 4. Storing, retrieving, and updating values (Kubika, kugarura, no kuvugurura indangagaciro) 5. Identifying a series of steps for a task (Kugaragaza urukurikirane rw'intambwe zibikorwa) 6. Making things happen at the same time (Gukorera ibintu icyarimwe) 7. Support for mathematical and logical expressions (Ubufasha mu mvugo y'imibare n' imitekerereze) 98. Simbizi	5. Identifying a series of steps for a task	
3.B.2.b. Loops	Same as above	**3.B.2.b. Loops (Umuzingi)**	Same as above	1. Running the same sequence multiple times	
3.B.2.c. Parallelism	Same as above	**3.B.2.c. Parallelism (Urubangikane)**	Same as above	6. Making things happen at the same time	
3.B.2.d. Events	Same as above	**3.B.2.d. Events (Ibyabaye)**	Same as above	2. One thing causing another thing to happen	
3.B.2.e. Conditionals	Same as above	**3.B.2.e.Conditionals (Ibisabwa)**	Same as above	3. Making decision based on conditions	
3.B.2.f. Operators	Same as above	**3.B.2.f. Operators (Abakoresha)**	Same as above	7. Support for mathematics and logical expressions	

3.B.2.g. Data	Same as above	**3.B.2.g. Data (Amakuru)**	Same as above	4. Storing, retrieving and updating values	
3.B.3 to 3.B.10. Match the strategy to the computational practice.		**3.B.3-3.B.10. Huza ingamba nuburyo bwo kubara**		Each correct response is worth 1 point	Computational Practices (from Scratched.gse.harvard)
3.B.3. Decide what scripts are needed for your project and what they should do	1. Testing and debugging 2. Reusing and remixing 3. Experimenting and iterating 4. Abstracting and modularizing 98. Don't know	**3.B.3 Guhitamo inyandiko zifashishwa mu mushinga wawe nicyo zizakora.**	1. Testing and debugging (kugerageza no gukemura) 2. Reusing and remixing (Kongera gukoresha no kongera kuvanga) 3. Experimenting and iterating (kugerageza no gusubiramo) 4. Abstracting and modularizing (Gukuramo no Guhindura) 5. Simbizi	4. Abstracting and modularizing	
3.B.4. Read through the scripts to investigate the cause of the problem	1. Testing and debugging 2. Reusing and remixing 3. Experimenting and iterating 4. Abstracting and modularizing 98. Don't know	**3.B.4. Gusoma inyandiko zose no gusesengura icyateye ikibazo.**	1. Testing and debugging (kugerageza no gukemura) 2. Reusing and remixing (Kongera gukoresha no kongera kuvanga) 3. Experimenting and iterating (kugerageza no gusubiramo) 4. Abstracting and modularizing (Gukuramo no Guhindura) 5. Simbizi	1. Testing and debugging	
3.B.5. Try things out as you go	1. Testing and debugging 2. Reusing and remixing 3. Experimenting and iterating 4. Abstracting and modularizing 98. Don't know	**3.B.5. Kugenda ugerageza ibintu uko bije**	1. Testing and debugging (kugerageza no gukemura) 2. Reusing and remixing (Kongera gukoresha no kongera kuvanga) 3. Experimenting and iterating (kugerageza no gusubiramo) 4. Abstracting and modularizing (Gukuramo no Guhindura) 5. Simbizi	3. Experimenting and iterating	
3.B.6. Try new ways to do things or try new things	1. Testing and debugging 2. Reusing and remixing 3. Experimenting and iterating 4. Abstracting and modularizing 98. Don't know	**3.B.6. Kugerageza uburyo bushya bwo gukoramo ibintu cyangwa kugerageza ibishya.**	1. Testing and debugging (kugerageza no gukemura) 2. Reusing and remixing (Kongera gukoresha no kongera kuvanga) 3. Experimenting and iterating (kugerageza no gusubiramo) 4. Abstracting and modularizing	3. Experimenting and iterating	

			(Gukuramo no Guhindura) 5. Simbizi		
3.B.7. Find ideas and inspiration by trying other projects and reading the scripts	1. Testing and debugging 2. Reusing and remixing 3. Experimenting and iterating 4. Abstracting and modularizing 98. Don't know	**3.B.7. Gushaka ibitekerezo bishya binyuze mu kugerageza indi mishanga no gusoma inyandiko.**	1. Testing and debugging (kugerageza no gukemura) 2. Reusing and remixing (Kongera gukoresha no kongera kuvanga) 3. Experimenting and iterating (kugerageza no gusubiramo) 4. Abstracting and modularizing (Gukuramo no Guhindura) 5. Simbizi	2. Reusing and remixing	
3.B.8. Observe what happens when you run your project	1. Testing and debugging 2. Reusing and remixing 3. Experimenting and iterating 4. Abstracting and modularizing 98. Don't know	**3.B.8. Kureba uko bigenda igihe utangije umushinga wawe**	1. Testing and debugging (kugerageza no gukemura) 2. Reusing and remixing (Kongera gukoresha no kongera kuvanga) 3. Experimenting and iterating (kugerageza no gusubiramo) 4. Abstracting and modularizing (Gukuramo no Guhindura) 5. Simbizi	1. Testing and debugging	
3.B.9. Organize the scripts in ways that make sense to you and to others	1. Testing and debugging 2. Reusing and remixing 3. Experimenting and iterating 4. Abstracting and modularizing 98. Don't know	**3.B.9. Gushyira inyandiko kumurongo kuburyo zigira igisobanuro haba kuri wowe no kubandi.**	1. Testing and debugging (kugerageza no gukemura) 2. Reusing and remixing (Kongera gukoresha no kongera kuvanga) 3. Experimenting and iterating (kugerageza no gusubiramo) 4. Abstracting and modularizing (Gukuramo no Guhindura) 5. Simbizi	"4. Abstracting and modularizing"	
3.B.10. Give credit to people whose work you build on or are inspired by	1. Testing and debugging 2. Reusing and remixing 3. Experimenting and iterating 4. Abstracting and	**3.B.10. Gushimira ba nyiri mishinga washingiyeho ukora umushinga wawe cg abaguhaye igitekerezo.**	1. Testing and debugging (kugerageza no gukemura) 2. Reusing and remixing (Kongera gukoresha no kongera kuvanga) 3. Experimenting and iterating (kugerageza no gusubiramo) 4. Abstracting and	2. Reusing and remixing	

	modularizing 98. Don't know		modularizing (Gukuramo no Guhindura) 5. Simbizi		
**3.B.11.					
3.B.11. In this example, what will the puppy say?	1. Hello 2. 22 3. 4 4. NaN 98. Don't know	**3.B.11. Muri izi ngeri, wakwerekana imbwa?**	1. Hello 2. 22 3. 4 4. NaN 98. Simbizi	3. 4 (4 points)	Using Math Operator Blocks. Module 1
**3.B.12.					
3.B.12. If the code is entered, in which direction will the cat moved?	1. Upper right of the screen 2. Lower right of the screen 3. Upper left of the screen 4. Lower left of the screen 98. Don't know	**3.B.12. Uramutse ushyizemo iyi kode, iyi njangwe yajya mu kihe cyerekezo?**	1. Upper right of the screen (Hejuru iburyo bwa ekara) 2. Lower right of the screen (Hasi iburyo bwa ekara) 3. Upper left of the screen (Hejuru ibumoso bwa ekara) 4. Lower left of the screen (Hasi ibumoso bwa ekara) 5. Simbizi	2. Lower right of the screen (4 points)	Module 2: Motion and Direction in XY Coordinates

**3.B.13.					
3.B.13. When does Abby appear in this story?	1. When the green flag is clicked 2. When Anne says "Come here!" 3. When Anne says "Abby?" 4. After 5 seconds 98. Don't know	**3.B.13. Ni ryari Abby agaragara muri iyi nkuru?**	1. Iyo ibendera ryicyatsi rikanzwe 2. Iyo Anne avuze ati "Come here" 3. Iyo Anne avuze ati "Abby!" 4. Nyuma y'amasengonda atanu 98. Simbizi	2. When Anne says "Come here!" (4 points)	Module 3 and 4: Story Creation and Animation in Scratch
**3.B.14.					
3.B.14. What shape will the following code make?	1. Circle 2. Square 3. Triangle 4. Octagon 98. Don't know	**3.B.14. Aya makode akurikira araza gukora iyihe shusho?**	1. uruziga 2. Mpande enye 3. Mpandeshatu 4. Icyinyampande cy'impande umunani 98. Simbizi	3. Triangle (4 points)	Module 5: Polygons and Flowers
*					
3.B.15. Based on this Scratch Code, which of the list of items would not allow the player to win the game?	1. Crystal, flaming sword, ring of power, potion of invulnerability 2. Crystal, magic wand, flaming sword 3. Crystal, magic wand, key 4. Key, ring of power 98. Don't know	**3.B.15. Uhereye kuri iyi kode ni uruhe rutonde rw'ibintu bitagomba kwemerera umukinnyi gutsinda uyumukino.**	1. Crystal, flaming sword, ring of power, potion of invulnerability 2. Crystal, magic wand, flaming sword 3. Crystal, magic wand, key 4. Key, ring of power 98. Don't know	4. Key, ring of power (4 points)	Module 6 and 7: Games Question modified from "Randomized Controlled Trial and Process Evaluation of Code Clubs"

Section 3C		**Igice cya 3C**			
Question (English)	**Response Options (English)**	**Question (Kinyarwanda)**	**Response Options (Kinyarwanda)**	**Score**	**Question Notes**
3.C.1. I use online and offline resources to improve my coding/scratching skills	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**3.C.1. Nifashisha ibikoresho/ubumenyi mvanye kuri murandasi n'ibitavuye kuri murandasi kugira ngo niongerere ubumenyi mubijyanye no kodingi cyangwa Scratch.**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	Global Framework 5.1 Problem Solving and Global Framework 5.4 Identifying digital competence gaps
3.C.2. When I have a question about coding/Scratch, I use an on-line discussion forum.	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**3.C.2. Iyo mfite ikibazo kubijyanye na kodingi cyangwa Scratch, nkoresha ibiganiro by'ihuriro bikorerwa kuri murandasi.**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	Global Framework 5.1 Problem Solving and Global Framework 5.4 Identifying digital competence gaps
3.C.3. When I have a question about coding/Scratch, there is someone at my school that I talk to.	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**3.C.3. Iyo mfite ikibazo kubijyanye na kodingi cyangwa Scratch, hari umuntu ku ishuli ngenda nkabaza.**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	Community of Practice
3.C.4. I am confident in my ability to resolve any challenges that I may face when coding/using Scratch.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree 6. I have never used scratch	**3.C.4. Nifitiye ikizere mu bushobozi bwanjye bwo gukemura ikibazo cyose nahura nacyo mu bijyanye no gukodinga cyangwa gukoresha Scratch.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane 6. Sinigize nkoresha Scratch	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points) 6. I have never used scratch (0 points)	DIGITAL LITERACY Competency 5: Problem Solving (5.1)

Section 4: School Scratch Clubs		Igice cya 4: Amahuriro y'ishuri ya scratch			
Section 4A		**Igice cya 4A**			
Question (English)	**Response Options (English)**	**Question (Kinyarwanda)**	**Response Options (Kinyarwanda)**	**Score**	**Question Notes**

4.A.1. My school has student clubs	1. Yes 2. No 3. Don't know	**4.A.1. Ishuri ryanjye rifite amahuriro/amaclub y'abanyeshuli.**	1. Yego 2. Oya 3. Simbizi	1. Yego (4 points) 2. Oya (0 points) 3. Simbizi (0 points)	
4.A.2. Clubs at my school are on the school timetable	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**4.A.2. Amahuriro/amaclub ku ishuli ryanjye aba ku ngengabihe y'ishuli.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	
4.A.3. Student clubs take place	1. More than 1 time per week 2. Weekly 3. Every 2 weeks 4. Monthly 99. Other	**4.A.3. Amahuriro/amaclub y'abanyeshuli arakorwa.**	1. Inshuro irenze imwe mu cyumweru 2. Buri cyumweru 3. Buri byumweru bibiri 4. Buri kwezi 99. ibindi		
4.A.4. Student clubs run for	1. Less than 1 hour 2. 1 hour 3. 1-2 hours 4. More than 2 hours	**4.A.4. Amahuriro/amaclub y'abanyeshuli amara**	1. Munsi y'isaha 2. Isaha imwe 3. Hagati y'isaha imwe n'ebyiri 4. Hejuru y'amasaha abiri		
4.A.5. Students actively participate in clubs at my school	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**4.A.5. Abanyeshuli bitabira amahuriro/amaclub ku ishuli ryanjye.**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	
4.A.6. My school has STEM and/or ICT clubs	1. Yes 2. No 3. Don't know	**4.A.6. Ishuli ryanjye rifite ihuriro/club rya siyansi cyangwa iry'ikoranabuhanga (ICT)**	1. Yego 2. Oya 3. Simbizi	1. Yes (4 points) 2. No (0 points) 3. Don't know (0 points)	
4.A.7. Students participate in STEM and/or ICT clubs at my school	1. Never 2. Rarely 3. Sometimes 4. Very Often 5. Always	**4.A.7. Ku ishuli ryanjye banyeshuli bitabira amahuriro/amaclub ya siyansi n' ikoranabuhanga.**	1. Gake cyane 2. Akenshi 3. Buri gihe 4. Ntabwo mbizi 5. Ntanarimwe	1. Never (0 points) 2. Rarely (1 point) 3. Sometimes (2 points) 4. Very Often (3 points) 5. Always (4 points)	
4.A.8. Girls and boys participate equally in clubs at my school	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**4.A.8. Ku ishuli ryanjye bahungu n'abakobwa bitabira amahuriro/amaclub kimwe.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points)	

				5. Strongly agree (4 points)	
4.A.9. I have in the past or am currently leading a student club at my school	1. Yes 2. No 3. Don't know	**4.A.9. Ku ishuli ryanjye nayoboye cg ubu nyobora ihuriro/club ry'abanyeshuli.**	1. Yego 2. Oya 3. Simbizi	1. Yes (4 points) 2. No (0 points) 3. Don't know (0 points)	

Section 4B		**Igice cya 4B**			
Question (English)	**Response Options (English)**	**Question (Kinyarwanda)**	**Response Options (Kinyarwanda)**	**Score**	**Question Notes**
4.B.1. I lead a STEM/ICT (or scratch club) at my school	1. Yes 2. No	**4.B.1. Nyobora uhuriro/club rya siyansi cyangwa ikoranabuhanga (cyangwa ihuriro rya Scratch) ku ishuli ryanjye.**	1. Yego 2. Oya	1. Yes (4 points) 2. No (0 points)	
4.B.2. I actively encourage girls to join STEM (Science, technology, engineering, and mathematics)/ICT (or Scratch) clubs at my school	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree 6. Not applicable	**4.B.2. Nshishikariza abakobwa kwitabira amahuriro/amaclub ya siyansi n'ikorabuhanga (cyangwa ihuriro rya Scratch) ku ishuri ryanjye.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane 6. Ntibijyanye	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points) 6. Not applicable (0 points)	Expected Competency: Motivating learners, especially girls, to join the clubs and remain active in them
4.B.3 I give students roles in the club to give them a sense of pride in the club and help with motivating other students to join.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree 6. Not applicable	**4.B.3. Mpa abanyeshuri inshingano muri club kugirango bagire ishema muri club kandi bamfashe gushishikariza abandi banyeshuri kwitabira.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane 6. Ntibijyanye	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points) 6. Not applicable (0 points)	STEM.Org.UK Stem Clubs Handbook
4.B.4.I let students decide on the activities that happen in the club.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree 6. Not applicable	**4.B.4. Ndeka abanyeshuli bakaba aribo bafata umwanzuro ku bikorwa twakora mw'ihuriro/ muri club.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane 6. Ntibijyanye	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points) 6. Not applicable (0 points)	STEM.Org.UK Stem Clubs Handbook Expected Competency: Facilitating clubs in a learner-centered way, focusing on collaboration, problem-based learning and self-regulation

Section 4C		**Igice cya 4C**			
Question (English)	**Response Options (English)**	**Question (Kinyarwanda)**	**Response Options (Kinyarwanda)**	**Score**	**Question Notes**
4.C.1. I can lead a Scratch Club at my school.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately	**4.C.1. Nshobora kuyobora ihuriro/club rya Scratch ku ishuli ryanjye**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident	Indicator 2: Percentage of trained teachers who report to feel competent to facilitate after

	confident 5. Completely confident		5. Ndiyizeye cyane	(3 points) 5. Completely confident (4 points)	school Scratc2h 2050 coding clubs
4.C.2. I can motivate boys and girls to participate in a Scratch Club at my school.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**4.C.2. Nshobora gushishikariza abahungu n'abakobwa kwitabira amahuriro/amaclub ya scratch ku ishuli ryanjye.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	
4.C.3. I can set learning targets for the Scratch Club with the club members.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**4.C.3. Nshobora gushyiraho intego y'ibyigwa mu ihuro/muri club rya scratch mfatanyije n'abagize ihuriro/club.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	
4.C.4. I can develop an agenda for each Scratch Club session.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**4.C.4. Nshobora gutegura gahunda ya buri huriro/club rya scratch.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	
4.C.5. I can evaluate Scratch Club achievement against the learning targets.	1. Not at all confident 2. Slightly confident 3. Somewhat confident 4. Moderately confident 5. Completely confident	**4.C.5. Nshobora gusuzuma ibyo buri huriro/club rya scratch ryagezeho ngendeye ku ntego y'ibyo bagombaga kwiga.**	1. Ntago niyizeye 2. Nifitiye icyizere gike 3. Niyizeye mu rugero 4. Ndiyizeye 5. Ndiyizeye cyane	1. Not at all confident (0 points) 2. Slightly confident (1 point) 3. Somewhat confident (2 points) 4. Moderately confident (3 points) 5. Completely confident (4 points)	

Section 5: Teaching Scratch		Igice cya 5: Gufasha abanyeshuli kuzamura ubumenyi kuri scratch.			
Section 5A		**Igice cya 5A**			
Question (English)	**Response Options (English)**	**Question (Kinyarwanda)**	**Response Options (Kinyarwanda)**	**Score**	**Question Notes**

5.A.1. Both boys and girls can benefit from learning how to code.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.A.1. Abahungu n'abakobwa bashobora kungukira mu kwiga gukodinga.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	
5.A.2. Coding/Scratch can help students learn problem solving skills.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.A.2. Gukodinga/ Scratch bishobora gufasha abanyeshuli kugira ubumenyi bwo gukemura ibibazo.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	
5.A.3.Learning coding/Scratch and participation in Scratch clubs can help students better understand future career options.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.A.3. Kwiga ibijyanye na kodingi/ scratch no kwitabira amahuriro/amaclub ya scratch bishobora gufasha abanyeshuli kumenya neza guhitamo icyo bazakora mu gihe kizaza.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	
5.A.4.Boys are naturally better at coding than the girls at my school.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.A.4. Ku ishuli ryanjye, muri kamere bahungu bazi gukodinga kurusha abakobwa.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (4 points) 2. Disagree (3 point) 3. Neither agree nor disagree (2 points) 4. Agree (1 points) 5. Strongly agree (0 points)	REVERSE
5.A.5. It is not important to incorporate digital technologies like Scratch into the classroom if the school already has Coding or Scratch clubs.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**6.A.3. Ntabwo ari ingenzi kongeramo ikoranabuhanga rigezweho nka scratch mu cyumba cy' ishuri mu gihe ishuri rifite amahuriro ya Scratch.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (4 points) 2. Disagree (3 point) 3. Neither agree nor disagree (2 points) 4. Agree (1 points) 5. Strongly agree (0 points)	REVERSE

Section 5B		**Igice cya 5B**			
Question (English)	**Response Options (English)**	**Question (Kinyarwanda)**	**Response Options (Kinyarwanda)**	**Score**	**Question Notes**
5.B.1. I set digital learning activities that engage my students.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.B.1. Nashyizeho uburyo bwo kongera uruhare rw'abanyeshuri mu isomo ryanjye nifashishije ibikorwa byo kwigisha nkoresha ikoranabuhanga**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	Based on SELFIE Questionnaire Secondary Schools. D8 engaging students
5.B.2. I incorporate digital technologies/Scratch into my lesson plans	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.B.2. Nkoresha/nshyira ikoranabuhanga/ Scratch muri gahunda z'amasomo yanjye.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	Indicator 3: Percentage of trained teachers who report to feel competent to integrate scratch into STEM/ICT lessons plans
5.B.3. I use digital technologies/Scratch to tailor my teaching to students' individual needs	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.B.3. Nkoresha ikoranabuhanga/ Scratch mu guhuza uburyo nigishamo n'ibyo buri munyeshuri ku giti cye akeneye.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	Based on SELFIE Questionnaire Secondary Schools. D6 Tailoring to students' needs
5.B.4. I use digital technologies/Scratch to encourage my students to identify and solve problems	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.B.4. Nkoresha ikoranabuhanga/ Scratch mu gushishikariza abanyeshuri banjye kugaragaza no gukemura ibibazo**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	Inquiry Based Learning / 5 Es instructional model DIGITAL LITERACY Competency 5: Problem Solving (5.2)
5.B.5. I use digital technologies/Scratch to facilitate student collaboration.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.B.5. Nkoresha ikoranabuhanga/ Scratch mu gufasha abanyeshuri gukorera hamwe**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	Based on SELFIE Questionnaire Secondary Schools. D9 Student collaboration DIGITAL LITERACY Competency 2: Communication and Collaboration (2.4)
5.B.6. I use digital technologies/ Scratch to foster students' creativity.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree	**5.B.6. Nkoresha ikoranabuhanga/Scratch mu kuzamura ubumenyi/ubushobozi bw'abanyeshuri bwo guhanga udushya.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	Based on SELFIE Questionnaire Secondary Schools. D7 Fostering creativity

	5. Strongly agree				
5.B.7. I teach my students how to behave safely online.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.B.7. Nigisha abanyeshuri banjye uko bagomba kwitwararika bari gukoresha murandasi.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	Based on SELFIE Questionnaire Secondary Schools. F2: Safe behavior DIGITAL LITERACY Competency 4: Safety (4.3)
5.B.8. I teach my students how to give credit to others' work.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.B.8. Nigisha abanyeshuri banjye uko bagomba kubaha ibikorwa by'abandi.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	Based on SELFIE Questionnaire Secondary Schools. F5: Giving credit to others' work DIGITAL LITERACY Competency 2: Communication and Collaboration (2.2)
5.B.9. When my students have questions about digital technologies/Scratch, I direct them to online/offline resources to find their answers.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.B.9. Igihe abanyeshuri banjye bafite ibibazo bijyanye n'ikoranabuhanga/ Scratch mbohereza kujya gukoresha imbuga zo kuri murandasi mu gushaka ibisubizo byabo.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	Expected Competency: Pointing members to resources to continue developing their coding skills DIGITAL LITERACY Competency 5: Problem-Solving (5.4)

Section 5C		**Igice cya 5C**			
Question (English)	**Response Options (English)**	**Question (Kinyarwanda)**	**Response Options (Kinyarwanda)**	**Score**	**Question Notes**
5.C.1. I have the skills to incorporate Scratch into my lesson plans.	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.C.1. Mfite ubumenyi bwo kongeramo/gushyira Scratch muri gahunda z'amasomo yanjye**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	Indicator 3: Percentage of trained teachers who report to feel competent to integrate scratch into STEM/ICT lessons plans
5.C.2. My school leaders support me to use digital technologies/Scratch in the classroom	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.C.2. Abayobozi b'ikigo bamfasha gukoresha ikoranabuhanga/ Scratch ndi kwigisha.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	Based on SELFIE Questionnaire Secondary Schools. A3: New ways of teaching
5.C.3. Teachers at my school talk about using digital technologies/ Scratch in the classroom	1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree 5. Strongly agree	**5.C.3. Abarimu ku ishuri ryanjye baganira ku bijyanye no gukoresha ikoranabuhanga/ Scratch mu ishuri.**	1. Simbyemera namba 2. Simbyemera 3. Simbyemera sinabihakana 4. Ndabyemera 5. Ndabyemera cyane	1. Strongly disagree (0 points) 2. Disagree (1 point) 3. Neither agree nor disagree (2 points) 4. Agree (3 points) 5. Strongly agree (4 points)	Community of Practice

Most Significant Change Guide

Most Significant Change Guide: Teachers

Introduction	Hello, my name is _____ and I would like to invite you to take part in this study on behalf of VVOB and REB and to share your thoughts and opinions about this school year. If you have questions at any time, you can ask them of me or of another researcher from our team. Your participation in this interview is entirely voluntary. It is your choice whether to participate or not. You may also stop participating at time. If you choose not to participate, there will be no penalty. We will not be sharing information about you to anyone outside of this research team. All personal identification information collected will be kept private. If you consent to photographs, video footage or audio recording, these may be used in project reports but will not contain any personal identification information. If you have further questions about this research/evaluation or how we will use this information, please contact: _____.

First Name	
Last Name	
Gender	
Subject	
School Name	
School Sector	
Date of interview	
Enumerator	

1	From your point of view, can you describe the most significant change (either positive or negative) that has happened to you in this school year?
	If Scratch is mentioned as a significant change, ask the following probing questions where relevant: Why do you think that? What has changed as a result of your participation in the Scratch training? How has this affected you? How has this changed your teaching practices? How has this changed for your students? Can you explain? Why do you think that this was so significant? What was it like for you before you participated in the Scratch training?
	If Scratch was not mentioned as a significant change, ask the following:
2	I would like to ask you about your participation in the Scratch training: From your point of view, can you describe the most significant change that has resulted from your participation in the scratch training? **Use the following probing questions where relevant:** Why do you think that? How has this affected you? How has this changed your teaching practices? How has this changed for your students? Can you explain? Why do you think that this was so significant? What was it like for you before you participated in the Scratch training? What was it like for your students before you participated in the Scratch training?

Thank you for your participation.

Most Significant Change guide: Learners

Introduction	Hello, my name is _____ and I would like to invite you to take part in this study on behalf of VVOB and REB and to share your thoughts and opinions about this school year. If you have questions at any time, you can ask them to me or to another researcher from our team. Your participation in this interview is entirely voluntary. It is your choice whether to participate or not. You may also stop participating at any time. If you choose not to participate, there will be no penalty. We will not be sharing information about you to anyone outside of this research team. All personal identification information collected will be kept private. If you consent to photographs, video footage or audio recording, these may be used in project reports but will not contain any personal identification information. If you have further questions about this research/evaluation or how we will use this information, please contact: _____.

First Name	
Gender	
Age	
Grade	
School Name	
School Sector	
Date of interview	
Enumerator	

1	From your point of view, can you describe the most significant change (either positive or negative) that has happened to you in this school year?
	If Scratch is mentioned as a significant change, ask the following probing questions where relevant: Why do you think that? What has changed as a result of your participation in the Scratch club? What was it like for you before you participated in the Scratch club? How has this affected you? How has this changed how you participate in school? How has this changed how you view opportunities for your future? What does your family think about your participation in the Scratch club? Can you explain? Why do you think that this was so significant?
	If Scratch was not mentioned as a significant change, ask the following:
2	I would like to ask you about your participation in the Scratch club: From your point of view, can you describe the most significant change that has resulted from your participation in the Scratch coding club? **Use the following probing questions where relevant:** Why do you think that? What has changed as a result of your participation in the Scratch coding club? What was it like for you before you participated in the Scratch coding club? How has this affected you? How has this changed how you participate in school? How has this changed how you view opportunities for your future? What does your family think about your participation in the Scratch coding club? Can you explain? Why do you think that this was so significant?

Thank you for your participation.

In-Depth Interview Guide: Teachers

Teacher IDI to be combined with the MSC guide for teachers at endline. The guide may be revised prior to the endline to reflect KAP findings and learning questions.

3	How would you describe student interest in Scratch Clubs? Explain. **Probes:** Can you describe the recruitment of students? Can you describe the participation of students? Do students from cycle 1 continue with scratch? Did they take up any role in the 2nd cycle? Were students interested in participating in the Hackathons? Was this the same for male vs. female students, for students with disabilities? Can you describe your role in the coding club?
4	How would you describe school leadership support for Scratch Clubs at your school? Explain. **Probes:** Do you have access to the resources that you need for your club? Explain. Are clubs on the school timetable? Explain. Do school leaders encourage students to participate in the clubs? Explain.
5	To what extent do you feel that the training prepared you to initiate and facilitate Scratch coding clubs? Did the training meet your expectations? Explain. How could the training be improved? Explain. **Probe:** How effective was the blended learning (combining both online and in-person training sessions)? To what extent do you think the digital literacy received was effective before starting Scratch clubs
6	Did you receive any additional support for your coding clubs? If so, from whom? How effective was this support? Explain. Did the support meet your expectations? Explain. How could support be improved? Explain. **Probe:** Did the external trainers/Rwanda Coding Academy and SEIs provide any support at your school? If so, how effective was their support? Probe for: Meetups with SEIs (peer learning), School visits by VVOB and external trainers ScratchEd online community platform (forum on Moodle, Regular communication with external trainers), Any other support if any?
7	When you have questions about Scratch or coding, where do you go? To what extent have you used the following resources for your coding clubs and how useful did you find these resources Probe for: Pedagogical guide Instructional videos online learning environment (Moodle) Coding club lesson plans Coding club PowerPoint presentations
8	To what extent do you think you and the other teachers at your school will continue to hold Scratch coding clubs? Why or why not? Probe: What will motivate teachers to continue to facilitate the clubs without the project funding? Please explain.
9	To what extent have you incorporated Scratch into your lessons in the classroom? If yes, what has been the effect of incorporating Scratch in your lessons? Do you feel that you need additional support? If so, what type of support do you need to do this?
10	Did you participate in the Scratch Day events? What did you find most interesting about the event? To what extent has this event supported your coding and professional skills? Please give an example.

	Probe for attendance: (which event did you attend?) Hackathon Competitions Exposure visit
11	Do you have anything else that you would like to share about Scratch?

School/District Key Informant Interviews

School Leader KII

Introduction	Hello, my name is _____ and I would like to invite you to take part in this study on behalf of VVOB and REB and to share your thoughts and opinions about the Scratc²h 2050 project and Scratch coding clubs in secondary schools in Kayonza. If you have questions at any time, you can ask them to me or to another researcher from our team. Your participation in this interview is entirely voluntary. It is your choice whether to participate or not. You may also stop participating at any time. If you choose not to participate, there will be no penalty. We will not be sharing information about you to anyone outside of this research team. All personal identification information collected will be kept private. If you consent to photographs, video footage or audio recording, these may be used in project reports but will not contain any personal identification information. If you have further questions about this research/evaluation or how we will use this information, please contact: _____.

First Name	
Last Name	
Gender	
Title	
School Name	
School Sector	
Date of interview	
Enumerator	

1	Are you aware of the Scratc²h 2050 project? If so, can you describe your school's involvement in the project? Did any teachers at your school attend the Scratch training? Does your school have any Scratch coding clubs? Have you participated in any of the club sessions?
2	Have you seen any changes in the use of digital technology in the school as a result of teachers attending the Scratch training? If so, can you describe?
3	Have you seen any changes in how teachers at your school use digital technology and coding in the classroom since the Scratch training? If so, can you describe? If yes, you think that this change will be lasting? Why?
4	Have you seen any changes in student interest in ICT and coding as a result of the Scratch coding clubs? If so, can you describe? Is this different for male or female students?
5	To what extent is teaching secondary students to code using Scratch relevant for schools? Why?
6	Do you think that Scratch coding clubs will continue at your school? Why or why not? What would be your role in sustaining the Scratch club at your school?
7	Would you recommend that this project expand to other districts? Why or why not? What could be done to improve the project?

8	To what extent did the project meet the needs of teachers and students in your district/sector (was this the same for male vs. female students, for students with disabilities)? Explain. To what extent is teaching secondary students to code using Scratch relevant for schools in your district/sector? Why?
9	Is there anything else that you would like to share about the project?

District Director of Education/ School Education Inspector KII

Introduction	Hello, my name is _____ and I would like to invite you to take part in this study on behalf of VVOB and REB and to share your thoughts and opinions about the Scratc²h 2050 project and Scratch coding clubs in secondary schools in Kayonza. If you have questions at any time, you can ask them of me or of another researcher from our team. Your participation in this interview is entirely voluntary. It is your choice whether to participate or not. You may also stop participating at time. If you choose not to participate, there will be no penalty. We will not be sharing information about you to anyone outside of this research team. All personal identification information collected will be kept private. If you consent to photographs, video footage or audio recording, these may be used in project reports but will not contain any personal identification information. If you have further questions about this research/evaluation or how we will use this information, please contact: _____.

First Name	
Last Name	
Gender	
Title (circle 1)	DDE DEO SEI
Sector (if SEI)	
Date of interview	
Enumerator	

1	Are you aware of the Scratc²h 2050 project? If so, can you describe how schools in your district/sector were involved in the project? Did any teachers attend the Scratch training? Do schools have any Scratch coding clubs? Have you participated in any of the club sessions? If so, can you describe your role in this project? Probe: Have you facilitated any MeetUps? If yes, did you find this an effective support system for teachers? Why? If not, why did you not facilitate MeetUps? What support will be needed to continue MeetUps?
2	What were the expected results of the project? Do you feel that the project achieved these results? Explain.
3	To what extent did the project meet the needs of teachers and students in your district/sector (was this the same for male vs. female students, for students with disabilities)? Explain. To what extent is teaching secondary students to code using Scratch relevant for schools in your district/sector? Why?
4	Have you seen any changes in the use of digital technology in the schools in your district/sector as a result of teachers attending the Scratch training? If so, can you describe?
5	Have you seen any changes in student interest in ICT and coding as a result of the Scratch coding clubs? If so, can you describe? Is this different for male or female students?
6	Do you think that Scratch coding clubs will continue at the schools in your district/sector? Why or why not?
7	Have you seen any changes in how teachers in your district/sector use digital technology and coding in the classroom since the Scratch training? If so, can you describe? If yes, you think that this change will be lasting? Why?
8	What additional support, if any, do teachers need to be able to effectively use digital technology and coding in the classroom?
9	Would you recommend that this project expands to other districts? Why or why not? What could be done to improve the project?
10	Is there anything else that you would like to share about the project?

National Level Key Informant Interviews

Rwanda Basic Education Board (REB) KII

Introduction	Hello, my name is _____ from Three Stones International, a Rwanda-based consulting firm. We have been contracted by VVOB and REB to conduct an evaluation of the Scratc²h 2050 pilot project. I would like to invite you to take part in this study on behalf of VVOB and to share your thoughts and opinions about the Scratc²h 2050 project and Scratch coding clubs in secondary schools in Kayonza. If you have questions at any time, you can ask them of me or of another researcher from our team. If you have further questions about this research/evaluation or how we will use this information, please contact: _____.

1	Are you aware of the Scratc²h 2050 project? If so, can you describe REB's involvement in the project?
2	What were the expected results of the project? Do you feel that the project achieved these results? Explain.
3	How effective was the coordination between VVOB and REB? How could coordination be improved? Explain.
4	To what extent did the project meet the needs of teachers and students in Kayonza (was this the same for male vs. female students, for students with disabilities)? Explain. To what extent is teaching secondary students to code using Scratch relevant for schools in Rwanda? Why?
5	Have you seen any changes in the use of digital technology in the pilot schools as a result of teachers attending the Scratch training? If so, can you describe?
6	Have you seen any changes in student interest in ICT and coding as a result of the Scratch coding clubs? If so, can you describe? Is this different for male or female students?
7	Do you think that Scratch coding clubs will continue at the pilot schools? Why or why not?
8	Have you seen any changes in how teachers use digital technology and coding in the classroom since the Scratch training? If so, can you describe? If yes, you think that this change will be lasting? Why?
9	To what extent do you think the scratch day and exposure visit was relevant to teacher and student? Do you think that the events have had impact on teachers and student? Please explain.
10	What additional support, if any, do teachers need to be able to effectively use digital technology and coding in the classroom?
11	Would you recommend that this project expands to other districts? Why or why not? What could be done to improve the project? **Probe**: How effective was the blended learning trajectory? How effective were the other support systems (MeetUps, ScratchEd community platform, monitoring and support visits)?
12	Is there anything else that you would like to share about the project?

Rwanda Coding Academy (RCA) KII

Introduction	Hello, my name is _____ from Three Stones International, a Rwanda-based consulting firm. We have been contracted by VVOB and REB to conduct an evaluation of the Scratc²h 2050 pilot project. I would like to invite you to take part in this study on behalf of VVOB and to share your thoughts and opinions about the Scratc²h 2050 project and Scratch coding clubs in secondary schools in Kayonza. If you have questions at any time, you can ask them of me or of another researcher from our team. If you have further questions about this research/evaluation or how we will use this information, please contact: _____.

1	Can you describe your involvement in the Scratc²h 2050 pilot project?
2	What were the expected results of the project? Do you feel that the project achieved these results? Explain.
3	How effective was the coordination between VVOB and RCA? How could coordination be improved? Explain.
4	To what extent the project meet the needs of teachers and students in Kayonza (was this the same for male vs. female students, for students with disabilities)? Explain. To what extent is teaching secondary students to code using Scratch relevant for schools in Rwanda? Why?
5	Have you seen any changes in the use of digital technology in the pilot schools as a result of teachers attending the Scratch training? If so, can you describe?
6	Have you seen any changes in student interest in ICT and coding as a result of the Scratch coding clubs? If so, can you describe? Is this different for male or female students?
7	Do you think that Scratch coding clubs will continue at the pilot schools? Why or why not?
8	Have you seen any changes in how teachers use digital technology and coding in the classroom since the Scratch training? If so, can you describe? If yes, you think that this change will be lasting? Why?
9	To what extent do you think the scratch day and exposure visit was relevant to teacher and student? Do you think that the events have had impact on teachers and student? If so, can you explain?
10	What additional support, if any, do teachers need to be able to effectively use digital technology and coding in the classroom?
11	Would you recommend that this project expands to other districts? Why or why not? What could be done to improve the project?
12	Is there anything else that you would like to share about the project?

Trainers KII

Introduction	Hello, my name is _____ from Three Stones International, a Rwanda-based consulting firm. We have been contracted by VVOB and REB to conduct an evaluation of the Scratc²h 2050 pilot project. I would like to invite you to take part in this study on behalf of VVOB and to share your thoughts and opinions about the Scratc²h 2050 project and Scratch coding clubs in secondary schools in Kayonza. If you have questions at any time, you can ask them of me or of another researcher from our team. If you have further questions about this research/evaluation or how we will use this information, please contact: _____.

1	Can you describe your involvement in the Scratc²h 2050 pilot project?
2	How effective was the coordination between VVOB and trainers? How could the coordination be improved? Explain.
	Can you describe the support you provide to teachers? How the support has changed overtime, if at all? How effective was the support? What can be done to make it more effective in the future?
3	To what extent the project meets the needs of teachers and students at schools, was this the same for male vs. female students, for students with disabilities? Explain. To what extent is teaching secondary students to code using Scratch relevant for schools in Rwanda? Why?
4	To what extent do you feel teachers has the capacity to offer scratch coding lessons to students What challenge do the teachers face in providing scratch lessons to students?
5	Have you seen any changes in student interest in ICT and coding as a result of the Scratch coding clubs? If so, can you describe? Is this different for male or female students?
6	Do you think that Scratch coding clubs will continue at schools? Why or why not?
7	Have you seen any changes in how teachers use digital technology and coding in the classroom since the Scratch training? If so, can you describe? If yes, you think that this change will be lasting? Why?
8	To what extent do you think the scratch day and scratch hackathon was relevant to teacher and student? Do you think that the events have had impact on teachers and student? If so, can you explain?
9	What additional support and/or skills, if any, do teachers need to be able to effectively use digital technology and coding in the classroom?
10	Would you recommend that this project expands to other districts? Why or why not? What could be done to improve the project?
11	Is there anything else that you would like to share about the project?

VVOB Staff KII

Introduction	Hello, my name is _____ from Three Stones International, a Rwanda-based consulting firm. We have been contracted by VVOB and REB to conduct an evaluation of the Scratc²h 2050 pilot project. I would like to invite you to take part in this study on behalf of VVOB and to share your thoughts and opinions about the Scratc²h 2050 project and Scratch coding clubs in secondary schools in Kayonza. If you have questions at any time, you can ask them of me or of another researcher from our team. If you have further questions about this research/evaluation or how we will use this information, please contact: _____.

1	Can you describe your involvement in the Scratc²h 2050 pilot project?
2	What were the expected results of the project? To what extent did the project achieve these results? Explain.
3	How effective was coordination between REB, RCA and VVOB in achieving these results? Explain.
4	To what extent did the project meet the needs of teachers and students in Kayonza (was this the same for male vs. female students, for students with disabilities)? Explain. To what extent is teaching secondary students to code using Scratch relevant for schools in Rwanda? Why?

5	Were there any challenges or delays during implementation of the project? If so, can you explain. What effect did this have on the project outcomes, if any?
6	How effective was the blended learning trajectory in conducting the digital literacy and Scratch course? How could this be improved?
7	Have you seen any changes in the use of digital technology in the pilot schools as a result of teachers attending the Scratch training? If so, can you describe?
8	Have you seen any changes in student interest in ICT and coding as a result of the Scratch coding clubs? If so, can you describe? Is this different for male or female students?
9	Do you think that Scratch coding clubs will continue at the pilot schools? Why or why not?
10	Have you seen any changes in how teachers use digital technology and coding in the classroom since the Scratch training? If so, can you describe? If yes, you think that this change will be lasting? Why?
11	What additional support, if any, do teachers need to be able to effectively use digital technology and coding in the classroom?
12	Overall, what could be done to improve the project or make it more cost efficient?
13	What is needed to expand this project to other districts?
14	Were there any key lessons learned during the project that you would like to share?
15	Is there anything else that you would like to share about the project?

Student Digital Literacy Pre and Post Club Assessment

Instructions for Teachers	This assessment should be conducted twice during the Scratc²h 2050 Club. Pre-Assessment should be conducted during or immediately prior to the first club session Post-Assessment should be completed by the end of the Club cycle. Many skills may be demonstrated prior to club completion. For those that have not demonstrated achievement of the skills during the club, ask the student to demonstrate during or immediately following the final club session. Record student name, gender, grade level and date of assessment in the excel form provided. Record demonstrated skills for each question: 1. Easily completed the task (2 points) 2. Completed the task, but with some difficulty (1 point) 3. Was not able to complete the task (0 points) 4. Not assessed

Assessment questions

1	Student is able to turn on computer
2	Student is able to open a blank Word document and type their name
3	Student is able to open an internet browser and search “Scratch coding help”
4	Student is able to open Scratch and code a sprite to say “Hello Teacher”
5	Student is able to create a story in Scratch

Template for Scoring Most Significant Change Stories

Template for Scoring of Most Significant Change Stories for Teachers

Instruction for scoring:

Step 1: Please review the stories you have received from Teachers and rate them according to the following criteria and scoring scheme. After rating your stories, please identify your top-ranked story or stories for analysis.

- Did the Teacher identify Scratch as the most significant change unprompted (i.e., in question 1)? (1 point)
- Could the change be attributed to the Scratch training and/or ongoing online or in-person professional development opportunities? (1 point)
    - The change is a result of the Teacher incorporating skills or techniques into their everyday teaching practice OR
    - The change is a result of the Teacher's involvement with Scratch coding clubs
- Is the change likely to be sustained over time? (1 point)

Step 2: Provide the information in the table below the story or stories selected for analysis. For each story, assign one or more of the following domains and comment on why this story was chosen.

1. Effectiveness of training and/or ongoing online or in-person professional development opportunities
2. Relevance of program for Teachers
3. Availability of resources at school
4. Frequency of club sessions and duration
5. Support from school management
6. A student perspective on Scratch or STEM/ICT
7. Gender balance

Attention: Please note that you can choose one or more stories. Each story may be assigned one or more domains.

Interview Code	District	Sector	Gender	score	Assigned Domain(s)	Why the story was chosen
MSCT01	Kayonza	Rukara	male	3/3	1,2,6	From the story, the teacher clearly showed the importance of scratch to him and explained well how he used scratch as a tool to teach his subjects and students were motivation for scratch. The story shows that really the teacher understood and applied scratch in his daily teaching.
MSCT03	Kayonza	Mukarange	Male	3/3	Effectiveness of training and/or on-going online or in-person professional development opportunities,	Scratch is not just scratch and programming for the kids, but powerful tools to grab the attention of students as teaching aids in other subjects or as a successful full way of teaching and integrating

					Relevance of program for Teachers	technology among the students. and finally, his professionalism and skills have changed because the student from the clubs have a vision and their performance in all subjects has improved because of the new skill they have gained from the new techniques from their teacher which relating scratch and technology to the real life of the students.
MSCT 07	Kayonza	Gahini	Male	8,5/10	1,2,3, 5,6	The primary domain of the teacher is in science. This scratch was the big opportunity of the teacher to experience the works using computer. Learning scratch for the first and be able to teach his students the coding was helping to understand more. Now the teacher can relate his science courses to scratch by finding the perfect examples and express them using scratch. This story was chosen to be the best
MSCT10	Kayonza	Mukarange	Male	10	1. Effectiveness of training and/or on-going online or in-person professional development opportunities 2. Relevance of program for Teachers 3. Availability of resources at school 4. Frequency of club sessions and duration 5. Support from school management 6. Student perspective on Scratch or STEM/ICT 7. Gender balance	The teacher articulated well how scratch improved his computer skills. The teacher explained how scratch made them enhance lesson plans by using technology and how his computer knowledge increased.

MSCT11	KAYONZA	RUKARA	MALE	3/4	• Relevance of program for Teachers • Effectiveness of training and/or on-going online or in-person professional development opportunities • Student perspective on Scratch or STEM/ICT	The story links the time before the introduction of scratch and the post implementation of scratch. It also highlights the glories that came to teachers in the teaching activities of their everyday chores.
MSCT15	Kayonza	Mwili	Male	9/10	1,2,3,4,5,6	I select his story as the best because he showed the relevance of teaching scratch to students. Also, he understands that there should be time to teach scratch to students, he knows how to use the little resources they have at their school. He knows its application in STEM subjects and also teaches it to students.
MSCT17	Kayonza	Rukara	Male	3	Relevance of program for teachers	The teacher explained how different programs such as digital literacy training and scratch training improved his skills and engagement of the students in his course. The teacher shows eagerness to keep using scratch in his teaching practices.
MSCT06	Kayonza	Gahini	Female	3	1,2,6	The teacher clearly shows how scratch training has impacted her and she is now able to teach scratch and make research to improve her skills.
MSCT14	Kayonza	Gahini	Male	3/3	1,2,6	I have selected this story because he explains more clearly the change. Both for him and for learners.
MSCT19	Kayonza	Gahini	Male	3/3	1, 6	In the story, the teacher focuses on the integration of Scratch into the Maths curriculum. Learning to work with Scratch helped the teacher to become more innovative to teach his subject, which has sparked more interest by learners. He's more confident with technology and innovation and learners are more interested in Maths and Scratch.

Template for scoring of Most Significant Change stories for Learners

Instruction for scoring:
Step 1: Please review the stories you have received from Learners and rate them according to the following criteria and scoring scheme. After rating your stories, please identify your top ranked story or stories.

- Did the Learner identify Scratch as a most significant change unprompted (i.e., in question 1)? **(1 point)**
    - Was the change attributed to participation in a Scratch club? **(1 point)**
- Did the Learner attribute the change directly or indirect to Teachers' knowledge, skills, attitudes or practices, either in the Scratch club or classes? (**1 point)**
- Is the change likely to be sustained over time? **(1 point)**

Step 2: Provide the information in the table below for the top ranked story or stories. For each story, assign one or more of the following domains and comment why this story was chosen.

1. Effectiveness of Scratch clubs
2. Scratch club Teachers
3. Student perspective on Scratch or STEM/ICT
4. Teachers' approach to STEM/ICT
5. Support system (family, friends, school management)
6. Availability of resources at school

Attention: Please note that you can choose one or more stories. Each story may be assigned one or more domains.

Interview Code	District	Sector	Gender	score	Assigned Domain(s)	Why story was chosen
MSCL04	Kayonza	Kigabiro	female	4/4	1,3,4,5,6	the story is so interesting, the learner explained deeply what she gained from the scratch club like developing some projects, presentation skills, ICT skills and she highlighted that she gained skills to the extent of applying it and become a film and games producer in future.
MSCL07	Kayonza	Murundi	Female	3/3	Effectiveness of Scratch clubs, Student perspective on Scratch or STEM/ICT	She has already decided not to be a homegirl after school because of scratch. in her future plan, there is Scratch and technology in general. she has mentioned how she has gained new skills from that club like computer skills, public speaking(confidence), and team working which can improve

						the way she was learning other subjects before not only technology.
MSCL 14	Kayonza	Gahini	Male	9/10	1,2,3,4,5,6	The students participated in the club have given him a lot of skills and knowledge. A part of learning how to code in scratch, the students have gained the way to think critically when they were preparing for the hackathon competition and be able to present the project in the public. This student is selected to have the best story.
MSCL20	Kayonza	Rukara	Male	10	1,2,3,4,5,6	The story was chosen because the learner articulates each point well and these seem to have made him learn a lot.
MSCL22	KAYONZA	GAHINI	FEMALE	4	● Effectiveness of Scratch clubs ● Scratch club Teachers ● Student perspective on Scratch or STEM/ICT ● Support system (family, friends, school management)	Regardless of the hurdles the learner goes through, she still manages to make something pleasant out of the scratch journey. She is also an educational element as she shares everything with her family and in the course, the family gets to support her immensely.
MSCL23	KAYONZA	RUKARA	FEMALE	4	● Effectiveness of Scratch clubs ● Student perspective on Scratch or STEM/ICT ● Support system (family, friends, school management) ● Availability of resources at school	The learner clearly understands the way forward with scratch and clearly outlines the journey to her success around operating the computer. The learner also has had a great trip in the "Exposure Visits" and she is so determined to get future digital.
MSCL24	KAYONZA	RUKARA	FEMALE	4	● Student perspective on Scratch or STEM/ICT	The learner splits the downsides of not knowing scratch and also entails the advantages of having known scratch. In addition, the learner showed that she did not only study scratch in the coding club journey but also learned the basic computer skills in the course of learning scratch

MSCL35	Kayonza	Mwili	Female	7.4/10	1,3,5,6	she is the best scorer because she tried to explain scratch study relevance and availability of time at their school to study scratch. although she does not mention teachers' participation in their studies but understands the relevance of studying scratch and its use in STEM subjects.
MSCL40	Kayonza	Mukarange	Male	4	Student perspective on Scratch, effectiveness of Scratch clubs	The learner was able to discuss the relevance of Scratch for his professional growth. Specifically, the learner discussed how scratch improved his technology skills, improved his collaboration skills and built his confidence. I also liked that the learner found Scratch as an opportunity to network with individuals who can assist with work opportunities/skills development.
MSCL10	Kayonza	Mukarange	Female	3	1,3,5,6	She is giving more specific examples and really showing how scratch program helped her improve.
MSCL25	Kayonza	Mukarange	Female	3/4		I have chosen this story because the learner clearly explains the change both in skills and in other 21st century skills such as communication.
MSCL31	Kayonza	Mwili	Female	4/4	1, 3, 5	The participation in the coding club opened many opportunities for this learner. She didn't only increase her computer skills, she also strengthened her collaboration skills with other learners, helping them with their own Scratch projects (teamwork). It has built her confidence. She also replaced teachers when they were not available for the coding clubs. It has made her more open-minded, be more creative (think out of the box) and encouraged her to learn and explore. She also received a lot of support from her parents.

Annex 4. Most Significant Change Case Studies

Benon Karuhanga

Title: Physics and ICT Teacher
School: New Life Christian Academy
Location Type: Rural
Gender: Male
Age: 36

"The most significant change that has happened to me in this school year is the Scratch project helped us to get training on the use of Scratch, which helped us also to teach it to students."

Before participating in the SCRATC^{2}H 2050 pilot, Benon Karuhanga did not understand the full potential Scratch had for him, his teaching practice, and his students. He had experience with other coding languages but saw the simple block-based coding language as a "useless" and only for children's games.

"Before, I thought that Scratch was for children as they used to create games only. But now, I know that I can use it in different things."

The SCRATC^{2}H 2050 pilot unlocked the importance of Scratch for Karuhanga by giving him basic Scratch skills and helping him understand how the coding language could be linked to other STEM subjects.

"I was able to understand how Scratch is connected to other subjects we teach, and how I can use it as a tool in my teaching duties. For example, I learn how to create different animations and images using Scratch."

Scratch became a way for him to present advanced concepts to learners in engaging way while also streamlining his workflow as a teacher.

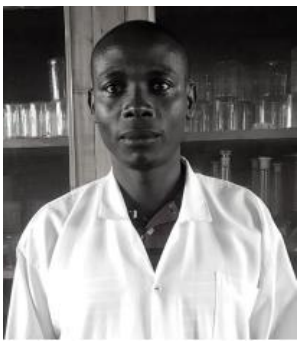
"Before I used to teach by drawing different diagrams. But now, I create diagrams using Scratch, and present them while teaching, which makes it easy for me to explain them to students. For example, I was able to create electric circuit diagrams we use in Physics using Scratch. So, this eases my teaching duties as I am not doing many drawings."

The training also helped create a collaborative environment for digital literacy. For example, although Benson had a high level of digital literacy before the training, Karuhanga found that his "fellow teachers had no skills about ICT, but because of the training, they were able to support me to facilitate these clubs." Additionally, now when he has questions, he can turn to the ScratchEd Online platform to discuss with other teachers and trainers. He also leverages the resource videos and lesson plans on the platform to provide students with engaging Scratch projects without needing to invest significant time doing research or developing lesson plans from scratch.

Karuhanga also observed concrete changes in students since participating in the SCRATC^{2}H 2050 pilot. He describes Scratch as a way for students to support each other, learn how to research and problem solve, and build their self-confidence, especially through participating in events like the Zorobots exposure visit and Hackathon competition.

"Scratch opened a way to motivate our students. Scratch helped students to increase interests of studying ICT and doing research. Again, through the competition, Scratch improved self-confidence and winning spirit of our students, which is helping them to succeed also in their studies."

Nzabarankize J. Damascene



Title: STEM Teacher
School: G.S. Guru
Location Type: Rural
Gender: Male
Age: 37

The most significant change that has happened to me in this school year is "I received training on coding which helped me and also, I was able to share the knowledge with my students."

Nzabarankize J. Damascene joined the SCRATC^{2}H 2050 pilot as a teacher with very limited digital literacy and no previous experience in Scratch, but a desire to learn more complex applications like Excel.

"I had basic skills on the computer like using PowerPoint, Microsoft word and Gmail only…We would all use the head teacher's computer, and I didn't know how to use most of the applications [like] Excel, I wanted to use it. I would ask for support from my colleague. ***When it comes to Scratch, I didn't even know that it exists or how it works.****"*

He left the SCRATC^{2}H training with increased digital literacy skills and a basic ability to accomplish simple skills in Scratch. Equally as important, he completed the training with an understanding of how this knowledge would directly change how he engaged students.

"I learnt a new programming language and also saw that [Scratch] could be used in teaching. When you are explaining a topic to students using animation, they will be much more interested than writing on the blackboard. In short, ***I can say that [the training] created much awareness to me on how technology can be used in teaching.*** *Now that I am able to make short stories, If there is an important message I want to share with my students, I use animation."*

Damascene reported that engaging his students with technology in the classroom and how he adapted his teaching practice after the training changed how learners absorbed complex messages.

"Nowadays, I try to relate the subject to real examples, and I have seen that students understand this method better when I make examples on the computer."

Damascene also noted significant changes in students as a result of the SCRATC^{2}H coding clubs. Living in a rural area, Damascene reports that most of his students had very limited exposure to computers prior to the pilot project. Practical computer experience afforded by the clubs, even through simple tasks like clicking on different icons or downloading and installing the Scratch application, "created curiosity in students." Students came to the coding clubs to learn Scratch and left with a greater understanding of how to do research across school subjects, ultimately improving their overall performance, according to Damascene. Since boys and girls equitably participate in the clubs and demonstrate similar gains, Damascene also saw the clubs as important for cutting the "myth of girls thinking that boys are better than them in academics."

"You find that they are very interested in knowing new things. In the club, we encourage them to make projects. Even in academics, it has increased their participation."

A great motivator for Damascene and, as he reports, for his students was the project-based learning model of the SCRATC^{2}H coding clubs and hackathon competitions. Damascene was able to support one student who made a project that was selected to represent his school at the Sector level, which was a success to Damascene and his wider school, motivating him and giving him the courage to continue to do advance his Scratch and digital literacy skills.

Angel Ingabire

Title: Student
School: New Life Christian Academy
Location Type: Rural
Gender: Female

"Scratch has made me feel more interested in coding… it enabled me to gain new skills in using Scratch as an easy way to code without many processes. Moreover, through Scratch, I was able to attend an exposure visit which made me see all the things you can do with it….The way that I view opportunities for my future has also changed as I have decided to never take any opportunity for granted or judge it, regardless of how simple it may look."

When SCRATC^{2}H coding clubs were launched in her school, Angel Ingabire was passionate about joining. Because her major included computer science, she was already excited about programming and had a keen interest in coding. Her first exposure to Scratch at the club, however, left her skeptical. She had a harder time visualizing how the simple block-based language would translate to more complex deliverables or tangible products. Because of her previous experience with programming, she quickly picked up the new language. Through the SCRATC^{2}H coding clubs, her classmates developed a sense of teamwork as they supported each other in learning new skills while having fun coding together. After engaging with Scratch through the coding club, she decided the part of Scratch that made her skeptical at first – it's simplicity – was also a key reason it was so enjoyable to use. Without advanced coding knowledge, her and her classmates could accomplish tasks just by putting together some blocks of code.

"Scratch has made me feel more interested in coding as I have found it very fun and easy. With Scratch, it is very easy to create something and get the result immediately. This is what it makes it different from other programming languages which require mathematical concepts and other instructions."

To Angel, simple nature of Scratch also made the language more practical for her and her classmates. For instance, she worked with other students to create a project about COVID-19 detailing how it started, how the virus spreads, and detailing the importance of getting vaccinated. Angel and her team's project was selected as a winner in the hack-a-thon competition at the district level. Her participation in an exposure visit further quelled her initial skepticism as she directly saw how Scratch could be used for very complex projects like coding robots.

"Moreover, through Scratch, I was able to attend an exposure visit which made me see all the things you can do with it. I learned how you can use coding through Scratch, and make a robot be in function."

Angel noted how the coding clubs shifted her practices and perspective as a learner. She can now use her free time to further hone her Scratch skills and she engages more in school activities.

"I used to not attend many clubs before at school, but because of attending the Scratch club, I started to be engaged in it a lot. It even motivated me to keep on loving my major [Computer Science] for now."

Her motivation extends beyond her major with her identifying how her newly developed Scratch skills will propel her as she advances academically and professionally.

"Scratch club has helped me to gain new skills in coding easily, and I believe that what I have gained will keep on being impactful to me even in the future. My goal is to grab that chance as long as I have the skills to do it, nothing will stop me."

Alice Niyomukiza

Title: Student
School: G.S. Rwisirabo
Location Type: Rural
Gender: Female

*"I am more open-minded compared to before as now **I am even willing to innovate, think outside the box, explore and learn**…Participation in Scratch club increased my curiosity to know more not only in the technology world, but also in academics, which led to positive results where my academic performance increased remarkably."*

"My opportunities in the future expanded from limited choices to a variety of choices." According to Alice Niyomukiza, participation in SCRATC^{2}H coding clubs opened doors to a future with more options. The coding clubs helped Alice to break down mental barriers around STEM/ICT learning, making her more interested in pursuing advanced academic and a professional career around technology.

"Participating in Scratch clubs opened me to the idea of pursuing computer science in university. Before, this was not among my options as I thought Computer science was hard and complicated…With more advanced skills in technology, I believe I will have different opportunities in the future as technology quickly evolves."

Coding clubs created a space for Alice to learn coding concepts and advance her digital literacy skills while having fun with her peers. She created practical projects, like a Body Mass Index project, which made her proud of her skills and motivated her to keep developing these skills. By having an opportunity to practice what she learned, she grew from a basic computer user to a source of support for other students. Her enthusiasm for the clubs was infectious at her school, and her support motivated other students to enjoy Scratch as well. Teachers also saw Alice as a Scratch point person, directing other students' questions to Alice.

"Scratch became my channel/way of assisting my colleagues. I liked Scratch and motivated other students to learn it which made more students open to approach me for support and peer guidance regarding Scratch. Scratch is a significant change as it made me popular in the school for a positive reason of helping other students in Scratch."

Alice reported an increased ability to innovate and troubleshoot, even in other subjects, due to her participation in the coding clubs. She described spending more time using computers to research and find her own answers for all of her classes. Additionally, increased facetime with teachers at coding clubs encouraged her to ask questions about her academics across the board. The increased curiosity and motivation reportedly gained by participating in the clubs led Alice to ask strategic questions, enabling her to more comprehensively absorb learning across all subjects, resulting in increased academic performance.

"Participating in Scratch club increased my curiosity to know more not only in the technology world but also in my academics, and that spirit of curiosity together with working often with teachers in the scratch club opened me to asking questions when I am in class to understand more about introduced chapters in class which led to positive results where my academic performance increased remarkably."