Project Evaluation Report

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Notes:

Some annexes listed in the contents page of this document have not been included because of challenges with capturing them as an A4 PDF document or because they are documents intended for programme purposes only. If you would like access to any of these annexes, please enquire about their availability by emailing uk_girls_education_challenge@pwc.com

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iMlango Transitions midpoint research report

Avanti

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Acronyms and abbreviations

BoM	Board of Management
DFID	Department for International Development
DLA	Discovery Learning Alliance
CSO	Curriculum Support Officer
EGMA	Early Grade Mathematics Assessment
EGRA	Early Grade Reading Assessment
FM	Fund Manager
GEC	Girls' Education Challenge
ICT	Information and Communications Technology
KICD	Kenya Institute of Curriculum Development
KII	Key informant interview
MEL	Monitoring, Evaluation and Learning
MoEST	Government, Ministry of Education, Science and Technology
PTA	Parent Teacher Association
RQ	Research question
SDG	Sustainable Development Goal
SEGMA	Secondary Grade Mathematics Assessment
ToC	Theory of Change
ToR	Terms of Reference
VfM	Value for Money

Glossary of key terms

EdTech: EdTech is an abbreviation of Education Technology. It is the broad term that encompasses the wide range of ways in which technologies can be used in education. It includes the use of technology at the individual, classroom and school levels, and in education system management, and includes both formal and informal education. It largely focuses on digital technologies and is closely linked to the narrower term 'e-learning'. The intention within the sector that identifies as EdTech is to improve the way in which technologies can be used to enhance education as a whole and, most often, enhance student learning outcomes.

Gender Responsive Pedagogy: The definition of Gender Responsive Pedagogy (GRP) used for the data collection, analysis and presentation of findings refers to teaching and learning processes that emphasise the specific learning needs of girls and boys.[1]

Maths Age: Progress in Maths-Whizz is measured through Maths Age. A Maths Age of 8.5, means the student is performing at the overall level that is expected of an eight-and-a-half year old. Higher attaining students may have a higher Maths Age than their actual age, whereas struggling students may have a lower Maths Age than their actual age.[2]

Maths-Whizz virtual tutoring programme: This is composed of three components: (i) an adaptive, online virtual tutor, which guides students through a comprehensive mathematical curriculum, delivering lessons tailored to individual needs; (ii) live reporting, which provides real-time data on student progress from the ongoing formative assessments built into the programme; and (iii) Teachers' Resource, a collection of lessons and instructional resources for teachers that support lesson planning and enable richer classroom dynamics.[3]

School administration: The definition of school administration used for the data collection, analysis and presentation of findings is inclusive of (i) head teachers on their own, and (ii) the Board of Management.

Whole-class lesson: A whole-class lesson in the context of this report refers to the use of project equipment (i.e. a laptop and projector) to deliver iMlango resources during a classroom lesson.

[1] Mlama P, Dioum M, Makoye H, Murage L, Wagah M, Washika R. (2005). Gender Responsive Pedagogy: A Teacher's Handbook. Nairobi, Kenya: Forum for African Women Educationalists. Retrieved from: http://www.ungei.org/files/FAWE_GRP_ENGLISH_VERSION .pdf. Accessed June 25, 2018.
[2] Whizz Education (2018). Whizz Education Proof Pack. Retrieved from: https://www.whizzeducation.com/wp-content/uploads/Whizz-Education-Proof-Pack-1.pdf
[3] Whizz Education (March 2019). Data to insight to action. Retrieved from: https://www.whizzeducation.com/wp-content/uploads/White-Paper-Data-to-Insight-to-Action-Whizz-Education.pdf

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Executive summary

The iMlango Transitions midpoint research study provides a strategic assessment of the delivery, effectiveness and impact of the project. It considers the impact of using technology to support pupil learning and the factors which have enabled or constrained this learning. It explores what is working and what is not working within the learning and teaching environments and assesses how this varies according to different school contexts. It also assesses who benefits and to what degree from the intervention and under what circumstances.

Chapter 1 provides an overview of the study, the rationale for the adopted approach to the study in light of COVID-19, the structure of the report, its intended audiences, and a summary of the additional deliverables.

Chapter 2 presents the methodology for the study. The methodology was guided by research questions within four research themes: pupil learning, teacher practices, school management practices and the use of data to inform decision-making, and project sustainability and scalability. The study employed a mixed methods design and a sequenced approach to data collection and analysis. This included four phases: (i) inception phase, which included a document review and key stakeholder workshops; (2) school-level quantitative data, which included student numeracy data from Maths-Whizz and EGMA/SeGMA data, student literacy data from sQuid's iMlango portal and EGRA data, teacher portal usage data, and a digital teacher survey; (3) project-level qualitative data, which included key informant interviews (KIIs) with iMlango consortium partners; and (4) school-level qualitative data, which included KIIs with teachers, head teachers, and Parent Teacher Association (PTA) or Board of Management (BoM).

Chapter 3 provides a summary of the background to the project, including the operating context, the Theory of Change, and beneficiary numbers. iMlango Transitions (iMlango-T) is a project working in 205 primary schools and 40 secondary schools, which seeks to support improvements to girls' learning in Kenya. The schools are spread across four counties: Kajiado, Kilifi, Makueni, and Uasin Gishu. iMlango's Theory of Change seeks to support improvements to girls' learning by providing: (i) teaching and learning interventions focused on the immediate need for higher quality teaching, and better learning content, and (ii) interventions designed specifically to challenge the gendered expectations which act to limit the academic performance, aspirations and progression of the most marginalised girls (and specific groups of marginalised boys). The project works at four levels: the individual (pupil), the school, the community, and the system. The interconnectedness of these four areas is intended to ensure long-lasting results that directly affect all related beneficiaries and stakeholders.

Research theme 1: pupil learning

Chapter 4 presents findings from research theme 1, which explores numeracy and literacy learning improvements, the reach and access of individualised learning content, exposure time, gender and social inclusion, and additional direct benefits for learners.

Changes in learning regarding progress in numeracy were measured through a calculation of progress rates based on Maths-Whizz portal data and numeracy learning assessment data collected by the project (i.e. EGMA and SeGMA scores). According to Maths-Whizz progress rate data, using the portal for the recommended amount of time results in a higher than expected progress rate and shows a strong correlation between time spent on the portal per week and an increase in progress rates. Analysis of January 2020 EGMA and SeGMA results

shows that students that spent between 30 to 90 minutes on the portal scored 3.11 marks higher than students that spent 0 to 29 minutes per week on average on the portal. However, the findings from the assessment data are mixed and are subject to limitations. Students who spend the recommended time per week on the Maths-Whizz portal have a higher average progress rate than students who spend less than 30 minutes per week. However, it is not possible to prove that learners who are performing well or improving fastest are doing so because they are receiving the recommended time per week of lab learning. The average number of minutes spent on the Maths-Whizz portal per week is 17 per student, which is lower than the recommended 30 to 90 minutes of usage per week. Five barriers emerged as impacting whether students are able to receive the recommended time per week: (i) power and connectivity, (ii) having a limited number of computers, (iii) breakdown of devices, (iv) poor attendance, and (v) the digital literacy of students. The research findings did not indicate a clear trend of students receiving or not receiving the recommended 30 minutes of Maths-Whizz based on gender and social inclusion.

Changes in learning regarding progress in literacy were measured through a comparison of sQuid's iMlango portal data and literacy learning assessment scores (i.e. EGRA scores). Usage of literacy portal data over time and EGRA results indicate that there is a positive correlation between more time spent on the platform and learning outcomes in literacy, although the trend is not completely linear. The findings related to portal usage and changes in learning outcomes are mixed, showing a decrease in results for some students with higher usage of the platform. As such, spending more time on the portal does not necessarily lead to improvements in literacy outcomes for all students. For sQuid's iMlango portal, on average each student spent a total of 15 minutes per month.

Additional non-numeracy and non-literacy benefits for learners cited by iMlango stakeholders include improved digital literacy, increased enthusiasm for learning, improved attendance, and pupil confidence.

Research theme 2: teacher practices

Chapter 5 presents findings from research theme 2, which explores teaching approaches and practices, school ICT lab sessions, whole-class lessons, teacher confidence using whole-class resources, and influential factors for using projected content.

School ICT labs, where available, and whole-class lesson resources appear to be used by teachers on a regular basis and are becoming embedded in teacher approaches to improving pupil learning. However, analysis of teacher usage of sQuid's iMlango teacher portal reveals that many teachers are not using the portal consistently. Time per login is low and many teachers are only logging into the portal in one or two active teaching months. There is scope to increase teachers' use of some available approaches, such as the Children's Encyclopaedia and Gender Responsive Pedagogy.

Enablers and barriers for achieving a well-executed ICT lab session were explored. Enablers were grouped within two broad themes: (i) preparing for the session and (ii) having support systems in place, such as student champions and supportive senior management. Four themes emerged as barriers: (i) availability of the lab, (ii) hardware (i.e. a low number of working and available computers), (iii) unreliable electricity and internet connectivity, and (iv) and technical skills of teachers (i.e. the necessary digital and technical skills to adequately supervise and support students). Enablers and barriers for achieving a well-executed whole-class lesson were similarly explored. Four themes emerged as enablers: (i) preparing for the lesson and (ii) teacher confidence in the use of the equipment and resources, (iii) teacher familiarity with the available content and how it aligns with the

curriculum, and (iv) the employment of classroom management techniques. Two themes emerged as barriers, which were similar to those of the ICT lab session: (i) availability of projectors and (ii) unreliable electricity and internet connectivity.

Five factors emerged as influencing a teacher's decision to use projected content: (i) availability of the projector, (ii) teacher confidence, (iii) use of a timetable (i.e. teachers used projected content when they were timetabled to do so), (iv) power supply and internet connectivity, and (v) digital literacy and prior experience using ICT in the classroom.

Research theme 3: school management practices and the use of data to inform decision-making

Chapter 6 presents findings from research theme 3 on school management practices and the use of data to inform decision-making at project, administrative and classroom levels. The use of data to inform decision-making at the project level includes adaptations to project interventions and activities credited to the availability of meaningful, real-time continuous data in tandem with rich contextual knowledge gained from engagement in local communities has the potential to transform the education sector. Knowledge and use of school data at the administrative level was present across most schools, but was most clearly observed in high and medium usage schools. Findings indicated that the use of data to monitor and follow-up on attendance and portal usage of individual students was common amongst head teachers, however there was little evidence that project data was being used for longer-term school planning and decision-making at the school management level. The use of data at the classroom level includes teachers using data for decision-making purposes during their lesson planning. The findings indicated that the majority of teachers found classroom-level data reports produced by the project helpful for their lesson planning, and only a small minority reported that they do not use the reports at all.

Research theme 4: project sustainability and scalability

Chapter 7 presents findings from research theme 4 on project sustainability at the school, community and government levels, value for money, and scalability.

The midpoint research indicates that the majority of participating schools are not prepared for the closure of the project, and do not have realistic and sufficiently-developed plans in place for how activities will be continued. It is therefore an urgent priority to communicate clearly with all schools that the project is approaching completion, and to give as much guidance as possible regarding the anticipated role of schools within future activities. Findings indicate that there is a varied community response, although the communities in which iMlango operates are largely positive towards the project. Further research needed into the microfinancing intervention as well as the mobile application and their contributions to sustainability. Government buy-in and relationship building has been a particular focus in the second phase of the iMlango project in reference to sustainability. Despite significant achievements, most partners interviewed stated that iMlango would have benefited from having closer alignment and commitment from the government from the outset. Partners agreed that securing a nominal but multi-year financial contribution from the government at the outset would have increased the prospects for sustainability. It will therefore be necessary to engage in strategic dialogue across the consortium regarding the best way to align project activities with the current government strategic priorities for EdTech.

Consortium partners were optimistic about the future value proposition of iMlango, explaining how much had been learned through the previous years about the best way to implement the project effectively. However, it appears that the aspiration for increased

efficiency has not yet translated into full disclosure and visibility of costing between project partners, and to external parties. It is an urgent priority for the consortium partners to now develop and distribute fully transparent and detailed cost models, so that external parties can make their own assessment of the cost-effectiveness of the approach.

Consortium partners had considered and detailed perspectives regarding the barriers that make it difficult for iMlango to scale and, unsurprisingly, these are closely linked to the difficulties faced in the sector more widely. Key issues identified can be categorised into four main types: barriers because of design decisions that were taken at the outset, barriers linked to the implementation approach, barriers linked to the operating context, and barriers common to the wider sector.

Chapter 8 offers brief concluding remarks and a series of recommendations regarding final stage adaptations of the project, learning for the endline, and learning for the GEC and the wider sector.

1. Introduction

1.1. Overview of the study

The iMlango Transitions midpoint research study provides a strategic assessment of the delivery, effectiveness and impact of the project. It considers the impact of using technology to support pupil learning and the factors which have enabled or constrained this learning. It explores what is working and what is not working within the learning and teaching environments and assesses how this varies according to different school contexts. It also assesses who benefits and to what degree from the intervention and under what circumstances.

The specific objectives of the midpoint study are:

- To improve the policies to leverage the resources available.
- To understand the mechanisms and support needed for the teachers to embrace best practice in the classroom.
- To increase the reach of individualised learning content to the beneficiaries.
- To understand and disseminate the lessons learned to the wider international audience.

1.2. Rationale for the adopted approach

The study has been conducted in place of a conventional Girls' Education Challenge (GEC) midline evaluation. It was decided by the Department for International Development (DFID), the Fund Manager (FM), and Avanti that the alternative approach utilised would best serve the needs of iMlango at this review point. Specifically, the decision was taken that the midpoint review would focus in-depth on the specific elements of iMlango which relate to EdTech, rather than the project as a whole.

The data collection for the iMlango baseline evaluation took place in May 2018 and the full report was submitted to the FM in September 2018. A combination of factors led to delays in the execution of the full midline study that was originally planned for September 2019. As a result, it was agreed that a streamlined, targeted analysis would be conducted, with the aim of producing an evaluation that does not incorporate large-scale learning assessment data but does provide robust evidence to allow for the reflections and programmatic adaptations to happen within the key pillars of the project intervention.

The study methodology sought to enable data collection and analysis that will help ensure iMlango can prepare for the endline evaluation from a position of strength and with strategic insight regarding the programme future. The travel restrictions imposed as a result of COVID-19 have meant that the study has been solely desk-based and has utilised extensive remote data collection exercises.

1.3. Structure of the report

The report begins with a summary of the methodological approach and process employed for the midpoint data collection and analysis (Chapter 2). It then provides a summary of the background to the project, including the project context, the Theory of Change, and an overview of the target beneficiary groups and numbers (Chapter 3). Findings from the four main research themes are then presented in turn: research theme 1: pupil learning (Chapter 4), research theme 2: teacher practices (Chapter 5), research theme 3: school management practices and use of data to inform decision-making (Chapter 6), and research

theme 4: project sustainability and scalability (Chapter 7). Each research theme chapter is structured similarly: they open with an overview of the chapter's content, present a summary of associated research questions before transitioning into relevant sub-themes, and each chapter closes with key learning points from the theme. Following this thematic analysis, the report closes with conclusions and recommendations (Chapter 8) for iMlango and the sector more widely. Appendices are included at the end of the report which provide additional information regarding the project background, the methodological approach, further data analysis where it was not appropriate to keep it in the body of the report, as well as two school case studies on a high and low performing school.

1.4. Intended audiences

The intended audiences for the study are:

- Project Management team, project partners and government stakeholders to inform improvements in the delivery of the project ahead of the endline evaluation.
- FM to feed into and identify insights in order to inform programme level questions.
- Project Management team to leverage additional resources from existing and new partners and stakeholders in order to scale-up and sustain the activities/benefits delivered by the project.
- Project Management team to support the ongoing development and implementation of the project's sustainability and succession strategies.
- Other donors, academic institutions and education networks to inform the wider policy debate concerning the education of girls and marginalised girls.
- Partners, stakeholders and the Government, Ministry of Education, Science and Technology (MoEST) to learn lessons from the project for the purpose of replicating what works elsewhere.

1.5. Additional deliverables

This report sits alongside three additional deliverables that have also been developed as outputs from the midpoint review. These are:

- A PowerPoint presentation of key findings that provides an accessible visual summary of the midpoint research report for all relevant stakeholders.
- A briefing designed to be accessible for governments that provides a summary of the most significant insights from iMlango that can help shape future programmes and policies.
- A strategic learning document that focuses on the implications of the learning from study for the broader Avanti strategy for contributing to Sustainable Development Goal (SDG) 4.[4]

2. Methodology

2.1. Research questions and themes

The research questions (RQs) presented in the table below provided the framework for the study design. These questions were taken from the Terms of Reference (ToR) (see Appendix B) and were discussed and prioritised in conversation with the project partners and FM in

[4] SDG4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

light of COVID-19 travel restrictions. Several original questions were adapted and rephrased, and others were removed because of the constraints of a fully distance-based methodology. The research questions are organised within four key research themes: pupil learning, teacher practices in the classroom, school management practices and the use of data to inform decision-making, and project sustainability and scalability.

Table 1: Research questions

RQ#	Research question
Central research question	
Under which conditions do Information and Communications Technology (ICT) resources, provided by iMlango, improve literacy and numeracy? From this what can we say about the value added of using and providing EdTech in Kenyan schools?	
Research theme 1: pupil learning	
1.1	To what extent are learning level improvements seen from the Maths-Whizz and Longhorn content data?
1.1.A	*What changes in learning have taken place regarding progress in maths? What similarities and differences exist between Maths-Whizz and Early Grade Mathematics Assessment (EGMA)/Secondary Grade Mathematics Assessment (SeGMA) data?*
1.1.B	*What changes in learning have taken place regarding progress in literacy? What similarities and differences exist between Longhorn and Early Grade Reading Assessment (EGRA) data?*[5]
1.2	What is the reach and access of individualised learning content for Maths-Whizz and Longhorn content (i.e. number of students accessing content for more than 0 minutes and number accessing content for the recommended amount of time or more)?
1.3	How is exposure time linked to changes in Maths-Whizz scores? How is individualised lab learning likely to be improving learning outcomes of children who do not achieve the recommended exposure time? What are the reasons for not achieving this exposure time?
1.4[6]	Who is benefiting from the recommended 30 minutes per week, who does not, and what is the process of decision-making around this? How does this relate to issues of gender and social inclusion? What are the key enablers or barriers for how more children can reach this recommended level?
1.5	How, why and under what conditions do iMlango inputs contribute to non-numeracy and non-literacy, but direct benefits for learners, such as improved

[5] Note that the original research question included further details regarding the aims of the analysis. These were removed for consistency with RQ 1.1.A, although these aims (i.e. to gauge changes in learning, describe methodological selection limitations and their limitations, and compare datasets to explain differences or similarities in trends) guided the data collection for both RQ 1.1.A and RQ 1.1.B.
[6] Please note that the original order of RQs 1.3 and 1.4 were swapped due to the flow of argument and presentation.

	digital literacy or increased enthusiasm for learning?
Research theme 2: teacher practices	
2.1	What approaches have teachers taken (or not taken) in relation to improvements in pupil learning?
2.2	What factors contribute to the achievement of a well-executed Maths or English session using the ICT school lab? What factors inhibit this achievement? What factors compromise and contribute towards the learning that comes out of such a session?
2.3	What factors contribute to the achievement of a well-executed Maths or English lesson that uses projected iMlango resources? What factors inhibit this achievement? What factors compromise and contribute to the learning that comes out of such a lesson?
2.4	To what extent do teachers feel confident in their ability to use numeracy and literacy whole-class resources as a tool to support pupil learning within a lesson (particularly as they relate to lesson objectives, teaching the whole class, alignment with curriculum, pace, formative assessment, etc.)?
2.5	What influences a teacher's decision as to whether or not they use projected content in a planned lesson? In particular, how does a teacher's confidence with the topic of the lesson influence their decision as to whether or not to use a projector?
2.5.A	*To what extent do teachers understand what projected content is available for their use and how it can be used to support specific objectives of the lesson?*
2.5.B	*What are teachers' perceptions of whether using this content helps or hinders their a) preparation of the lesson, b) delivery of the lesson, and c) ability to evaluate the lesson and what children learnt (or did not learn)?*
Research theme 3: school management practices and the use of data to inform decision-making	
3.1	To what extent are reports with automatically generated individualised student data used for school management purposes? How does the data inform decision-making at the school level? What are the perceived advantages and challenges?
3.2	How is individualised student data used at the classroom level by teachers?
Research theme 4: project sustainability and scalability	
4.1	To what extent is iMlango sustainable? What is the likelihood of school-level sustained usage of iMlango resources and content after the project ends?
4.2	To what extent does iMlango provide good Value for Money (VfM) with regard to the cost required to shift learning practices and outcomes? What conditions are required for a shift in learning practices and outcomes to take place?
4.3	To what extent is iMlango scalable? What scenarios exist for scaling the project, including implications of the Government of Kenya taking the project to scale?

(I.e. What would the costs likely be? Would this represent good value for money for the government given the findings above on effectiveness and impact?)

2.2. Summary of approach

The study employed a mixed methods design and each component is outlined below. In combination, these provide the foundation for a rigorous analysis that weaves together available project data and a series of school case studies. Central to the methodology has been a sequenced approach to data collection and analysis, separated into four tiers:

1. Inception phase:
    a. Document review including the baseline report and all other relevant project documentation.
    b. Key stakeholder workshops: an inception meeting and three virtual stakeholder meetings took place with the FM, Whizz Education, and sQuid in March 2020. These meetings discussed the priorities of the research study and for Whizz Education and sQuid, available data for the use of the midpoint study was also discussed.
2. School-level quantitative data:
    a. Student numeracy data (Maths-Whizz portal, EGMA and SeGMA data)
    b. Student literacy data (sQuid's iMlango student portal and EGRA data)
    c. Teacher portal usage data (sQuid's iMlango teacher portal)
    d. Digital teacher survey
3. Project-level qualitative data:
    a. Key informant interviews with iMlango consortium partners
4. School-level qualitative data:
    a. Key informant interviews with teachers
    b. Key informant interviews with head teachers
    c. Key informant interviews with PTA or BoM representatives

Constraints on the timeline meant that there was a degree of overlap between each tier, but with sufficient sequencing to allow the data from each tier to inform the next. Each of the above data sources are described more fully in the following section with their associated research questions they sought to address, their sample sizes and data collection and analysis considerations.

2.3. Data collection and analysis

This section provides an overview of the approach to data collection and analysis. Table 2 below provides an overview of each data source, its final sample size and the associated research questions the data source seeks to address. See Appendix D for a detailed overview of the sampling strategy for each data source, which includes how sampling was conducted alongside characteristics of the final samples.

Table 2: Data source details

Data type	Data source	Final sample size	Associated RQs
School-level quantitative data	Student numeracy data: Maths-Whizz	50,039 students	1.1; 1.1.A; 1.2; 1.3; 1.4

	Student numeracy data: EGMA/SeGMA[7]	678 students[8]	1.1; 1.1.A
	Student literacy data: sQuid	43,198 students	1.1; 1.1.B; 1.2
	Student literacy data: EGRA[9]	• 250 students with results for January/February 2020. • 68 students with two sets of learning assessment data (to assess change over time).	1.1; 1.1.B
	Teacher portal data	1526 teachers	2.1
	Digital teacher survey	280 responses	1.4; 1.5; 2.1; 2.2; 2.3; 2.4; 2.5; 3.2
Project-level qualitative data	KIIs with consortium partners	17 respondents	4.1; 4.2; 4.3
School-level qualitative data	KIIs with head teachers	8 respondents	3.1; 3.2
	KIIs with teachers	14 respondents	1.3; 1.4; 1.5; 2.1; 2.2; 2.3; 2.4; 2.5
	KIIs with PTA/BoM representatives	4 respondents	4.1

School-level quantitative data collection and analysis

Student numeracy data

Student numeracy data was derived from internal Maths-Whizz data as well as externally collected learning assessment scores. This resulted in an aggregated dataset for 50,039 students (49% female; 51% male) including the following:

- Student and school demographics (from internal Maths-Whizz data).
- Learning assessment scores, where relevant (from externally sourced EGMA and

[7] Note that for EGMA/SeGMA, this was administered by field teams, teachers and Curriculum Support Officers (CSOs) with the purpose of having teachers use results to inform their teaching practices. The project selected the 29 schools which were School Type 'C' within iMlango, and then selected all girls in the evaluation grades in those schools for the assessments.
[8] This is the number of students that completed a learning assessment in both 2019 and 2020 which allowed for comparison over time. In total, there were 739 entries for 2019, and 800 for 2020.
[9] Note that for EGRA, this was administered by field teams, teachers and CSOs with the purpose of having teachers use results to inform their teaching practices. Schools/students were sampled randomly from both evaluation and non-evaluation schools in all counties.

SeGMA results). Whizz Education conducted these assessments in collaboration with teachers, however they were not housed within the internal Maths-Whizz database.
- Student maths usage and progress rates from June 2019 to March 2020 (from internal Maths-Whizz data), excluding inactive teaching weeks.

Within the student numeracy data, Maths-Whizz data was analysed by calculating the average group progress rate for the whole time frame and each individual period using the same formula as Maths-Whizz:

Average progress rate = Average Maths Age improvement / Average Timespan (in years)

To do this, the improvement rate from each period for each student was summed together to provide the improvement rate across the four periods. Each 'period' corresponds to school term dates used in iMlango schools. The timespan was then calculated by establishing the number of active teaching weeks per period per student and this was multiplied by 0.02, which is used by Maths-Whizz to represent one week of a year. This provided the timespan for each student in years (total number of active teaching weeks * 0.02). The average usage per week for each student was calculated by the sum of the total usage for each period, divided by the sum of the number of weeks for each student. This was used to create the bands for average usage used in the analysis. Quantitative analysis of the cleaned Maths-Whizz student data was undertaken in Microsoft Excel. A copy of the anonymised, cleaned dataset is included in Appendix I1.

Student literacy data

Student literacy data was derived from internal sQuid data as well as externally collected learning assessment scores. This resulted in an aggregated dataset for 43,198 students (48% female and 52% male) including the following:

- Student and school demographics (from internal sQuid data).
- Learning assessment scores, where relevant (from externally sourced EGRA results). sQuid conducted these assessments, however they were not housed within the internal sQuid database.
- Student literacy portal usage from June 2019 to March 2020 (from internal sQuid data). Note that August, November and December 2019 were removed because they had no complete active teaching weeks.

The sample of 250 students with EGRA results for January to February is used for analysis of total portal usage over time and overall learning outcomes. The sample of 68 students with July, January and February EGRA scores is used for analysis of change over time in learning outcomes and portal usage. For students who completed both September and October EGRA examinations, October was discarded and September was kept. Students that completed EGRA in January, February and partway into March 2020, the lowest score was kept. Aggregate results were calculated for EGRA, by averaging the subtask scores (i.e. each subtask had an equal weighting). Quantitative analysis of the cleaned sQuid student literacy portal data was undertaken in Microsoft Excel. A copy of the anonymised, cleaned dataset is included in Appendix I1.

Teacher portal data

Teacher portal data included teacher and school demographics and their usage of sQuid's iMlango teacher portal. The portal data captures the number of logins and time spent logged into the portal. The portal data does not provide information about the subjects taught by

the teacher, grades or class sizes, or the activities completed when logged into the portal.

Quantitative analysis of the cleaned sQuid teacher portal usage data (1526 entries with 61% female teachers and 39% male teachers) was undertaken in Microsoft Excel on the following areas: sample demographics, number of logins, months logged in, time spent logged in and time per log in. Averages were calculated across these areas. Contingency tables were constructed to explore the relationships between variables. During analysis, the data was disaggregated by active and non-active teaching months, gender of gender, county, type of teacher (literacy or numeracy) and school intervention type. A copy of the anonymised, cleaned dataset is included in Appendix I2.

Digital teacher survey

The digital teacher survey was designed in collaboration with iMlango consortium partners and field officers, who provided contextual information and aided in defining the scope of the survey. The survey included a total of 61 questions. Three questions had open response answers and the remaining questions were designed to be closed questions with a mixture of single response, multiple choice and Likert scale questions. The finalised survey questions are included in Appendix G.

A link to the survey on Google Forms was sent to all participating iMlango teachers in all intervention school types (i.e. A/C and B), regardless of gender. Field Officers were asked to share the survey via WhatsApp forums to encourage widespread teacher participation, and the research team offered teachers 500 KSH to complete the survey as a reimbursement for their data usage in accessing the online survey. This cost was calculated in dialogue with in-country partners. The project used m-pesa as a transfer service for providing participants with reimbursements. This was clearly communicated to teachers and it is documented in further detail in the Ethical Framework in Appendix E.

The final dataset was downloaded from Google Forms and cleaned, resulting in 280 entries. Multiple choice variables were re-coded into separate binary variables and all "other" answers were re-coded. School names, SC numbers and intervention types were cleaned. Open response answers were re-coded through a qualitative coding exercise. The final dataset was anonymised, removing teachers' names, mobile phone numbers and email addresses. Quantitative analysis was undertaken on the cleaned data in Microsoft Excel on the following areas: demographic and general information, school ICT lab, iMlango portal and use of the projector in whole-class teaching, iMlango training and support, and iMlango project impact. Contingency tables were constructed to explore the relationships between different variables. Univariate and bivariate statistical analysis was conducted. During analysis, the data was disaggregated by gender of teacher, county, type of teacher (literacy or numeracy) and school intervention type. A copy of the anonymised, cleaned dataset is included in Appendix I3.

Project-level qualitative data

17 interviews were conducted with a range of iMlango consortium partners (6 from Whizz Education, 5 from sQuid, 2 from Avanti, 3 from the FM, and 1 from DFID). Field Officers were also interviewed and their insights regarding impact at the school level were leveraged when refining the digital teacher survey, school sampling strategy for the KIIs, and KII templates. The semi-structured template is included in Appendix H1, however KIIs were tailored to the individual and their organisation and informed by the findings from the school-level quantitative data analysis. Interviews were conducted remotely and lasted approximately 60 to 90 minutes.

The coding process for project-level KIIs was both inductive and deductive. An initial coding

framework was developed around the research questions associated with each template, with further codes added inductively as themes arose during the analysis process. Codes were applied and analysis was conducted using MAXQDA qualitative analysis software.

School-level qualitative data

Schools were selected based on their overall usage in Term 1 of 2020 among other factors (see Appendix D for the sampling strategy). Distance-based interviews were conducted with 26 participants (14 teachers, 8 head teachers, and 4 PTA/BoM members). A semi-structured approach was adopted in the interviews, which lasted approximately 30 minutes. The semi-structured interview templates are included in Appendix H. While connectivity was generally better than expected for the phone interviews, there were connection issues in a small number of cases, which led to poor sound quality. During a couple of interviews, connection was lost one or several times during the call, affecting the quality of the interview. In one instance, connection was lost entirely, and the research team member therefore sent a number of additional questions over email, which the participant responded to. There are broader discussions around the potential limitations of conducting interviews over the phone that require consideration. This includes the added layer of difficulty that not being face-to-face may have in building rapport and encouraging open dialogue. This and other related challenges regarding remote qualitative data collection is discussed further in the extended methodology in Appendix O as well as the methodological constraints and opportunities section below.

The coding process for school-level KIIs was the same as for project-level KIIs; both inductive and deductive. An initial coding framework was developed around the research questions associated with each template, with further codes added inductively as themes arose during the analysis process. Codes were applied and analysis was conducted using MAXQDA qualitative analysis software.

2.4. Parameters and expectations

This midpoint research study is not consistent with the standard reporting requirements for a GEC midline evaluation. The methodological approach was adapted because of the constraints on the programme and the desire to obtain more qualitative and strategic insight regarding the technology-specific aspects of iMlango.

The midpoint review does not provide a large-scale learning assessment to give comparison with the baseline report and data. The anticipation is that this will be done in some form at the endline evaluation.

The study offers brief anecdotal reflections on cost-effectiveness, but a full cost-effectiveness analysis has been deliberately excluded from the study at the request of Avanti and with agreement from the Fund Manager. Similarly, the study does not discuss the dynamics of the microloans and the impact that they may have had on attendance. While these things are outside the remit of the midpoint review, they are both important areas for future research.

2.5. Methodological limitations

A series of methodological constraints and limitations faced during data collection and analysis are discussed below. These are presented within five main areas: reliability of data, sampling bias, software, and remote data collection.

Reliability of data

EGMA, SeGMA and EGRA were conducted by project partners, teachers and CSOs and therefore not conducted with the controlled conditions required for evaluation standards. This was indeed noted by project partners when first discussing the use of this data. In addition, the sample size of schools and learners is not up to the standard the research team would usually expect at the end of an intervention cycle. The numbers of matched participants were very small and therefore the learning assessment data is not representative, especially for the EGRA results. In addition, some pupils taking the EGRA test may be repeated due to the classroom individualised need for the data. Note that these duplications were removed following the method agreed before the student's records were appended, whereby the lowest score was kept and the higher scores were removed.

Numeracy learning assessment results (i.e. EGMA/SeGMA) were matched manually to Maths-Whizz portal usage data by Whizz Education. This was based on student information such as name and date of birth, and school data. It was not possible to match data based on pupil ID as this was not recorded consistently when the learning assessments were administered. However, this was problematic in instances where there were multiple students with the same name in the same grade at a school. This means that there may be a small number of students with mismatched portal usage and learning assessment data. Further limitations regarding the numeracy learning assessment data include that it did not have subtask scores, and they were only completed by girls so a comparison of results disaggregated by gender was not possible. This was possible for student literacy data, however, and has been completed. Given the limitations in learning assessment data, it is therefore recommended that in order to assess attainment and progress in student numeracy, the Maths-Whizz progress rate should be given precedence over the learning assessment data.

For student literacy data from sQuid's iMlango portal, literacy progress was assessed only by the learning assessment results and the progress tests built into the sQuid platform were not utilised because of the small sample size. Note that the literacy platform analysis has not been disaggregated by the type of educational content e.g. Longhorn, Stories, Q-Files but rather literacy content as a whole, decided in conversation with project partners. The target time for students to engage with literacy portal content is 25 minutes per week per student. The dataset used contains data organised by months, so a more granular analysis based on minutes per week was not undertaken. In addition, in order to account for inactive teaching time throughout the year, three months did not have any complete teaching weeks and were therefore excluded from the analysis (August, November and December 2019). However, some months were not complete teaching months but had at least one complete active teaching week and were therefore retained in the analysis but will likely affect the overall results.

The main limitation of the teacher portal dataset is that the activities teachers completed when logged into the portal are not recorded. The available insights from this dataset are therefore limited to the number of logins and time spent logged in, which does not provide rich data regarding engagement and usage. Secondly, the dataset does not provide information about the classes the teacher teaches and therefore the research team was unable to disaggregate by grade or class size. Third, there is data in the dataset from August, November and December, which are months where there was not a full month of teaching and may therefore misrepresent usage figures. These have been reclassified as "non-active teaching months" rather than excluded from the dataset. Lastly, there is no comparable data from Maths-Whizz to make a comparative analysis of teacher portal usage.

As the survey was completed remotely for each individual respondent without the guidance

of an enumerator, it was not possible to ensure all questions were interpreted and answered as intended. Explanatory notes were included in some questions to support interpretation. In addition, there were financial reimbursements available for participants to cover their costs of mobile data usage to complete the online survey. This method of survey administration meant that the quality of responses were mixed and the research team had to trust that only one response was submitted for each teacher. It was not possible to stop teachers submitting more than one survey response without severely restricting the participation of teachers to only those with a Google account. During the design of this instrument, the research team developed a process to check for the quality and validity of the data through having survey information whereby school names could be matched and duplicate entries could be easily removed. In the cleaning process, all entries were cross-checked and 16 duplicate entries were removed. It is not possible, however, to be completely sure that there are no entries submitted by the same teacher. Note that further ethical considerations regarding financial reimbursements for survey completion are presented in Appendix E.

In addition, the disaggregation of data by county does not account for their differing numbers of schools. Statistical tests reveal that this has not significantly affected results. However, it is important to note when considering the findings presented in the report.

Sampling bias

The use of a digital collection method of the teacher survey may have created the potential bias towards sampling teachers with a higher level of digital literacy. Compared to a traditionally administered survey, the digital survey may have attracted respondents who are most comfortable using digital resources, meaning that they are more likely and able to complete a digital survey. A potential consequence of this is that responses could be biased in favour of positive engagement and opinion of project activities. Furthermore, only teachers with access to the internet through an ICT device, such as a smartphone or laptop, could participate in the survey, meaning that those without access are not represented in the survey sample.

For the school-level KIIs, from the schools selected in the sampling strategy, Field Officers selected the teachers and PTA or BoM representatives to take part in the research. This selection process was therefore not random and was likely skewed towards people that the Field Officers had an existing relationship with. This has potential implications for the data and should be kept in mind when interpreting the data from this source.

Software

iMlango consortium partners reported that during previous digital surveys teachers expressed an aversion to the Survey Monkey platform because of offense caused by its name. This resulted in the decision to use Google Forms for data collection. This platform has limited capacity for skip logic and may have resulted in teachers answering questions that were not relevant to them, such as a literacy teacher responding to a numeracy question. To mitigate this, an answer option of "not applicable" was included, but it is possible that some teachers may have answered questions not targeted at them. Related to this, some teachers did not know their school intervention type (A/C and B) and incorrectly selected an answer. This affected the questions asked based on skip logic tied to the school intervention type, namely regarding the school lab since school labs are only present in A/C schools. All schools were correctly identified using school code, name and location during the cleaning process. However, as a result of incorrect identification by the respondents, there were 20 B school teachers who answered the school lab questions (these were removed from the section for analysis) and 22 A/C school teachers who did not answer the

school lab questions.

Remote data collection

There is a considerable lack of knowledge, understanding and practice of how to conduct research effectively and meaningfully in the context of a global pandemic. This includes the design of effective and relevant tools and instruments that elicit the required insights while also ensuring that the process is enriching for the participants. It was therefore necessary for the research team to draw on current insights from within the sector through a review of literature and attendance at webinars. In addition, a flexible approach and systematic way of capturing successes and challenges of the methodology itself was needed, alongside a sequenced approach to the data collection and analysis.

The research team acknowledges the significant limitation in not presenting the voice of girls themselves in this research. The pivot to remote data collection resulted in the removal of data collection from students, predominantly due to logistical challenges caused by school closures, and importantly, ethical complexities that arise with attempting remote data collection of student insights. With the absence of student voices, the collection of qualitative data at the teacher level included adapted versions of research questions related to student experiences, although most research questions regarding students were removed rather than having them answered by someone else in their stead. However, even with the adapted questions, multiple biases were introduced. Examples of this include that participating teachers were selected by Field Officers, and teachers may have provided what they perceived would be desirable answers. The research team sought to mitigate this through emphasising confidentiality and anonymity and building judgement-free spaces, however this was inevitably challenging while interacting over the phone in such a short timeframe.

Remote data collection was most challenging for the collection of qualitative data for the school-level KIIs. This included making contact with teachers who were not in the school, and often not in the school's county following closures due to COVID-19. The research team leveraged the relationships between the project Field Officers and the school staff to make contact with potential interviewees. However, since the Field Officers were able to select the teachers, head teachers, and PTA/BoM representatives from those schools, there is of course an inherent bias with the sample.

For individuals who were available to participate in interviews, remote qualitative data collection presented a range of further challenges in creating a positive and enriching environment. This was firstly a result of poor connectivity in some calls, which the team mitigated through a flexible approach, whereby conversations were continued at a later time where possible. Secondly, this was a result of not being face-to-face and not having the necessary time to build a meaningful connection with interviewees. To mitigate this, the research team was intentional in all data collection interactions, ensuring that the overall culture of the interview was as carefully planned as the questions within it and utilised trauma-informed interviewing techniques. There was a large emphasis at the beginning of interviews on building rapport and trust and the interviewer addressed the difficulties of COVID-19 with compassion. In addition, every effort was made to schedule interviews around the needs of the participants.

Note that a detailed analysis of successes, challenges and areas of opportunity for remote data collection and analysis is included in Appendix O.

3. Background

3.1. Project context

iMlango Transitions (iMlango-T) is a project working in 205 primary schools and 40 secondary schools, which seeks to support improvements to girls' learning in Kenya. The schools are spread across four counties: Kajiado, Kilifi, Makueni, and Uasin Gishu. These counties were selected based on poverty rates, attendance statistics and learning achievements for girls, availability of electricity, safety, and accessibility. The majority of schools within the project are located in rural settings, with some schools situated in peri-urban regions. Table 3 outlines the number of iMlango primary schools by county. Note, this excludes the aforementioned 40 secondary schools. The different school types (A, B, and D) refer to treatment and comparison schools, where A and B schools are both treatment schools that receive different interventions and levels of resource provision[10], and D schools are comparison schools. D schools (i.e. comparison schools) are not included in this midpoint study.

Table 3: iMlango primary schools by county

School type	Kajiado	Kilifi	Makueni	Uasin Gishu	Grand total
A	16	52	26	46	140
B	10	28	11	16	65
D	4	17	29	15	65
Total	30	97	66	77	270

iMlango is delivered by a consortium of partners led by global satellite operator Avanti Communications. Its partners are sQuid, the digital transactions and eLearning solutions provider, Whizz Education, a simulated maths tutoring provider, and the social enterprise Camara Education.

3.2. Project Theory of Change

iMlango-T is a continuation of the GEC-1 project iMlango that ran for three years in the same schools and was part of the original Strategic Partnerships window within the GEC. The core project activities remain the same, with a focus on the primary school as the point of learning delivery. In order to achieve the three project outcomes of learning (numeracy and literacy), transition and sustainability, the project has worked towards five intermediate outcomes as the key project objectives:

1. Improved attendance among certain pupil sub-sets in primary schools
2. Improved quality of teaching using ICT by the primary school teachers
3. Learning progress by girls in primary schools
4. Improved life skills for girls
5. Increased use of iMlango reports by key stakeholders to inform their decision-making

[10] 'A' schools have ICT Labs whereas 'B' schools do not have ICT labs but have 2 projectors and 2 laptops.

and actions to support schools

iMlango's Theory of Change seeks to support improvements to girls' learning by providing: (i) teaching and learning interventions focused on the immediate need for higher quality teaching, and better learning content, and (ii) interventions designed specifically to challenge the gendered expectations which act to limit the academic performance, aspirations and progression of the most marginalised girls (and specific groups of marginalised boys[11]).

The project works at four levels: the individual (pupil), the school, the community, and the system. The interconnectedness of these four areas is intended to ensure long-lasting results that directly affect all related beneficiaries and stakeholders. The figure below presents the activities provided at each of these levels (for 'A' schools).

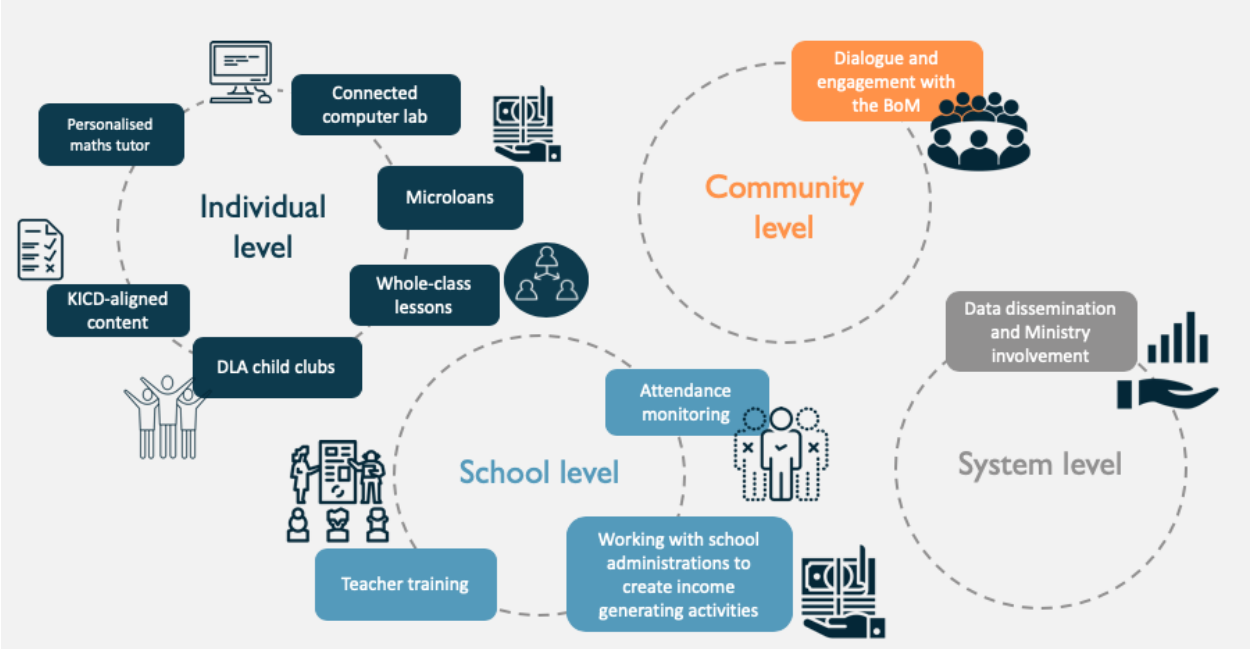


Figure 1: iMlango-T project activities[12]

These activities have a range of associated intended learning outcomes. At the individual level, the personalised maths tutor and digital learning content for literacy and life skills, KICD-aligned content, and whole-class lessons are designed to help pupils progress in numeracy and literacy, to help them transition to secondary school. Appendix C offers screenshots of the Maths-Whizz portal and Appendix J offers a user analysis for the sQuid literacy content. Whole-class learning lessons are dedicated 80% to 20% to literacy and maths respectively. The digitised content is delivered through the use of projectors, which is a strategy used in both intervention A and B schools. ICT labs are equipped with approximately 25 computers and are proportionately dedicated in 80% to 20% to math and literacy respectively, which is a strategy used in intervention A schools only. In addition to the above for individual level interventions, the provision of microloans aim to address financial barriers in order to support families to send their daughters to school. The

[11] A small percentage of boys with poor attendance are included in the stipend support initiative.
[12] Image credits (all from Noun Project): Computer by Denis Shumalov; Exam by lathiif studio; Sustainability by Made by Made; Meeting by Jesus Puertas; Data by Alfredo @ IconsAlfredo.com; absentees by Priyanka; Income by monkik; Group by SANB; training by Chaowalit Koetchuea

Discovery Learning Alliance (DLA) child clubs aim to develop life skills and increase the self-esteem of girls to engage more in the project interventions.

At the school level, continuous training and support is provided to teachers to use best practices integrating ICT into lessons. This aims to enhance their capabilities in adopting and integrating ICT into their teaching practices, thereby improving pupil learning. In addition, attendance monitoring allows for greater visibility of pupil attendance, and thus greater capacity to devise strategies to improve attendance. Lastly, the project works with school administrations to create income generating activities.

At the community level, dialogue and engagement with the BoM aims to align the project with the school's needs and mission, thereby facilitating stronger buy-in and application of the project interventions.

At the system level, data dissemination aims to lead to further Ministry involvement, which in turn helps with the continuous school-level adoption of interventions and sustainability.

In addition to the above, the project provides high-speed satellite broadband connectivity to schools, in-field teams to support the schools and ensure timely technical maintenance is delivered, and real-time project monitoring and measurement.

See Appendix A for the full iMlango Theory of Change.

3.3. Target beneficiary numbers

The following table provides a breakdown of target direct and indirect beneficiaries.

Table 4: Target direct and indirect beneficiaries

Direct beneficiaries	All girls within the project who are[13]: • In primary school: ~70,000 currently enrolled • In secondary school: ~800 per year (up to Form 3) and will come from existing beneficiaries in the primary schools • Out of school via the CIHs. The size of this group will depend on the final design of the CIH activities
Indirect beneficiaries	• Boys who are enrolled in an iMlango primary school: ~70,000. • New Standard 1 girls and boys: ~17,500 per annum.

4. Research theme 1: pupil learning

4.1. Overview

This chapter presents thematic findings regarding pupil learning in iMlango project schools. It begins with learning improvements and progress seen from the available numeracy and literacy data and considers changes in learning that have taken place as a result of project

[13] Direct and indirect beneficiary numbers were taken from Section 1.4 of the 2017 iMlango-T MEL framework (v2.4).

interventions. It then explores the reach and access of individualised learning time and the connection between exposure time and learning improvements. Issues related to gender and social inclusion regarding exposure time are additionally considered. Lastly, the chapter explores the direct but non-numeracy or literacy impacts and benefits for learners. This chapter draws largely from quantitative iMlango partner data, as well as findings from the digital teacher survey and project and school-level KIIs. The chapter closes with key learning points regarding pupil learning in iMlango project schools.

4.2. Research questions

The research questions regarding this research theme are presented in the table below.

Table 5: Research questions regarding pupil learning

RQ#	Research theme 1 research questions
1.1	To what extent are learning level improvements seen from the Maths-Whizz and Longhorn content data?
1.1.A	*What changes in learning have taken place regarding progress in maths? What similarities and differences exist between Maths-Whizz and EGMA/SeGMA data?*
1.1.B	*What changes in learning have taken place regarding progress in literacy? What similarities and differences exist between Longhorn and EGRA data?*
1.2	What is the reach and access of individualised learning content for Maths-Whizz and Longhorn content (i.e. number of students accessing content for more than 0 minutes and number accessing content for the recommended amount of time or more)?
1.3	How is exposure time linked to changes in Maths-Whizz scores? How is individualised lab learning likely to be improving learning outcomes of children who do not achieve the recommended exposure time? What are the reasons for not achieving this exposure time?
1.4	Who is benefiting from the recommended 30 minutes per week, who does not, and what is the process of decision-making around this? How does this relate to issues of gender and social inclusion? What are the key enablers or barriers for how more children can reach this recommended level?
1.5	How, why and under what conditions do iMlango inputs contribute to non-numeracy and non-literacy, but direct benefits for learners, such as improved digital literacy or increased enthusiasm for learning?

4.3. Literacy and numeracy learning improvements and progress

Overall learning improvements

RQ 1.1: To what extent are learning level improvements seen from the Maths-Whizz and Longhorn content data?

In school-level KIIs, most teachers expressed that they had seen overall learning improvements or learning improvements in both numeracy and literacy. Perceived learning

improvements as a result of the iMlango project intervention were expressed across schools in all usage bands. Some participants expressed this in general terms, however others explained that they had seen an improvement in results for national exams over the duration of the project: *'We have seen a positive impact in exam results and teaching in class. And way students participate in class'* (Teacher, medium usage school, Kajiado County).

Whilst most participants did not identify a difference in progress between numeracy and literacy, one teacher in a low usage school in Uasin Gishu said that he had observed more learning improvements in maths, than in literacy. When probed as to why, he answered:

> *'...Because of the maths resources and Maths-Whizz - and how the questions are based on levels of learners through matching ages and levels - matching with their standards. These children are able to go ahead with whatever they're doing with their gadgets, were motivated [by their progress] and saw the need to interact with it more.'*

Conversely, a teacher at another low usage school in Makueni disagreed, saying: *'Both written and spoken language has improved significantly. The inputs from iMlango have had a greater impact on literacy than on numeracy, but both have improved slightly'.*

Communication skills and reading comprehension are specific skills that several teachers referred to with regards to improvements in literacy. The teacher at one low usage school in Uasin Gishu was keen to emphasise that although they had seen some improvements, this progress had been slow, and that at the beginning of the project they had some challenges getting used to the project resources.

One exception to this overall perception of learning improvements resulting from the project was from a teacher in a medium usage school in Makueni. He said that in the previous iMlango school he worked in he had seen a big difference in terms of learning improvements, but that in the school he was at now, he had not observed the same improvements *'because of other factors affecting performance - external factors - home situations for example domestic factors like poverty, lack of community support, parents are school drop-outs, and we don't have power and so the impact is not that big'.*

Numeracy learning improvements

RQ 1.1.A: What changes in learning have taken place regarding progress in maths? What similarities and differences exist between Maths-Whizz and EGMA/SeGMA data?

Changes in learning regarding progress in numeracy were measured through two metrics, (i) calculation of progress rates based on Maths-Whizz portal data and (ii) EGMA and SeGMA data collected by the project.

The Maths-Whizz dataset is presented by four periods of active teaching weeks, roughly in line with the school term times after removing inactive term-time weeks (i.e. those with registration, or exams or half-term break):

- Period 1: 06 May 2019 to 09 June 2019
- Period 2: 24 June 2019 to 02 August 2019
- Period 3: 09 September 2019 to 11 October 2019
- Period 4: 20 January 2020 to 14 February 2020

Disaggregation of findings by grade uses the grade that the student was in during the 2019

school year.

Maths-Whizz progress rate

The international global benchmark for the expected progress rate for students using the Maths-Whizz portal is 1.0. A progress rate of 1.0 means that (if sustained) a student's Maths Age will increase by one year in a one year period. A progress rate of 0.7 means that the student has progressed at 70% of the expected international rate. For iMlango, the baseline progress rate is 0.58,[14] which means that students' Maths Ages get 0.42 years further away from age-related expectations for mathematics annually throughout primary school. In effect, there are then two levels of accelerated learning which the project is able to observe: progress rates of above 0.58, which denote acceleration above the iMlango baseline, and progress rates of above 1.0, which denote acceleration at international standards.

For the analysis for this study, the Maths-Whizz progress rate was calculated using the same formula as used by Maths-Whizz:

Average progress rate = Average Maths Age improvement / Average timespan (in years)

The Maths-Whizz progress rate data shows a strong correlation between time spent on the portal per week and an increase in progress rates. Across the four periods from May 2019 to February 2020, students who spend the recommended time on the portal have an average progress rate of 1.55, compared to 0.49 for students that spend less than 30 minutes per week. This means that students using the portal as recommended are exceeding the expected progress rate of 1 by over 50%. In contrast, students that use the portal for less than the recommended time are progressing at less than 50% of the expected rate. For students that spend more than the recommended time (i.e. more than 90 minutes a week), the average progress rate is 3.35. A breakdown of the 30 to 90 minute recommended usage band into smaller increments also shows a clear trend between time and progress rate, as shown below.

[14] This was calculated by Whizz Education using data for over 25,000 iMlango students in 2016 and is the average rate at which iMlango primary school students' Maths Ages progress without access to Maths-Whizz.

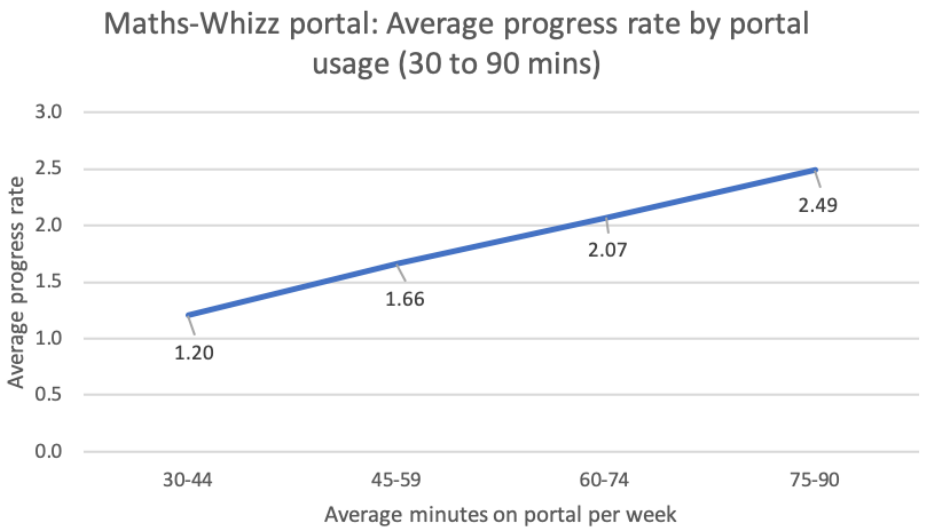


Figure 2: Average progress rate by portal usage (30 to 90 minutes)

However, it should be noted that a third of students that use the portal for the recommended amount of time did not achieve a progress rate of 1 or higher in the timeframe analysed. Female students are slightly less likely to use the platform than male students, with 31% of female students registering 0 time compared to 28% of male students. Among the counties, 35% of students in Kilifi registered 0 time, whilst Makueni had the lowest proportion at 22% of students. Grade 4 and standard 8 both have 36% of students registering no time on the portal, whilst standard 7 has the highest proportion of users, with only 25% of students not registering time. Reasons for not achieving the recommended time on the portal are presented in Section 4.5.

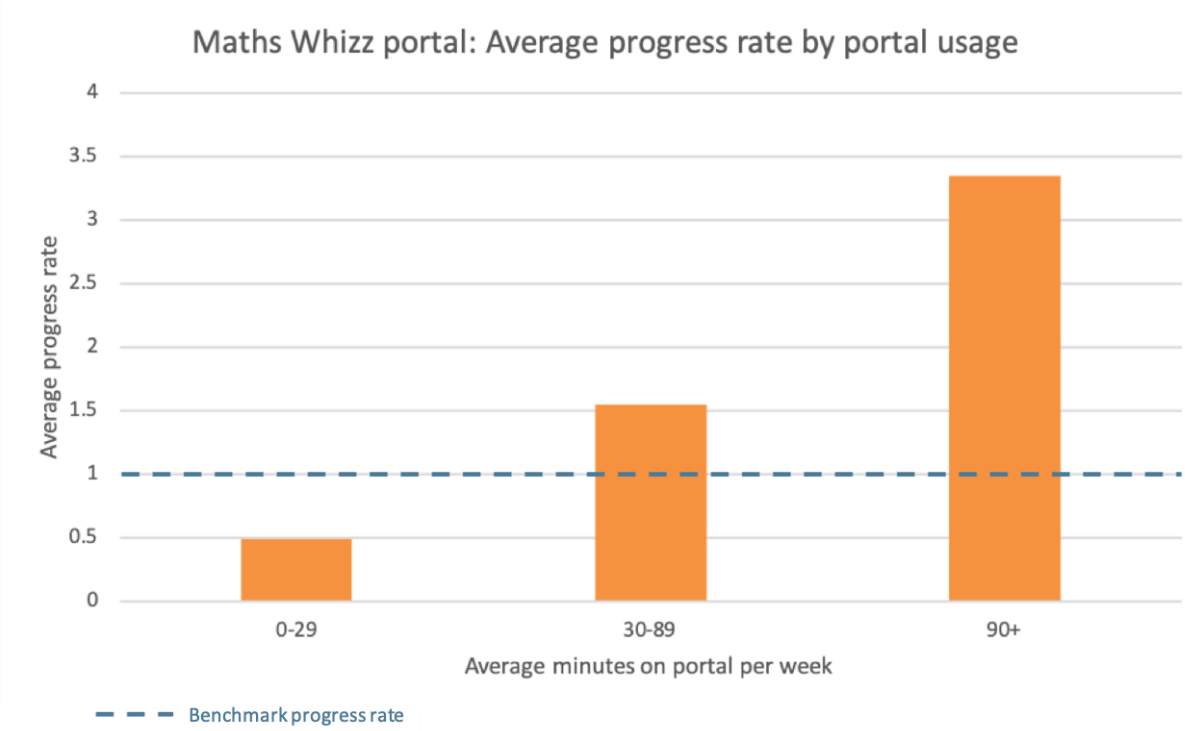


Figure 3: Average progress rate by portal usage for Maths-Whizz

There are some notable findings when progress rate data is disaggregated by gender, county and grade.[15] On average across the four periods, the progress rate is slightly higher for female students, at 1.57 compared to 1.54 for male students.[16] Students in Kilifi have the highest average progress rate with 1.70, followed by Makueni with 1.60, and Uasin Gishu with 1.40 and Kajiado with 1.39.[17] Students in grade 4 and standard 5 have the highest progress rate at 1.76, and standard 8 students have the lowest progress rate, at 1.25.

It is important to note that across the four periods, progress rates decrease over time. The average progress rate for students with the recommended time on the portal is 1.67 in period 1 and this decreases to 1.18 in period 4. This is true for all subsets ie. gender, county and grade. Period 4 follows a long break at the end of school year and it would be expected that there are learning losses during this time. Analysis based on periods 1 through 3 ie. in the same school year, show the same results; that over time the rate of progress decreases.

Observations conducted by Maths-Whizz have shown that an exposure time of 18 minutes per week can lead to a higher progress rate than the 0.58 iMlango progress rate.[18] This is supported by the findings. Students that spend an average of 18 to 29 minutes on the

[15] Sample sizes: female students 3368, male students 4350, Kilifi 3189, Kajiado 1302, Makueni 1220, Uasin Gishu 2003, grade 4 1318, standard 5 1626, standard 8 374. Note that for county and grade male and female students are combined.
[16] This has not been tested for statistical significance.
[17] The county weighting of schools in the project does not reflect the number of students in the portal data. The project reaches 80 schools in Kilifi, 37 in Makueni, 62 in Uasin Gishu, and 26 in Kajiado.
[18] Whizz Education. (2019). Data to insight to action. Retrieved from: https://www.whizzeducation.com/wp-content/uploads/White-Paper-Data-to-Insight-to-Action-Whizz-Education.pdf

platform achieve a progress rate of 0.78. This means that (if sustained), students achieving these rates will have an increase in Maths Age by 0.78 of a year in a 12-month period. As noted above, a progress rate of over 0.58 indicates that the student is accelerating faster than the iMlango baseline progress rate. Across the period, 0.2% of students (81) experienced a negative progress rate. Progress rates may be negative in cases where students have been reassessed at a lower age.

Learning assessment data (EGMA and SeGMA)

Numeracy learning assessment data includes EGMA and SeGMA scores, which were administered and collected by iMlango partners in 'A' intervention schools. It is important to note that the learning assessment data collected by the project was not intended for use in this midline research study. The data is therefore not of necessary quality to ensure validity and reliability of the findings. The endline evaluation would still benefit from conducting a learning assessment such as EGMA/SeGMA, however the research team recommends replicating the analysis of Maths-Whizz progress data as well. This comparison is necessary. As such, this research study was only able to focus on the broad relationship of usage and learning outcomes in order to examine whether the relationship is the same for Maths-Whizz and EGMA/SeGMA. For the purpose of this midpoint research study, we recommend reviewing the data with caution.

Analysis of the January 2020 learning assessment results broken down by average time spent per week on the portal over the four periods shows that students that spent between 30 to 90 minutes on the portal scored 3.11 marks higher than students that spent 0 to 29 minutes per week on average on the portal (44.21 compared to 41.10, see table below). It should also be noted that 90% of the students that completed a learning assessment spent less than the recommended time on the portal per week across the whole time frame. The difference in learning outcome results is larger for students that sat EGMA than students that sat SeGMA. For students that took the EGMA, those that spent the recommended time on the portal across the four periods scored 5.45 percentage points higher than students that spent less than 30 minutes per week. For SeGMA, the difference is 2.31 percentage points.

Table 6: Average Maths-Whizz portal usage and EGMA/SeGMA scores

Average time per week spent on portal across the four periods	Average EGMA/SeGMA score (January 2020)	Number of students
0 to 17 minutes	41.76	616
18 to 29 minutes	37.06	102
30 to 89 minutes	44.21	79
90 minutes or more	38.00	3

There are 678 students in the dataset that completed a learning assessment in both 2019 and 2020. Analysis of the change in learning outcomes based on time spent on the portal shows that students that spent the recommended 30 to 90 minutes per week increased their score by an average of 4 percentage points between the two tests, compared to 1 percentage points for students that spent less than 30 minutes per week. However, 36% of the students that sat both assessments saw their results decrease over time. If these are

assumed to be anomalies and removed from the dataset, then there is no extra progress in learning outcomes that results from spending the recommended time on the portal; the average increase is 10 percentage points for less than 30 minutes and 30 to 90 minutes, although the largest increase in results is 12 percentage points for students that spend between 30 and 45 minutes on the portal per week. In addition, for the 155 students that did not register any portal usage time over the period saw an average of an 11 percentage point improvement in their scores. As noted earlier, these findings should be interpreted with caution due to the methodological limitations.

Analysis of time spent on the portal and change in learning outcomes as measured by EGMA and SeGMA shows in general that students who spent between 0 and 29 minutes on the platform improved at a lower rate than students that spent between 30 and 90 minutes on the platform (1 percentage point compared to 4 percentage points). However this trend is not reflected uniformly when broken down by county or grade. In Kilifi, students that spent the recommended amount of time on the platform improved at a lower rate than students that spent less time on the platform (+4 percentage points compared to +5 percentage points). In Kajiado, students that spent 29 minutes or less saw an average decrease of 25 percentage points in their results compared to a decrease of 15 percentage points for students that spent the recommended amount of time. In Uasin Gishu students with the recommended usage increased their scores by an average of 9 percentage points compared to 2 percentage points for students that used the portal for less than 30 minutes.

Table 7: Average portal usage per week and change in learning assessment results

Average portal usage per week	n all students	Average change in learning assessment result 2019 to 2020 (percentage point)			
		All students	Kilifi	Kajiado	Uasin Gishu
0 to 14	488	1	5	-24	1
15 to 29	121	0	6	-29	5
30 to 44	44	5	5	-22	10
45 to 59	14	5	4	1	7
60 to 74	4	-2	-3	-	0
75 to 90	5	1	2	-12	3

Therefore, according to Maths-Whizz progress rate data, using the portal for the recommended amount of time results in a higher than expected progress rate. Analysis of both data sources reveal a trend between time spent on the portal and increased measures of learning, shown in higher progress rates and learning assessment scores. However, the findings for the learning assessments are mixed and are subject to limitations.

Literacy learning improvements

RQ 1.1.B: What changes in learning have taken place regarding progress in literacy?

What similarities and differences exist between Longhorn and EGRA data? Analyse existing Longhorn data and EGRA results in order to: gauge changes in learning, describe methodological and selection limitations and their implications, and compare literacy data with EGRA to explain differences or similarities in trends.

sQuid's iMlango learning portal data was analysed as well as available learning assessment data. In conversation with sQuid, it was decided that the literacy content analysis would not disaggregate by Longhorn content because other literacy resources were utilised by students as well, which provides meaningful data. This includes Longhorn content, QFiles (an online library), African Story Books (e-books), and Tusome (early grade reading activities). This section contains two parts. The first presents usage over time from June 2019 to March 2020 and compares that to EGRA results from January to February 2020 (250 students). The second part compares usage over time with the change in EGRA results for students that completed an EGRA test in both July 2019 and January to February 2020 (68 students).

Overall, the results show that there is a slight positive correlation between more time spent on the platform and learning outcomes in literacy, although the trend is not completely linear. The findings related to portal usage and changes in learning outcomes are mixed, showing a decrease in results for some students with higher usage of the platform. It is noteworthy, however, that the consortium policy is that priority in lab time is given to maths with the literacy focus taking emphasis in whole-class teaching.

The table and graph below show the total time spent on the platform across the period from June 2019 to March 2020 (excluding August, November and December because they are inactive teaching months) grouped in 60 minute increments, and the average EGRA results for students that fall within that usage bracket. The average EGRA score relates to a total of 250 students that completed an EGRA test in January to February 2020. The target for portal literacy content is 25 minutes per week per child[19], which the majority of the 250 children do not reach.

The difference between students who spent a total of nine to ten hours on the platform compared to students that spent up to one hour is 16 percentage points. However, some of the time brackets have small sample sizes which may skew the results. The trend is similar for both female and male students, although female students score slightly higher than their male counterparts in all of the time bands except five to six hours.

Table 8: Average usage of sQuid's iMlango portal and EGRA scores

Total time spent on platform (June 2019 to March 2020)	Average EGRA aggregate score (out of 100)	Number of students
Up to one hour	65.77	65
1 to 2 hours	66.62	60

[19] According to iMlango consortium partners, the 25 minute figure was based on the available resources; i.e. the number of computers versus the school population and also considering that the stories within the portal have been segmented into chapters that can be read within 25 minutes per week.

2 to 3 hours	68.26	39
3 to 4 hours	71.05	29
4 to 5 hours	66.97	12
5 to 6 hours	73.08	19
6 to 7 hours	73.66	14
7 to 8 hours	73.06	7
8 to 9 hours	65.70	2
9 to 10 hours	81.33	3

Taking the information that is in Table 6 above, and presenting it in a graph (in Figure 2 below) highlights the slight linear trend.

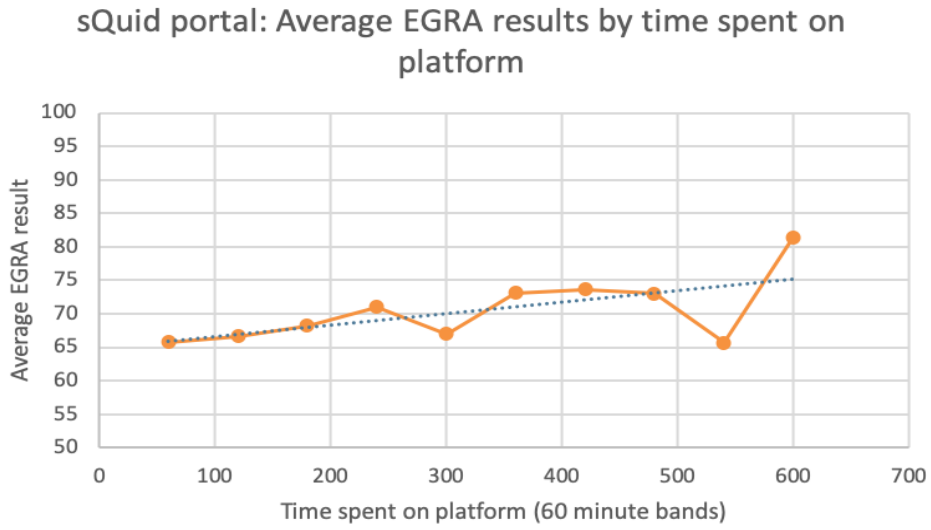


Figure 4: Average EGRA results by time spent on sQuid platform

Plotting total time spent on the platform against EGRA results for all students that took the assessment in January to February 2020 also shows a slight linear correlation.[20]

[20] Note that the correlation observation is from the graph. Regression analysis was not conducted.

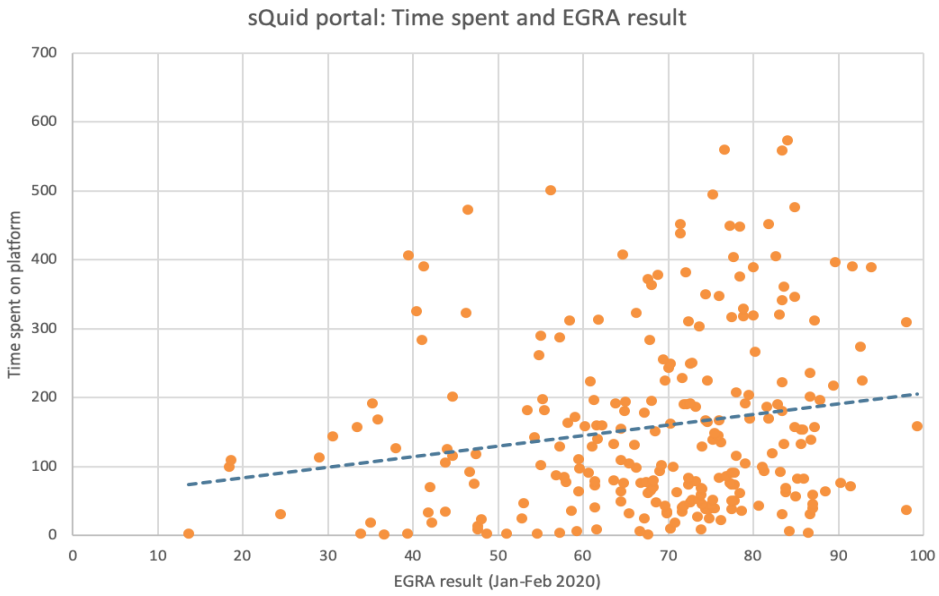


Figure 5: Time spent and EGRA results for all students

Notably, when the data is analysed by EGRA results band, there is a strong correlation between EGRA results and average time spent on the platform. There may be reasons for this such as students with higher literacy spend more time on the learning platform, however we cannot conclude that this explains the high correlation.

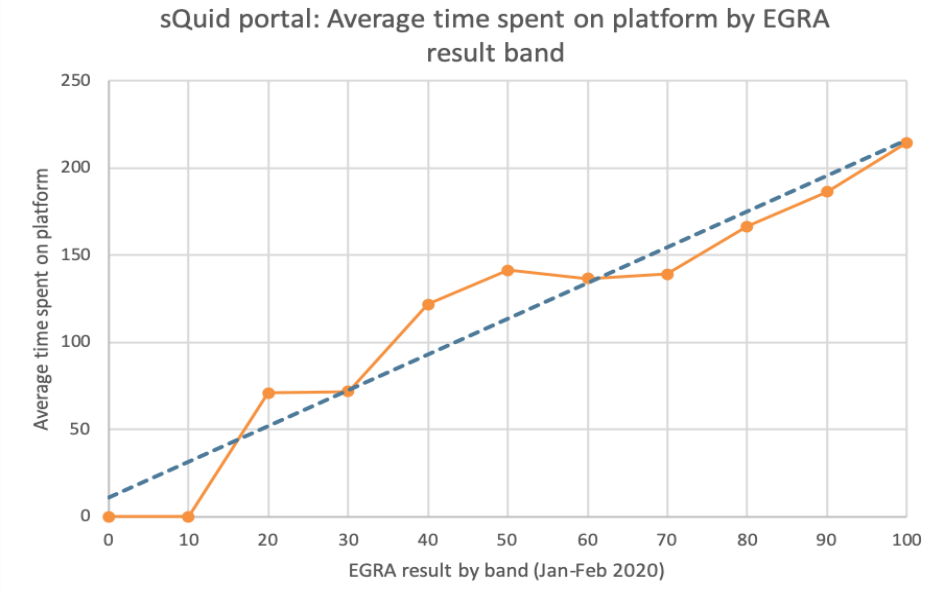


Figure 6: Average time on sQuid's iMlango portal by EGRA result band

There are 68 students that undertook the learning assessment administered by the sQuid team in July 2019 and again in January to February 2020. Analysis of these results provides findings of change over time in learning outcomes. It would be expected that students' literacy outcomes improve over time, regardless of usage of sQuid's iMlango portal.

However, the data shows a mixed picture with some subsets of students showing improvement in scores and others exhibiting a decrease in results over time.

Of the 68 students, the average improvement in score was 2 percentage points between July 2019 and January/February 2020. Disaggregation by gender shows that the female students improved on average by 3 percentage points, whilst the scores of the male students reduced by an average of 8.7 percentage points. However, there are 62 female students in the sample and only 6 male students so it is likely that the latter score is skewed by this small sample size.

At the county level, student results improved in Kilifi, but reduced in Makueni and Uasin Gishu. In Kilifi, EGRA outcomes improved by an average of 9.8 percentage points, and reduced by 4.6 percentage points in Makueni and 3.7 percentage points in Uasin Gishu. (-4.6) (-3.7). There are no students in Kajiado that completed learning assessments in both July 2019 and January to February 2020.

Between July and January there were two months with active teaching weeks, September and October. A third of the 68 students (22) did not spend any time on the portal in September and October. Assessment of time spent on the portal in these months for the 46 students that did log portal time shows that the students whose learning assessment result stayed the same or decreased spent more time on the portal on average than the students whose learning assessment results improved over the same period (97 minutes compared to 71 minutes per student). This is true across all disaggregations for which there is data, except for male students. Male students that improved in the learning assessment logged an average of 133 minutes on the portal compared to 79 minutes for students that did not improve or whose results decreased.

The same analysis for the cohort of students that took the learning assessment both in September and January to February shows that half of the students that took the learning assessment in both periods did not use the portal in October 2019 (the only month with active teaching weeks between September and January). It is noteworthy that KCPE examinations take place in October, however, which iMlango consortium partners have previously observed results in lower portal engagement annually during this time. This aligns with the portal data that shows students in grade 8 have the lowest average number of logins in September and October (8 and 5 respectively). Assessment of time spent on the portal in this period for the students that did log portal time shows the same trend as for July to January; that the students whose results stayed the same or worsened logged more time on the portal than the students whose grades improved (58 minutes compared to 51 minutes per student). When this data is disaggregated it shows a mixed picture compared to analysis of usage between July and January above. This trend holds true for female students, in Kilifi and Makueni, and in grade 3. However, grades 4 and 8 along with students in Uasin Gishu show the inverse, that students whose results improved over time spent more time on the portal.

These trends suggest that more time on the portal does not necessarily lead to improvements in literacy learning outcomes for all students. It has not been possible yet to fully validate the above data with the relatively small sample size. A range of possible barriers for students who access the portal but are not achieving expected learning outcomes are presented in Chapter 5, research theme 2 on teacher practices.

4.4. Reach and access of individualised learning content

RQ 1.2: What is the reach and access of individualised learning content for Maths-

Whizz and Longhorn content (i.e. number of students accessing content for more than 0 minutes and number accessing content for the recommended amount of time or more)?

This section presents Maths-Whizz and sQuid's iMlango portal data regarding time spent on the portals as well as findings from the digital teacher survey. The Maths-Whizz dataset is presented by the same four periods of active teaching weeks denoted above.

For Maths-Whizz, the average number of minutes spent on the portal per week is 17 per student. This is lower than the recommended 30 to 90 minutes of usage per week. Indeed, 82% of students used the platform for less than 30 minutes on average, while 16% of students used the platform for the recommended 30 to 90 minutes, and 2% of students used the platform more than 90 minutes a week. Of all students, 29% registered zero usage on the portal across the four periods. There is a higher proportion of girls with zero usage than boys (31% compared to 28%). Kilifi has the highest proportion of zero usage with 35% of students, grades 4 and 8 have the highest proportion of students with zero usage at 36% each. The average minutes per week per student for Maths-Whizz excluding the zero usage students is 25 minutes. Analysis of usage over time across the four periods shows that usage decreased across the periods, from June 2019 to February 2020. If the students that registered zero portal usage are excluded from the analysis, the proportion of the remaining students that used the portal for the recommended time is 26% in period 1 and reduces to 17% by period 4. It is not immediately clear why this trend exists. It may be because habits of regular portal usage are broken after the vacation at the end of the school year and take time to re-form with new teachers. In addition, iMlango consortium partners have observed disruptions to momentum caused by teacher transfers, which they note appeared to be significant in 2020.

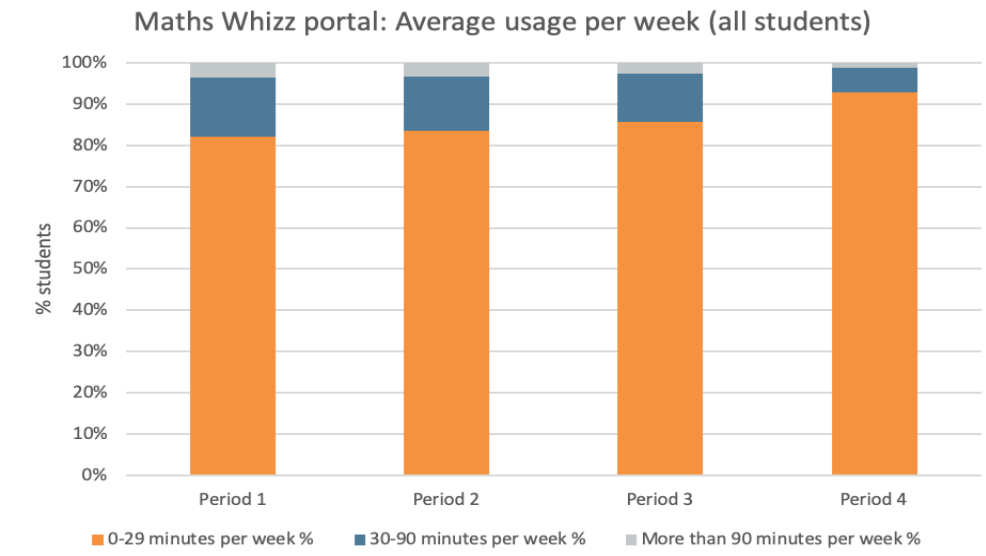


Figure 7: Average Maths-Whizz usage per week

There are some notable findings when the data is disaggregated by gender, county and grade. Male students have slightly higher average portal usage time than female students. On average, male students logged 18 minutes per week compared to 15 minutes per week for female students. Moreover, 18% of male students used the platform for the

recommended amount of time compared to 14% of female students. iMlango consortium partners note that male students often spend more time on the portal outside structured lab time than female students, and these sessions often have less supervision to regulate equitable access to computers. Gender is explored in more detail in Section 4.6 below. Between counties there is even more variation of usage. Kajiado has the highest proportion of students using the portal for the recommended amount of time, at 21% of students, compared to 16% of students in Kilifi, and 15% of students in Uasin Gishu and Makueni. Conversely, Makueni has the lowest proportion of students that registered zero portal time, at 22% of all students followed by 25% in Kajiado, 28% in Uasin Gishu and 35% in Kilifi. A comparison between grades shows that 19% of standard 5 students spent the recommended time on the portal, compared to 12% of standard 8 students, although iMlango consortium partners observe that teachers may be reluctant to take these students to the ICT lab so that they can focus on exam preparation. For students in standard 3 and standard 7, 15% of both spent the recommended time on the portal.

For Maths-Whizz to work most effectively, there is a recommended threshold for students to reach and sustain (i.e. 30 to 90 minutes per week).The usage per school varies widely. Only 13 schools (9%) meet the recommended usage per student. The proportion of students in a school achieving the recommended time ranges from 0% to 61%. There is no apparent relationship between the number of students registered on the portal at a school and the time spent per student on the portal. Results from the digital teacher survey indicate that there is a mixed level of students receiving the recommended 30 minutes of Maths-Whizz per week. Of teachers surveyed who use the ICT lab, barriers they note to receiving the 30 minutes per week include the internet not working, unreliable electricity, and teachers not following the school's timetable for the lab. While this is happening for some pupils in iMlango project schools, the data suggests this is not yet widespread. The degree to which students in schools who are using the portal for less than 30 minutes per week benefit from the usage remains an important area of further research, and the midline findings show that students that spend 15 to 30 minutes on the platform have an average progress rate of 0.72, higher than the Kenyan baseline of 0.58.

sQuid's iMlango portal data was similarly analysed. For usage during months with active teaching weeks, on average over the period June 2019 to March 2020 (excluding August, November and December 2019) each student registered 48 logins, and spent a total of 108 minutes on the platform, or slightly less than two hours. This is an average of 15 minutes per month with active teaching weeks, with an average number of 2.3 minutes per login. There were 93 students (0.2%) who did not log in or spend any time on the platform between June 2019 and March 2020. There is a wide disparity in usage by school. The average number of logins ranges from 11 to 130, and the average time spent on the portal over the period ranges from 22 minutes to 284 minutes.

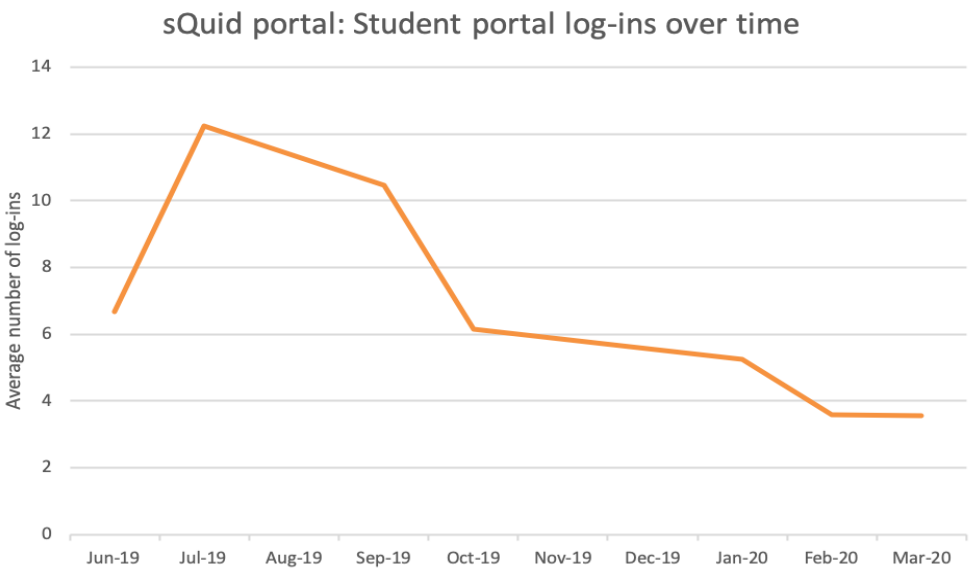


Figure 8: sQuid student portal logins over time

There are some notable findings when sQuid's iMlango portal data is disaggregated by gender, county and grade. The results are similar between female and male students, with an average of 48 logins for both genders, and 106 total minutes for females, and 111 minutes for males. This suggests that even though the total number of male students registered on the platform is higher than female students, the overall usage is similar. There is a slight variation in usage between counties. Kilifi has the lowest average time spent on the portal across the period, with 92 minutes compared to Makueni with the highest average time of 125 minutes. This is a difference of 33 minutes per student. However, the number of logins is similar across counties, ranging from 43 in Kajiado to 52 in Makueni. On average, students in standard 7 spent the highest amount of time on the platform, with 124 minutes per student. Students in grade 3 spent the lowest amount of time on the platform, with 74 minutes per student. Standard 8 has the lowest average number of logins, with 36 logins per student, but a middle range total time per student of 107 minutes.

In the school-level KIIs, two teachers mentioned that certain classes are prioritised for lab access. A teacher from a medium usage school in Kajiado suggested that 'focus' classes, i.e. those that are monitored for progress by iMlango, are given extra time in the computer labs:

> *'The classes called 'focus classes' are given more time than other classes. My class is a focus class … It means that iMlango are doing research on our classes, candidate class 8, 5 and another class. They want to see the progress of children from class 4 when they started, want to see impact. So there is more time in the lab for those monitored.'*

This suggests that there may be uneven usage of the portal across grades in some schools, and this is varied by school based on perceived priorities.

There was a peak of usage in July 2019 at the end of Term 2, and in September 2019 in the run-up to exams at the end of Term 3. This trend was similar across all disaggregations. For usage during months with no complete active teaching weeks (i.e. the months of August, November and December 2019), 4% of students logged on to the platform (1,589 students in total). On average, among these students, they logged on nine times and spent an

average of 22 minutes on the platform. In Makueni, 6% of students logged on to the portal during months with no complete active teaching weeks and spent an average of 21 minutes online during that time. Students in Kajiado spent an average of 36 minutes per student. Of standard 8 students, 4.5% spent an average of 26 minutes on the platform during months with no complete active teaching weeks.

4.5. Exposure time and improvements in learning

RQ 1.3: How is exposure time linked to changes in Maths-Whizz scores? How is individualised lab learning likely to be improving learning outcomes of children who do not achieve the recommended exposure time? What are the reasons for not achieving this exposure time?

This section explores the relationship between exposure time and scores on the Maths-Whizz platform, and considers the enabling and inhibiting factors for accessing the Maths-Whizz portal for the recommended time. Findings are drawn from analysis of portal data, school-level KIIs and the digital teacher survey.

As described above, students who spend the recommended time on the portal have an average progress rate of 1.55, compared to 0.49 for students that spend less than 30 minutes per week. For students that spend 0 to 15 minutes per week the progress is 0.31, and for students that spend 15 to 29 minutes the average progress is 0.72. This means that students using the portal as recommended are exceeding the target progress rate of 1 by over 50%, compared to students that use the portal for less than the recommended time that are progressing at less than 50% of the expected rate.

In school-level KIIs, most teachers across usage bands said that those students who achieve the recommended usage time perform better and have improved more than those students who do not. For example, a teacher at a low usage school in Makueni said the following:

> *'Those with high usage in the lab have really improved in their classwork. They are on an upward trend. Those who have been slow in picking up the work in the lab and slow to engage with the technology have not shown as stark an improvement.'*

Though this is encouraging, it is important to note that correlation does not imply causality in this instance. It is not necessarily the case that the learners that are performing well or even those who are improving fastest are doing so *because* they are getting the recommended time per week of lab learning. It is equally plausible that more advanced students are more likely to want to engage with the lab resources, and are also able to pick up new skills quicker and show greater improvement in a given period of time. This is indicated by the data which shows that students with a higher starting Maths Age have a higher average usage per week. Students with a starting Maths Age of 13 to 14 years use the portal for an average of 24 minutes per week, compared to students with a starting Maths Age of 5 to 6 years with an average usage of 13 minutes per week.

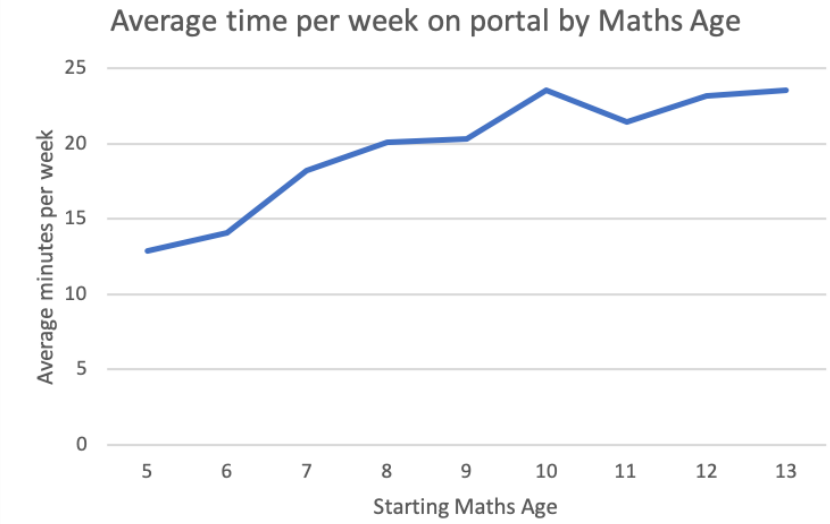


Figure 9: Average time per week on portal by starting Maths Age

Another factor to consider is the digital literacy of students, as those with lower digital literacy may take longer to engage meaningfully with the portal content.

Participants in the digital teacher survey report that the top three factors enabling students to receive the recommended 30 minutes of Maths-Whizz are:

1. 'My school administration supports the intervention' (64.2%)
2. 'Teachers at my school follow the timetable for the ICT lab' (62.6%)
3. 'The ICT lab is open throughout the day, including lunch, break, before school, and after school' (51.4%)

These are the top three factors for both male and female teachers, for all types of teachers in Kajiado, Makueni and Kilifi, and teachers in the 20 to 30, 31 to 40 and 51 to 60 age brackets. The first factor mentioned regarding administrative support of the project was a recurrent emerging theme within various data sources and is discussed in further detail in research theme 3 on school management practices.

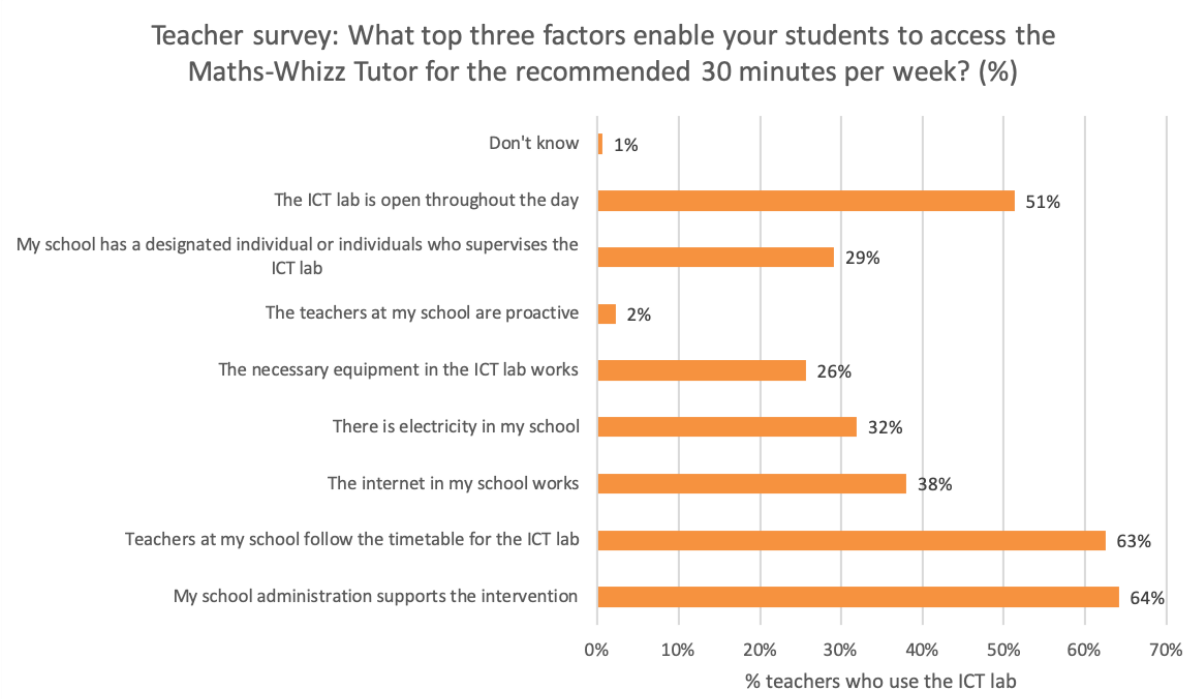


Figure 10: Enabling factors for accessing Maths-Whizz Tutor

Barriers to pupil portal usage were discussed in school-level KIIs, where participants noted five key barriers: having a limited number of computers, breakdown of devices, poor attendance, the digital literacy of students, and differences in usage between maths and literacy content suggesting barriers exist (whether engagement or otherwise) to either maths or literacy content. These are each discussed in turn below. In addition, power and connectivity were discussed by teachers as a barrier to successful ICT lab sessions and whole-class lessons using the projector, however this finding is explored in further detail in research theme 2 on teacher practices.

Alongside the issue of power and connectivity, many participants across schools in different usage bands said that one of the main barriers to children attaining the recommended time on the portal was the limited number of computers provided to schools. Several participants explained that they have very large class sizes - far greater than the number of computers - and as such it is difficult to ensure that all students meet their recommended weekly usage. iMlango consortium partners note that managing individualised exposure to the portal within large class sizes was a core component of teacher training offered by the project, however this was not discussed by respondents. This issue regarding managing large class sizes was mentioned in high usage schools as well as low usage, for example a teacher at a high usage school in Uasin Gishu said the following:

> *'Some of the children who do not receive the 30 minutes are in the larger classes - in a class of 68 only 25 learners can get into the lab at a given time. When you have several learners getting in, you have to divide them and split them across weeks - so they will have lost a week of the portal.'*

A teacher in a low usage school in Makueni expressed a similar sentiment. Interestingly, another teacher at the same low usage school said that one of the key barriers to a successful lab session in the school was '*time to access the resources - time is poorly managed'*. This barrier was also cited by teachers in the digital teacher survey and is further

explored in research theme 2 in relation to barriers to successful ICT lab sessions and whole-class lessons.

Many teachers indicated that because of the small number of computers relative to pupils, they split classes into groups which then take turns in accessing the labs. Providing more computers was also a common recommendation made by head teachers. Several participants mentioned computer breakdowns and issues with receiving timely maintenance to repair broken computers as a key challenge to successful lab sessions, although iMlango consortium partners note that the support and maintenance should be happening as a rolling exercise throughout the terms and a reporting mechanism is in place for schools to report problems:

> *'These machines regularly break and so there are fewer machines (computers) for the large classes (100 per class only 35 computers if all are working). Maintenance is done once per term, so the machines can sit idle for a long time.'* (Teacher, medium usage school, Kilifi County)

> *'There are times where we have fewer working computers. 40 pupils and 24 machines, but if it's down to 20 that's a challenge. I always have a problem with the machines not being serviced in time.' (Teacher, high usage school, Kajiado County)*

A teacher from a medium usage school in Makueni explained that one thing preventing students from obtaining the recommended 30 minutes per week of Maths-Whizz was low attendance at school. As he put it: *'Some children have poor attendance because of poverty. They can't access the portal if they are not in school'.*

The two teachers from a low usage school in Makueni both echoed this observation, with one of them saying:

> '*Many of the parents are poor - so they have not paid the school fees*[21] *and therefore the children are unable to attend classes. This has resulted in many not attending school and therefore not accessing the resources provided by iMlango.*' (Teacher, low usage school, Makueni County)

Teachers in two low usage schools also specifically mentioned the speed at which students are able to use the computers (i.e. their digital literacy) as a barrier that inhibits them from attaining the recommended usage time: *'Some are not quick learners - slow learners have not been able to pick it up quickly enough and it is a challenge for them to use the tools'* (Teacher, low usage school, Makueni County).

Lastly, in some sampled schools there was a marked difference between numeracy and literacy lab usage. One of these schools was a medium usage school in Kajiado. When asked about this disparity, the head teacher said, *'After the initial focus on maths, children developed an interest and loved maths. Pushing them to work on other subjects has not been easy'*. For the high usage school in Uasin Gishu, the data also indicates that Maths-Whizz is used for longer than sQuid's iMlango portal, which is expected from the 80% maths and 20% literacy dedication of lab time as presented in the Background chapter. When asked about this disparity, one of the teachers interviewed explained that although maths and literacy sessions are scheduled evenly across the timetable, when the children use their own free time to access the portal (e.g. during lunch break), they most often choose Maths-

[21] Note that through the free primary education for all programme instituted by the government of Kenya in 2003, there are no school fees for primary schools in Kenya. However, school levies are decided by Boards of Management and parents. It is likely that this interviewee is citing these levies.

Whizz.

4.6. Gender and social inclusion: demographics and access for individualised learning

RQ 1.4: Who is benefiting from the recommended 30 minutes per week, who does not, and what is the process of decision-making around this? How does this relate to issues of gender and social inclusion? What are the key enablers or barriers for how more children can reach this recommended level?

This section presents insights regarding gender and social inclusion for accessing individualised learning, drawing on findings from the Maths-Whizz portal, sQuid's iMlango portal, the digital teacher survey, as well as project and school-level KIIs.

As described above, Maths-Whizz portal data suggests that male students have slightly higher portal usage time than female students (18% of male students used the platform for the recommended amount of time compared to 14% of female students). sQuid's iMlango portal data suggests that female and male students use the portal for similar lengths of time (106 total minutes for females, and 111 minutes for males). In project-level KIIs, iMlango project Field Officers noted that during their school observations and visits, girls were performing equal to or better than boys, e.g. answering questions, showing confidence, engaging with the technology, etc.

The digital teacher survey data does not reveal a clear trend of students receiving or not receiving the recommended 30 minutes based on gender and social inclusion. Of teachers who use the school ICT lab, 30.2% report that there is no difference between students achieving the recommended 30 minutes. However, 31.8% report that girls are the least likely to achieve the recommended 30 minutes. A further 24.6% of teachers surveyed report that boys are the least likely to receive the recommended 30 minutes and 11.2% of teachers report that children with disabilities are the least likely.

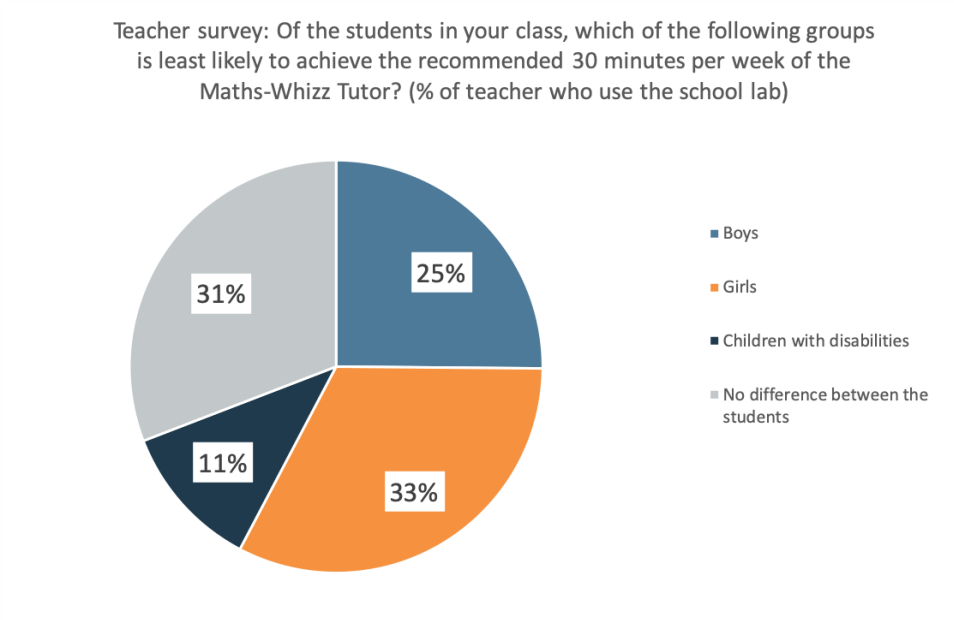


Figure 11: Groups unlikely to achieve recommended time on Maths-Whizz

In school-level KIIs, responses were somewhat mixed across participants regarding gender differences in lab usage. Several teachers said that girls and boys use the lab resources equally, while several other teachers said that boys use the labs more than girls. For two teachers, this was linked to the fact that the number of computers is limited and boys are more 'aggressive' in claiming computers to use:

> *'Yes, boys are more… in fact, when you look at learners' usage of the portal you see that boys have higher usage than girls. The boys are more aggressive - they will run fast to get into the lab compared to girls.'* (Teacher, high usage school, Uasin Gishu County)

In some instances, however, schools have taken steps to address this issue by either dedicating lab use during lunch and break times for girls only, or by increasing the number of girls in the groups for the lab sessions. A teacher from a high usage school in Kilifi explained that there was a disparity between boys' and girls' usage, but that they had managed to close the gap by making sure that there are more girls in any given group that attends a lab session:

> *'The numbers are almost the same between boys and girls [at the school], but through the group system we are able to find that in each of the groups, so if we have 25 computers, you have 10 boys and 15 girls, so even the ones in the lab previously can have an extra advantage of going back to the lab to continue their work.'*

However, in one instance in a low usage school in Makueni County, the teacher said that girls use the labs more than boys. This was somewhat contradicted, however, by another teacher from the same school, who said that one of the barriers to pupils getting the recommended usage was *'low self-esteem',* and that *'girls particularly struggle with this.'* A teacher from a medium usage school in Kilifi echoed these sentiments, saying:

> *'The girls feel like they are not able to use the machines (don't understand it), they are shy and they don't want to ask questions or call a teacher to assist them. The*

boys are eager and want to understand it.'

In two instances, teachers suggested that boys were more interested in the Maths-Whizz content, whereas girls were more interested in the sQuid literacy content: *'The attitude of maths, boys are more interested in maths than girls. Girls want to do the literacy more. Boys do not like reading much - they want to do the maths'* (Teacher, high usage school, Uasin Gishu County). However, in one medium usage school in Kajiado, the teacher said that whereas girls had previously not been interested in maths, several of her female pupils were doing very well in maths, and the girls in her class were more interested in learning maths. She attributed this change to iMlango, as well as because of her own influence as a female maths teacher.

There was some evidence of gender stereotyping amongst teachers, with one teacher from a high usage school in Kajiado expressing that boys use the computer labs more than girls because they are more *'naturally curious'.*

In school-level KIIs, responses regarding usage amongst children with disabilities and special educational needs were also varied across participants. In two schools, teachers indicated that pupils with special educational needs had not been provided with login details for the portal. In one medium usage school in Kilifi, one of the teachers said that the parents of children with disabilities came to the school to request that their children were given access to the lab, after which the school organised to grant them access. A teacher in a different medium usage school also said that although the children in the special educational needs class at his school had not been given login details, the school arranges time for them to attend the labs and the teachers source content that is suitable for their level so that they can engage with the computers. This teacher was particularly enthusiastic about the use of computers by children with special educational needs, and said that they were intending to schedule lab time for these children twice per week so that they could make the most of the resources. However, in a high usage school in Uasin Gishu, the teacher said that children with special educational needs engage with the portal content with assistance from teachers, and that he believes that these children *'get the same amount out of the portal'.* In a high usage school in Kajiado, the teacher explained that the *'maths teacher is taking individualised tutoring to those with learning difficulties to ensure they complete the required time'.* However, another teacher at the same school explained the difficulties that some children with disabilities face in attained the recommended portal usage time:

> *'I have noted one specific boy who has got eye problems and struggles a lot - I tried to change the font for him but he gets bored when he can't read or logs out. Every time he's in the lab you have to change the font. But he keeps logging himself out and he eventually gets bored.'*

Finally, a teacher at a medium usage school in Makueni said that the students with disabilities do not engage with the projected resources in class, and requested that the project should *'prepare some materials which are for their level of understanding, materials that are more pictorial'.*

4.7. Additional direct benefits for learners

RQ 1.5: How, why and under what conditions do iMlango inputs contribute to non-numeracy and non-literacy, but direct benefits for learners, such as improved digital literacy or increased enthusiasm for learning?

This section presents findings from the digital teacher survey as well as the project and school-level KIIs regarding additional non-numeracy and non-literacy benefits for learners.

Teachers responding to the digital teacher survey were asked to identify the areas that the iMlango project had directly impacted upon. These are summarised in the graph below and results are explored under the relevant sub-headings: improved digital literacy, increased enthusiasm for learning, improved attendance, and increased confidence.

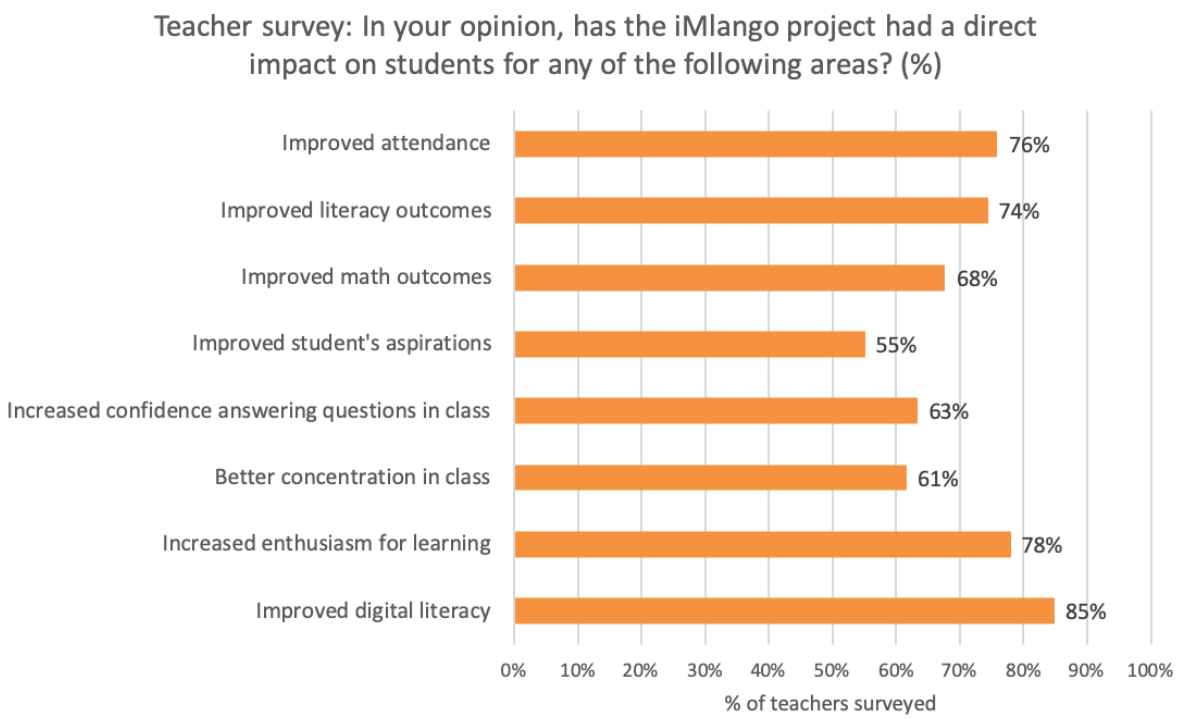


Figure 12: Other impacts of iMlango

Improved digital literacy

According to teachers surveyed, the iMlango project has had the greatest direct impact on improved digital literacy (84.6%). In school-level KIIs, a small number of participants also mentioned digital/ICT literacy as a benefit of the project, though this response was less common than other perceived benefits. One head teacher in particular from a medium usage school in Kajiado said that she had heard from parents that their children would come home and pass on the digital skills they had learned: *'The children have taken the IT skills to their parents at home so they can access the phones of their parents to look for information for example on Google.'* A teacher from a low usage school in Makueni also mentioned the dissemination of ICT knowledge from pupils to other community members.

Increased enthusiasm for learning

In the digital teacher survey, 77.9% of teachers surveyed selected 'increased enthusiasm for learning' as an area that the iMlango project has had a direct impact on students. This was the second highest selected direct impact by teachers. Teachers also reported that the project has had a direct impact on increased concentration in class (61.4%).

In school-level KIIs, increased attentiveness and concentration in class was articulated and conceptualised together with an increased enthusiasm for learning and presented as an

important benefit for learners. They described this as an increase in attentiveness and concentration in the whole class setting, as well as more enthusiasm and enjoyment in learning.

> *'When using the projector, you see that the learners are more curious and they want to learn. They are interested and when you are projecting they can view - you can talk and explain, they can see and they are happy. They seem more happy.'* (Teacher, high usage school, Kilifi County)

Project-level KIIs support this finding with Field Officers offering anecdotal evidence of their classroom observations where children were very attentive in class: *'Learners concentrate well with the whole-class lesson approach, and when digital resources are used - for example, projection. You can see all learners are engaged and concentrating. Learners are attracted to digital resources'* (iMlango Field Officer).

Similar to attentiveness and interest in something 'new', school-level KIIs also noted exposure to information that was previously inaccessible through the internet as an additional benefit for pupils. The head teacher at a medium usage school in Kajiado articulated this particularly well:

> '*Being in Southern Kenya, we are sort of isolated. We are really in a remote area. Since we have become digital, the children have seen so many things they have never seen. The children have interacted with so many things and become inquisitive. They want to know 'why are we like this, why are those people like that' and they have the answers.'*

Improved attendance

While attendance is discussed in further detail in research theme 3 on the use of data for decision-making, results from the digital teacher survey indicate that the majority of teachers consider that the iMlango project has had a positive impact on stabilising student attendance at their school. When teachers were asked to identify areas that the iMlango project had directly impacted, 76% of teachers reported that it had directly led to improved attendance. In addition, of all teachers surveyed, 97% reported that the project had a 'positive impact' (58.9%) or a 'large positive impact' (38.2%) on stabilising student attendance. Only five teachers reported that the project has had a 'large negative impact' on stabilising student attendance. Three of these teachers are aged 51 to 60 and one is aged 41 to 50, and three are in senior leadership (head teacher or assistant head teacher). As this was a closed question in the survey it is not possible to elaborate on the reasoning behind this view on attendance. Interestingly, a smaller percentage selected 'large positive impact' than 'positive impact' suggesting that some teachers do not consider there to be a direct link or that attendance remains an issue in some schools.

In school-level KIIs, increased attendance was also mentioned as a key benefit of the iMlango project expressed frequently by participants during the interviews. This improved attendance was attributed to the project activities by participants because they felt that students were more motivated to attend because of the presence of the project resources at the schools. See Appendix F for project data regarding attendance in 2018, 2019 and 2020.

Pupil confidence

In school-level KIIs, two participants expressly mentioned pupil confidence as a benefit of the project: *'They are able to use the machines alone. It builds their self-esteem/confidence'* (Teacher, low usage school, Makueni County). This is supported by observations from Field Officers in project-level KIIs who noted an increase in pupil

confidence, particularly with female pupils, during their lesson observations. Of teachers surveyed, 63.2% reported that the project has directly impacted students and increased their confidence in answering questions in class.

4.8. Key learning points

This chapter draws on quantitative iMlango partner data, as well as the digital teacher survey and project and school-level KIIs to present findings regarding numeracy and literacy learning improvement and progress, reach and access of individualised learning content, exposure time and improvements in learning, gender and social inclusion and additional benefits for learners.

Numeracy learning improvements: According to Maths-Whizz progress rate data, using the portal for the recommended time per week results in a higher than expected progress rate. The findings also support the observations by Maths-Whizz that an exposure time of 18 minutes per week can lead to a higher progress rate than the 0.58 iMlango progress rate. Students that spend an average of 18 to 29 minutes on the platform achieve a progress rate of 0.78. The learning assessment data suggests that portal usage may influence the rate of improvement in numeracy. Learning assessment results shows that students that spent between 30 to 90 minutes on the portal scored 3.11 marks higher than students that spent 0 to 29 minutes per week on average on the portal. However, the findings from the assessment data are mixed and are subject to limitations.

Literacy learning improvements: Usage of literacy portal data over time and EGRA results indicate that there is a positive correlation between more time spent on the platform and learning outcomes in literacy, although the trend is not completely linear. The findings related to portal usage and changes in learning outcomes are mixed, showing a decrease in results for some students with higher usage of the platform. As such, while there is some evidence of literacy learning improvements, this is not yet fully clear.

Reach and access of individualised learning content: For Maths-Whizz, the average number of minutes spent on the portal per week is 17 per student. This is lower than the recommended 30 to 90 minutes of usage per week. Analysis of usage over time across the four periods shows that usage decreased across the periods, from June 2019 to February 2020. For sQuid's iMlango portal, on average each student registered 48 logins, and spent a total of 108 minutes on the platform, or slightly less than two hours. This is an average of 15 minutes per month with active teaching weeks, with an average number of 2.3 minutes per login. School-level KIIs suggest that there may be uneven usage of the portal across grades in some schools, and this is varied by school based on perceived priorities.

Exposure time and improvements in learning: Students who spend the recommended time per week on the Maths-Whizz portal have a higher average progress rate than students who spend less than 30 minutes per week. In school-level KIIs, most teachers across usage bands said that those students who achieve the recommended usage time perform better and have improved more than those students who do not. Note that this does not imply causality. It is not necessarily the case that the learners that are performing well or even those who are improving fastest are doing so because they are getting the recommended time per week of lab learning. The main factors limiting student access to individualised learning are unreliable electricity and internet connectivity, and the limited number of devices within schools.

Gender and social inclusion: Teachers did not report a clear trend of students receiving or not receiving the recommended 30 minutes of Maths-Whizz based on gender and social inclusion. Maths-Whizz portal data suggests that male students have slightly higher portal

usage time than female students (18% of male students used the platform for the recommended amount of time compared to 14% of female students). sQuid's iMlango portal data suggests that female and male students use the portal for similar lengths of time (106 total minutes for females and 111 minutes for males). In the survey, of teachers who use the school ICT lab, 30.2% report that there is no difference between students achieving the recommended time on the portal. However, 31.8% report that girls are the least likely to achieve the recommended 30 minutes. A further 24.6% of teachers surveyed report that boys are the least likely to receive the recommended 30 minutes and 11.2% of teachers report that children with disabilities are the least likely.

In school-level KIIs, responses were somewhat mixed across participants regarding gender differences in lab usage. Several teachers said that girls and boys use the lab resources equally, while several other teachers said that boys use the labs more than girls.

Additional direct benefits: Additional non-numeracy and non-literacy benefits for learners cited by iMlango stakeholders include improved digital literacy, increased enthusiasm for learning, improved attendance, and pupil confidence.

5. Research theme 2: teacher practices

5.1. Overview

This chapter presents thematic findings regarding teacher practices in iMlango project schools. It begins with teacher approaches taken in relation to improvements in pupil learning. It then explores the factors contributing towards the achievement of a well-executed Maths or English session in the ICT lab and whole-class lessons using the projector. Lastly, the chapter discusses teacher confidence in using the projected resources, teacher perception of the helpfulness of resources and the factors influencing a teacher's decision to use the projector. This chapter draws from teacher portal data, as well as findings from the digital teacher survey and project and school-level KIIs. The chapter closes with key learning points regarding teacher practices in iMlango project schools.

5.2. Research questions

The research questions regarding this research theme are presented in the table below.

Table 9: Research questions regarding teacher practices

RQ#	Research theme 2 research questions
2.1	What approaches have teachers taken (or not taken) in relation to improvements in pupil learning?
2.2	What factors contribute to the achievement of a well-executed Maths or English session using the ICT school lab? What factors inhibit this achievement? What factors compromise and contribute towards the learning that comes out of such a session?
2.3	What factors contribute to the achievement of a well-executed Maths or English lesson that uses projected iMlango resources? What factors inhibit this achievement? What factors compromise and contribute to the learning that comes out of such a lesson?

2.4	To what extent do teachers feel confident in their ability to use numeracy and literacy whole-class resources as a tool to support pupil learning within a lesson (particularly as they relate to lesson objectives, teaching the whole class, alignment with curriculum, pace, formative assessment, etc.)?
2.5	What influences a teacher's decision as to whether or not they use projected content in a planned lesson? In particular, how does a teacher's confidence with the topic of the lesson influence their decision as to whether or not to use a projector?
2.5.A	*To what extent do teachers understand what projected content is available for their use and how it can be used to support specific objectives of the lesson?*
2.5.B	*What are teachers' perceptions of whether using this content helps or hinders their a) preparation of the lesson, b) delivery of the lesson, and c) ability to evaluate the lesson and what children learnt (or did not learn)?*

5.3. Teaching approaches and practices

RQ 2.1: What approaches have teachers taken (or not taken) in relation to improvements in pupil learning?

Teacher portal usage

An in-depth analysis of sQuid's iMlango teacher portal usage was conducted in order to assess how much teachers are engaging with the iMlango portal and is reported in Appendix K in full, with key findings presented in this section.

Across the full dataset of 1526 registered teachers, there was a total of 87,693 logins to sQuid's iMlango portal between June 2019 and March 2020. This is an average of 57.47 logins per teacher. The majority of logins are in active teaching months, with a total of 81,034 logins and an average of 53.10 logins per teacher. There are 48 teachers (3%) in the sample who did not log in at all during any active teaching months. Male teachers have a slightly higher average number of logins than female teachers: 59.92 compared to 55.87. The county with the highest average number of logins is Makueni and the lowest average number of logins is Kajiado although Kilifi has the lowest average number of logins in active teaching months. Kilifi has the highest number of teachers who did not log in to the portal in any active teaching month: 30 (4.8%). Note, however that regional disaggregation could be skewed by the varied number of schools in each county.

Across the whole sample, there is a clear trend that teachers do not spend a lot of time per login. In total, the average time spent is just 3.61 minutes and for active teaching months it is 3.62 minutes. Teachers who spend less than a minute per login on average make up 13% of the sample. Moreover, 54 teachers (4%) spend under 30 seconds per login, although this may be a case of failed access. The graph below presents the trend of time per logins in active teaching months.

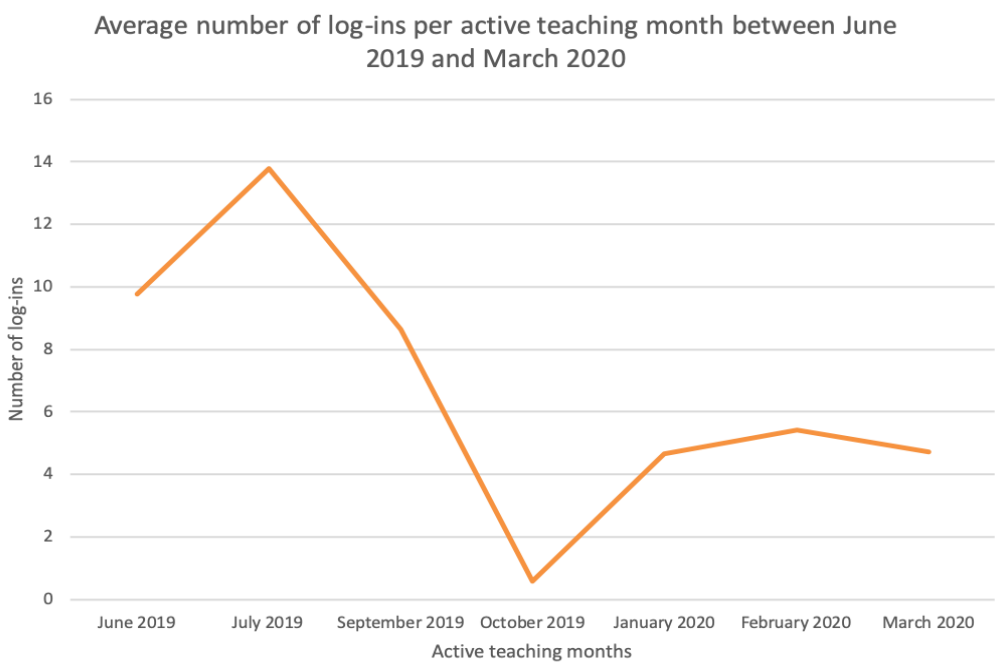


Figure 13: Average logins per active teaching month

This shows a fairly even trend of time per login, with a difference of 1.04 minutes between the highest and lowest average time per login. It is assumed that to conduct a whole-class lesson using the projector, teachers need to log into the portal for a minimum of 15 minutes. The portal does not capture the activities teachers undertake while logged in, so it is not possible to calculate the percentage of teachers who are using the portal for conducting whole-class lessons. However, a total of 24 teachers (1.6%) spent an average of 15 minutes or more per login during active teaching months. The months with the most teachers who spent an average of 15 minutes or more logged into the portal are June (23 teachers, 1.5%) and July (18 teachers, 1.2%). There is no significant variation across the counties, intervention types or gender of teacher. In active teaching months, an average of 363 teachers (24%) spent a total of 15 or more minutes logged into the portal.

Overall, analysis of teacher usage of sQuid's iMlango portal reveals that many teachers are not using the portal consistently. Time per login is low and many teachers are only logging into the portal in one or two active teaching months. Number of logins and time spent logged in are highest in July and June and decline towards the end of the school year, and start increasing incrementally after the new school year starts. For further analysis regarding teacher portal usage, please see Appendix K. It is also noteworthy that iMlango consortium partners observed in some cases during whole-class teaching, the teacher may have a student perform the login and therefore the data may be unable to indicate the full picture of usage.

Teacher usage of the ICT lab and whole-class resources

Results from the digital teacher survey indicates school ICT labs and whole-class resources via projectors are used by teachers on a regular basis, and suggests that they are becoming embedded in teacher approaches to improving pupil learning. Of the 179 teachers at A and C schools who answered the school lab questions, only one reported that they do not use their school's ICT lab with their students. As demonstrated in the graph below, the regularity of use of the ICT lab varies from once a week to over five times a week among

teachers. The largest percentage of teachers use the ICT lab five times a week or more (25.1%). 21.8% of teachers reported that the regularity of ICT lab use varies week to week.

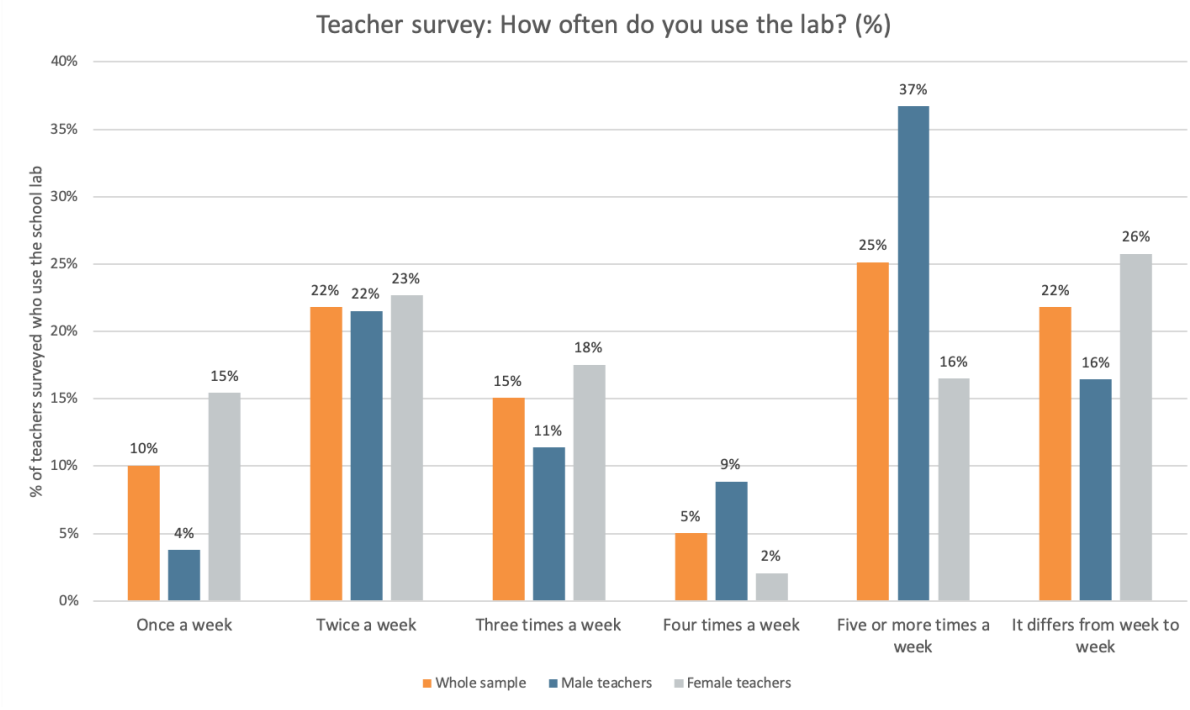


Figure 14:: Frequency of lab use

Further characteristics regarding gender, county, subject, and age related to teacher use of the ICT lab from the survey are summarised in the points below:

- Male teachers use the ICT lab more often than female teachers. 36.7% of male teachers report using the lab five or more times a week compared to 16.5% of female teachers. Moreover, 15.5% of female teachers use the lab just once a week compared to 3.8% of male teachers.
- The regularity of school lab usage also varies by county. Teachers in Kajiado report using the lab more than teachers in other counties, with 54.2% using it five or more times a week compared to only 14.7% in Makueni. Teachers in Uasin Gishu report the lowest use of the school lab, with 13.5% of teachers using the lab once a week, compared to 4.2% in Kajiado.
- Numeracy teachers report using the school lab more often than literacy teachers. Of numeracy teachers surveyed, 36.8% use the lab five or more times a week compared to 17.2% of literacy teachers. Among literacy teachers surveyed, 14.1% use the lab only once a week compared to 5.3% of numeracy teachers and 9.2% of teachers who teach both subjects.
- The digital teacher survey also revealed that older teachers use the school lab less regularly than younger teachers. The highest percentage of teachers who use the school lab just once a week are those aged 51 to 60, with 23.5% compared to only 4.7% of teachers aged 31 to 40 and 13.3% of teachers aged 20 to 30 and 41 to 50. This suggests that age of the teacher may be a factor in the uptake of teacher practices.

For the use of whole-class resources and the projectors, the digital teacher survey revealed that the majority of teachers deliver whole-class lessons using the digital educational

resources on a weekly basis. Across the whole sample of teachers, 58.6% report teaching weekly whole-class lessons. A further 33.6% report teaching whole-class lessons a couple of times a month and only 7.9% report doing so less than monthly. No teachers reported that they never teach whole-class lessons.

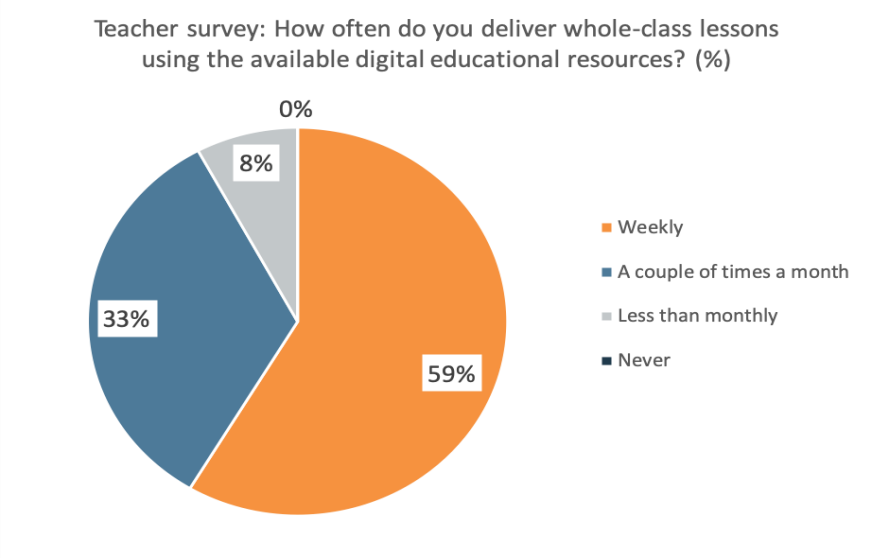


Figure 15: Frequency of delivering whole-class lessons

Further characteristics regarding gender, county, subject, age, and intervention type related to teacher use of the ICT lab from the survey are summarised in the points below:

- A higher percentage of male teachers report teaching whole-class lessons weekly than female teachers: 65.0% compared to 53.5%.
- Uasin Gishu has the lowest percentage of weekly whole-class lessons, with 50.0% of teachers compared to 64.2% in Makueni.
- Literacy teachers teach more weekly whole-class lessons than numeracy teachers: 60.2% of literacy teachers compared to 49.2% for numeracy teachers.
- Younger teachers teach whole-class lessons with the projector more often than older teachers, with 76.1% teaching weekly whole-class lessons compared to 42.5% of teachers aged 41 to 50.
- A higher percentage of teachers in Intervention B schools report delivering whole-class lessons weekly than teachers in Intervention A and C schools. In B schools, 65.0% of teachers report delivering weekly whole-class lessons compared to 55.8% in A and C schools.

Data from the digital teacher survey reveals that teachers perceive that projected resources are less impactful on pupil learning than ICT lab resources. This is demonstrated in the graph below, where ICT lab resources are selected by a higher percentage of teachers than projected resources for both literacy and numeracy.

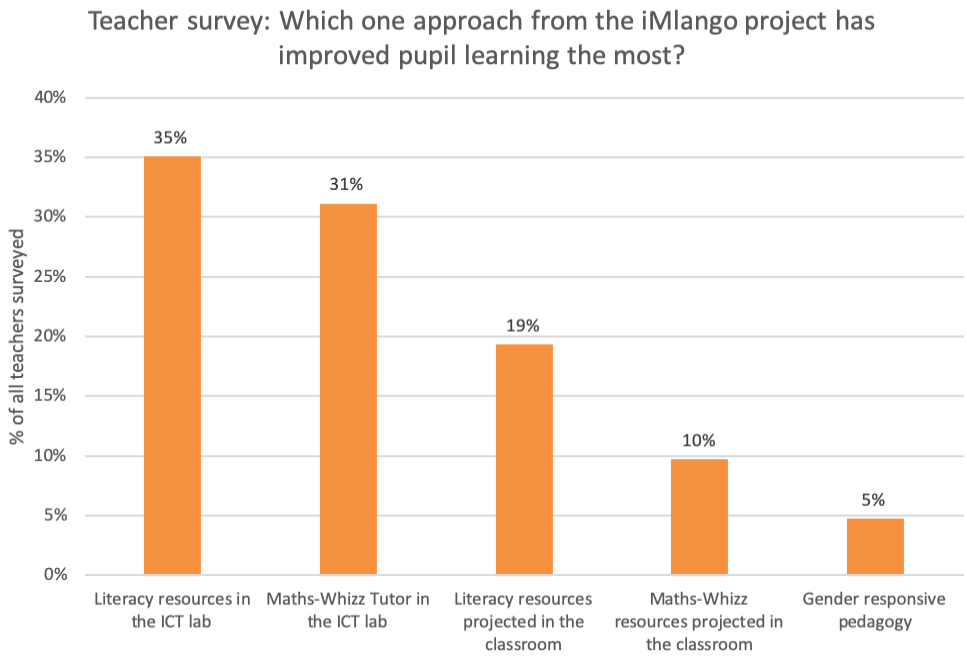


Figure 16: Approaches improving pupil learning

When asked to select the approach from the iMlango project which has improved pupil learning the most, the highest percentage of teachers selected the literacy resources in the lab: 35.0%, followed by the Maths-Whizz Tutor in the lab (31.0%). Male teachers favour Maths-Whizz Tutor while female teachers favour literacy resources in the ICT lab. Both genders consider the lab resources to be more effective than the projected resources. As expected, literacy teachers consider literacy resources in the lab to have improved student learning the most (50.4%) and numeracy teachers consider the Maths-Whizz Tutor in the lab to be the most effective (49.2%). This suggests that while teachers agree that projected resources support the delivery of their lesson, individualised learning sessions in the ICT lab are more highly favoured.

Gender responsive pedagogy

The data reveals a conflicting picture regarding teacher usage of gender responsive pedagogy. Approximately three quarters of teachers surveyed (76.4%) reported that they received gender responsive pedagogy training provided by iMlango. Of those teachers, the majority reported that they are confident in implementing gender responsive pedagogical approaches in their classroom: 98% self-reported that they are either “fairly confident” or “very confident”.

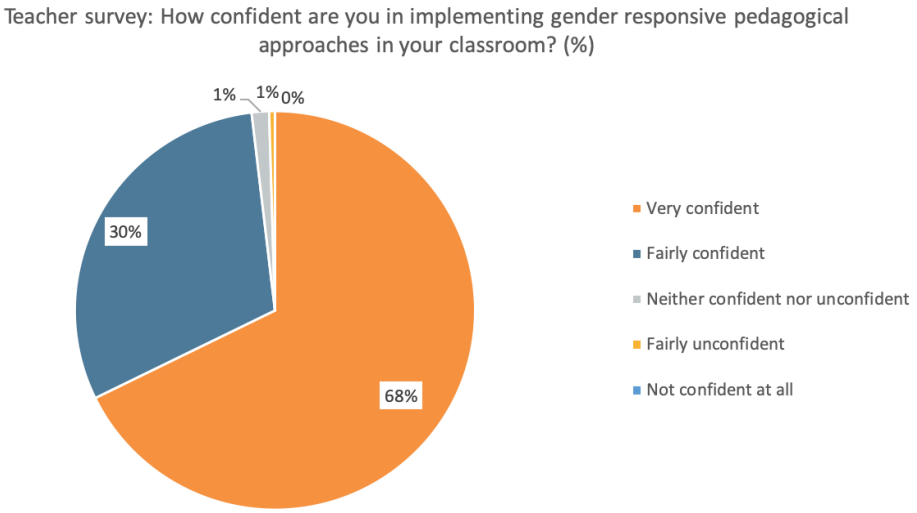


Figure 17: Teacher confidence in implementing gender responsive pedagogy

All male teachers report that they are "fairly confident" or "very confident" in implementing gender responsive pedagogical approaches compared to 97% of female teachers. Despite the high level of confidence in implementation expressed by teachers, in the digital teacher survey, only 4.6% of teachers consider gender responsive pedagogy to have improved pupil learning. The data does not provide a reason for this discrepancy. There are a number of possible suggestions: that teachers are not implementing the gender responsive pedagogical approaches covered in the training; teachers do not recognise the benefits for pupil learning; or that the gender responsive pedagogies are not having an impact on pupil learning.

However, qualitative insights from KIIs and lesson observations from field officers present a more positive picture, with wider teacher usage of gender responsive pedagogical approaches. One field officer reported in a lesson observation,

> *'One thing that stood out to me during a lesson - engaging teachers in gender responsive pedagogies - encouraging them to appreciate pupils when they answer questions in class. Lesson I attended [had a] culture of appreciating pupils in the class. Really motivated the pupils. Enjoyed the lesson. We could see that they were learning from that.'* (iMlango Field Officer)

This suggests that some teachers are changing their pedagogical approach to incorporate gender responsive methods into their lessons. Other field officers reported in their lesson observation notes that there is evidence that teachers are considering how they can apply gender responsive pedagogical approaches beyond their ICT lessons:

> *'They [teachers] apply the feedback to their normal lessons as well as the ICT lessons, so there is trickle down to their normal lessons. E.g. group work - they say that they will apply that in the normal classes as well. E.g. gender responsive pedagogy - they also think about how they can take it back to the normal lessons. That's what we want, to make it as wholesome as possible.'* (iMlango Field Officer)

No teachers interviewed made explicit mention of gender responsive pedagogy or referred to gender-sensitive teaching methods when asked about their approach to teaching. However, many teachers gave examples of progressive teaching techniques that they used

in lessons, in particular: group work, demonstration, and class discussion/debate. Several teachers expressed that their teaching methods had changed since the iMlango project started at their school.

> *'I use pupil-centred approaches. We talk less and we introduce questions and get the students to work through the answers themselves. They are practically learning and discovering, rather than simply learning by rote. We also do peer learning and group work - where the pupils can work in groups and the teacher can move around the room and support. We have introduced these practices since iMlango started supporting the school.'* (Teacher, low usage school, Makueni County)

> *'Since iMlango started things have changed a little. We do less lecturing and use resources more. We do more group work and participation. We use practical examples and visual demonstrations to aid learning.'* (Teacher, medium usage school, Kilifi County)

However, one teacher from a medium usage school in Makueni suggested that although they do group work and discussion, around 60% of his lessons remain 'lecture-style.' Indeed, from the Whizz Education lesson observation data from 2019, one of the biggest pedagogical gaps identified was a lack of group work. This was also identified as a gap in the lesson observation data in lessons observed at most of the schools sampled for interviews, suggesting that this approach to teaching is perhaps not as common as the evidence from the teacher interviews suggests.

Only one teacher, from a high usage school in Uasin Gishu, referred to a training on gender responsiveness in the teacher interviews. She said:

> *'MBWs (My Better World) training is from iMlango - a seminar we used to attend, we are told it is linked with iMlango. It was about empowering the girl child. In some communities you find that the girl child is left behind and boys are considered to be the ones who should go to school while girls stay at home. We were told about forming girls' clubs and empowering girls and for them to share their problems with mentors.'* (Teacher, high usage school, Uasin Gishu County)

No other teachers referred to this training during the interviews. However, a small number of teachers also mentioned the existence of girls' clubs at their school.

5.4. School ICT lab sessions

RQ 2.2: What factors contribute to the achievement of a well-executed Maths or English session using the ICT school lab? What factors inhibit this achievement? What factors compromise and contribute towards the learning that comes out of such a session?

Enablers for achieving a well-executed ICT lab session

Two broad themes emerged as enablers for achieving a well-executed ICT lab session: preparing for the session and having support systems in place.

The preparation of the lab and equipment before the session was the most selected response in the digital teacher survey when respondents were asked what the most important factors are that contribute to a well-executed ICT lab session.

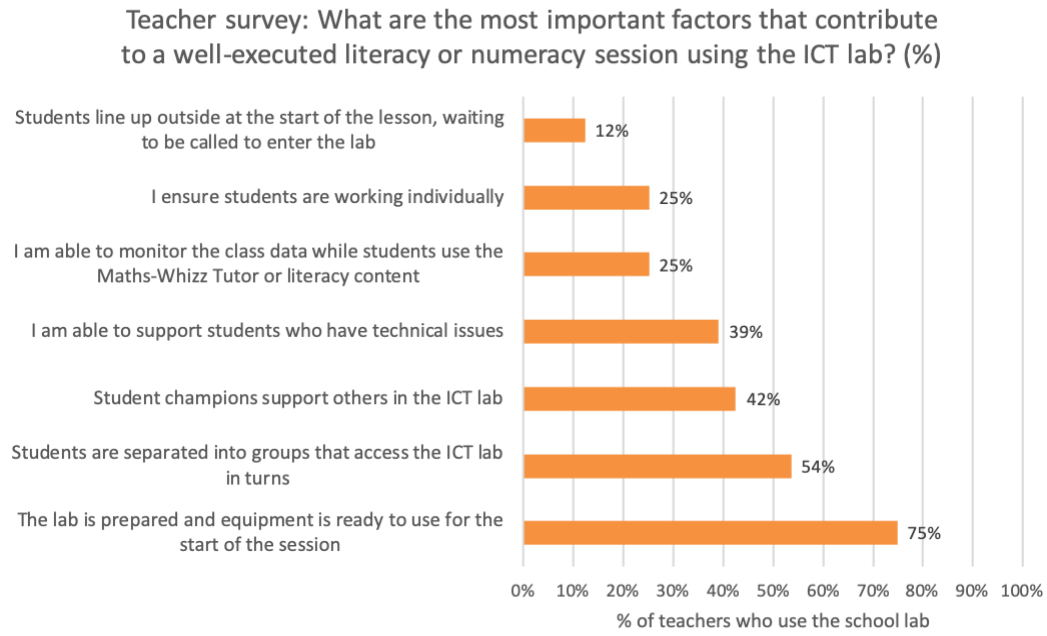


Figure 18: Contributing factors to a well-executed ICT lab session

Planning was also a critical success factor raised by school key informants during interviews, who noted that prior planning and preparation was needed for effective sessions as well as ensuring that the computers are switched on and the login page is open so that pupils can start as soon as they enter the lab. Preparing for the session also includes the second most selected response by survey respondents, separating students into groups to access the ICT lab in turns. In the school KIIs, teachers also discussed the benefits of this organisation and management technique, noting that it leads to well-run sessions and ensures equal access to computer time.

The second theme that emerged was having support systems in place, which included support from other students as well as teachers. The use of student champions to support others in the ICT lab was the third most selected option in the survey responses and was also noted within teacher KIIs. Interestingly, data from the survey suggests that younger teachers make more use of student champions to support others in the lab: 56.7% of teachers aged 20 to 30 compared 35.3% of teachers aged 51 to 60.

Teacher support for students experiencing technical issues was the fourth most selected option in the survey responses. This was echoed in the interviews with teachers who described teacher presence as a success factor. Teachers from all three high usage schools stressed the importance of having the teacher present in the lab in order to run a successful session. Interviews with iMlango consortium partners similarly emphasised the importance of support through proactive head teachers, technical skills of teachers and having a designated individual who is responsible for the lab, such as an ICT lead or champion. Interestingly, these all relate to school-level sustainability and are discussed in further detail in research theme 4, including the project's plans to address the technical skills of teachers and the challenges of doing so during COVID-19.

Barriers for achieving a well-executed ICT lab session

The majority of teachers surveyed (57%) reported that they are able to use the school lab as much as they would like to and did not report any factors restricting access. The graph

below reveals that there are some differences by gender, county and age of teacher:

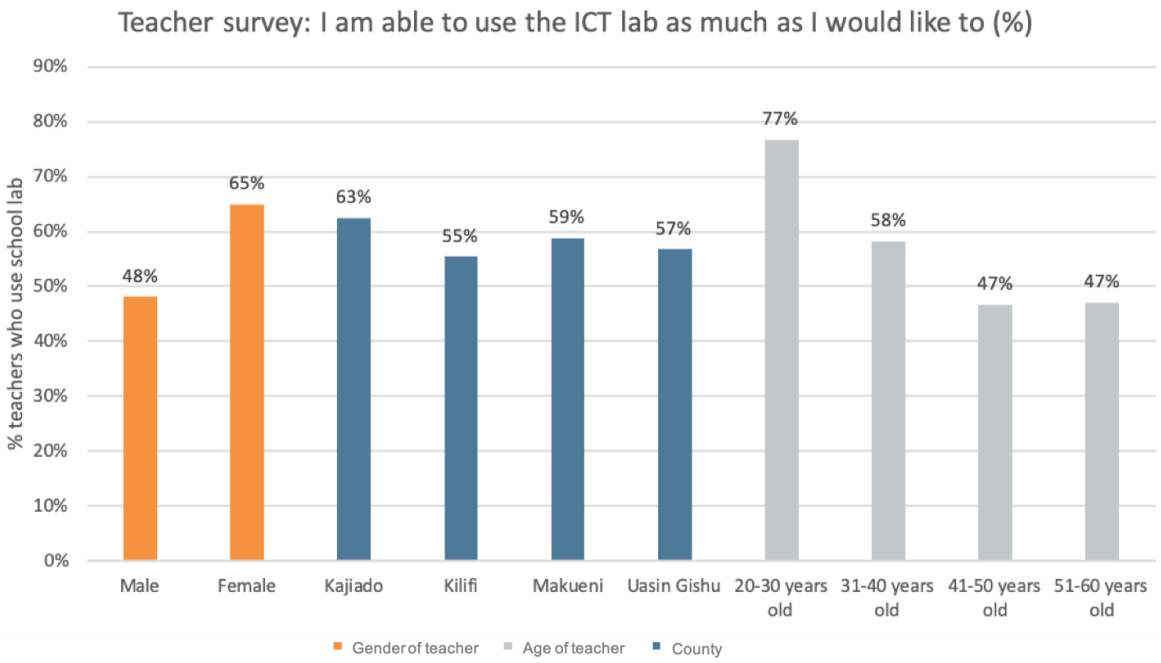


Figure 19: Teacher use of the ICT lab by gender, age and county

A higher percentage of female teachers report that they can use the lab as much as they like than male teachers. A higher percentage of younger teachers report that they are able to use the lab as much as they would like than other brackets. There is less variation by county, with Kajiado having the highest percentage of teachers who report that they can use the lab as much as they like.

While the above is promising, four themes emerged as barriers to lab use and to achieving a well-executed session in the ICT lab: availability of the lab, hardware, unreliable electricity and internet connectivity, and teacher supervision of sessions.

Among teachers surveyed who use the lab, the biggest reported barrier to using the school lab is that it is not always available for their class to use (25.7%). This is the main barrier when disaggregated by gender, with 32.9% of male teachers and 19.6% of female teachers. A higher percentage of older teachers report that the lab is not always available for their classes:

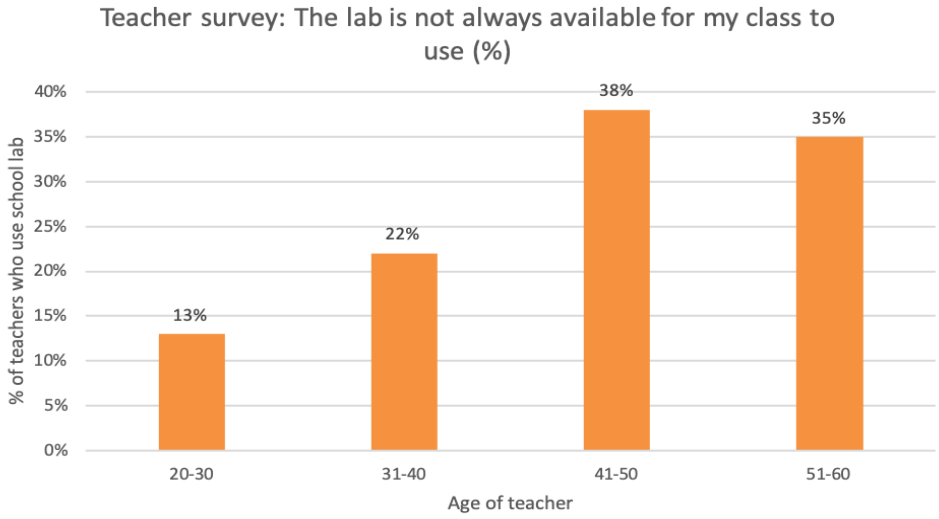


Figure 20: Unavailability of the ICT lab by teacher age

The low number of working and available computers was cited as a barrier in the digital teacher survey as well as in school interviews. In the survey, the most common suggestion given by teachers to improve the iMlango project pertains to hardware: i.e. 22% of teachers made recommendations regarding the "gadgets" such as computers or projectors provided as part of the project. In open responses, teachers made suggestions related to the number of devices provided (needing more to serve the large number of students), maintenance (timely repair of broken devices), and quality (some feel the devices are poor quality and break easily). This finding is supported by feedback from KIIs with both iMlango consortium partners and teachers. The barrier of a high student to device ratio was raised by a number of interviewees:

> *'High student to device ratio - in a large school particularly 25 computers, 8 tablets, class size of 80 needs to split itself into three to get access to the lab once. That automatically creates a massive challenge.'* (iMlango consortium partner)

In addition, broken hardware was cited by several teachers in school interviews. Teachers also reported in the digital teacher survey that there is often a delay in the repair of broken hardware, further reducing the number of available resources for students to use. Challenges related to hardware are explored in more detail as a barrier to students achieving the recommended portal time in research theme 1 on pupil learning.

Another barrier to the execution of a successful ICT lab session raised by multiple data sources was unreliable electricity and internet connectivity, although this is of course a barrier for the use of whole-class resources as well. Of teachers surveyed, 17 teachers reported that power outages were a barrier to a successful ICT lab session under the "other" option. This is echoed by iMlango consortium partners, who note that *'if the power goes off the whole system goes off. And if they haven't a back-up they can't continue with the class'* (iMlango Field Officer). Teachers and head teachers across almost all schools noted that power outages are a consistent issue. Sometimes power outages are due to problems with the power supply - i.e. power cuts - however sometimes these are due to schools not being able to pay for electricity bills. Schools receive a stipend from the government for electricity costs, however due to high levels of power usage in iMlango schools, the stipend may not cover the whole bill. When this happens, schools may be 'cut off' by the electricity provider until they are able to pay. Although high electricity bills are a cross-cutting issue, their

impact on overall school usage seems to vary. For example, a teacher from a medium usage school in Makueni said:

> *'Since we opened in January we had three weeks without power because the bills had not been paid - it is like that often at the start of the term. And also every, almost every month we go without power because of power surges, power cuts.'* (Teacher, medium usage school, Makueni County)

In one low usage school in Makueni, one of the teachers said that on average two lessons per day are lost due to power outages. Similarly, in a low usage school in Uasin Gishu, a teacher said the following:

> *'In my school, the major challenge is electricity. Sometimes it's disconnected by Kenya power. Sometimes this takes time [to come back on]. Learners don't get to use the computers as expected because of this. Head teacher says there's no finances for power and we have to accept this.'*

Although this teacher did later say that the head teacher had tried asking parents to contribute to the electricity costs, the parents were not able to contribute due to their own difficult financial situations. This contrasts with the response to electricity bills in some high and medium usage schools, where the school administration and management have successfully sought ways to raise funds to cover the costs through either parent contributions or income generating activities (see research theme 4 on project sustainability for more details).

Out of all the schools sampled for KIIs, only one head teacher in a school in Kajiado said that they do not have any problems with electricity supply. The teacher at this school mentioned a company that provides electricity for the community. Upon researching, it seems that there is a factory that manufactures soda ash in the particular township where the school is located. The company that owns the factory installed a 10 megawatt power line in the area for their own use, however the local community also benefits from this infrastructure. This may explain the relatively better electricity supply to this otherwise very rurally located school.

Issues with internet connectivity were another commonly cited barrier for effective use of the ICT lab within school KIIs. Similarly, in the digital teacher survey the second most common suggestion to improve the iMlango project was about reliable internet access. Of teachers surveyed, 15% recommended that the internet access needs to be improved. Further suggestions included increasing the number of logins available per school or teacher and ensuring that a larger number of devices are able to be connected simultaneously.

The technical skills of teachers were also noted in project KIIs as a barrier for a well-executed ICT lab session. This includes the necessary digital and technical skills to adequately supervise and support students:

> *'Some teachers are still dependent on a champion to set up the equipment to conduct the lesson. They might click on the wrong thing then not know how to get back to the right screen, so they rely on the class champions to help them.'* (iMlango Field Officer)

iMlango consortium partners observed that poor teacher supervision could potentially result in students misusing the 'replay' feature on Maths-Whizz Tutor as students sometimes replay a set of exercises and questions they have already understood. Thus, even though student usage is increasing, they are not progressing and gaining new knowledge and skills, which could be in part because teachers are not guiding students through the progressions.

5.5. Whole-class lessons

RQ 2.3: What factors contribute to the achievement of a well-executed Maths or English lesson that uses projected iMlango resources? What factors inhibit this achievement? What factors compromise and contribute to the learning that comes out of such a lesson?

Enablers for achieving a well-executed whole-class lesson

Four themes emerged as enablers for achieving a well-executed whole-class lesson: preparing for the lesson, teacher confidence in the use of the equipment and resources, teacher familiarity with the available content and how it aligns with the curriculum, and classroom management.

The most selected factor that contributes most to the achievement of a well-executed whole-class lesson using the projector in the digital teacher survey was the preparation of the classroom and equipment before the start of the class.

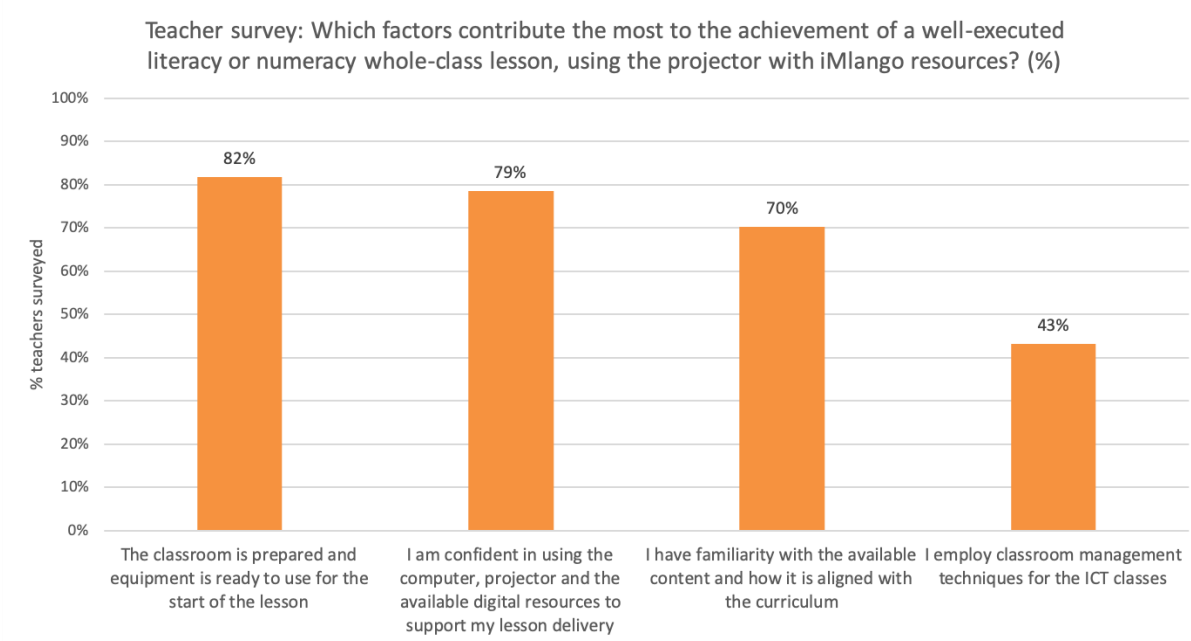


Figure 21: Contributing factors to achieving a well-executed whole-class lesson

Preparation for the class was also discussed within teacher interviews. Teachers noted the importance of lesson planning and having a back-up plan in place in case of power or internet failure. As part of the preparation for classes, one teacher in a medium usage school in Makueni also said that in his school they timetable the whole-class lessons before or after breaks, so as to not lose time when students move between lessons.

Teacher confidence in using the computer, projector and digital resources was the second most selected factor by survey respondents. Teacher confidence, including insights shared within teacher interviews, is discussed more fully in the sections that follow.

Teacher familiarity with the available content and its relevance to the curriculum was the third most selected factor by survey respondents. Data from the digital teacher survey

demonstrates that teachers consider the content of the iMlango digital resources and educational materials for literacy and numeracy classes to be relevant to the Kenyan curriculum. There is no notable variation of this opinion by gender, county, type of teacher, age of teacher or intervention type for literacy or numeracy resources.

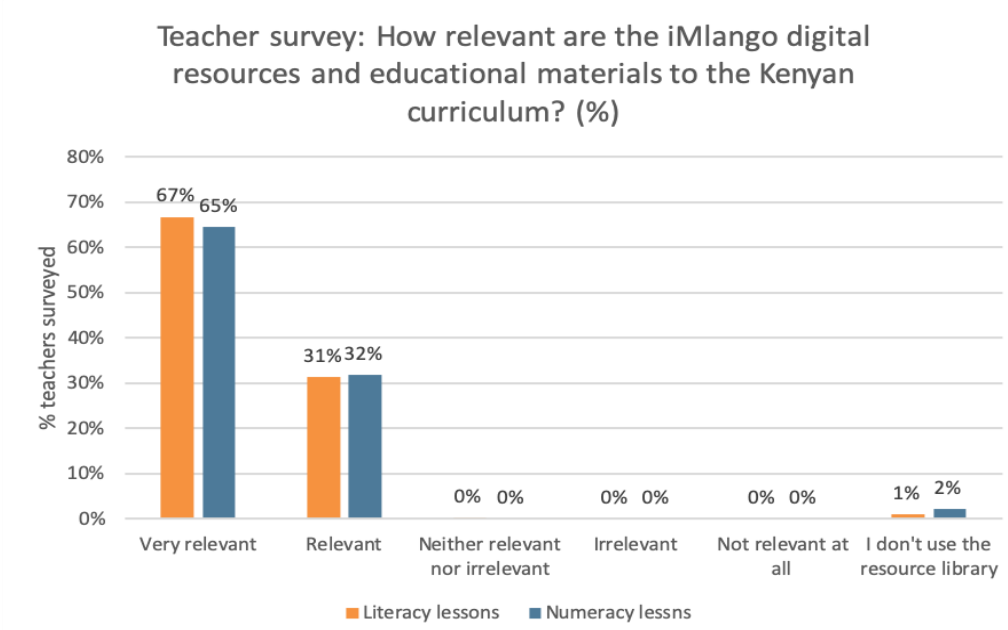


Figure 22: Relevance of resources to the curriculum

However, several teacher KIIs present a slightly more nuanced picture regarding teachers' views on the alignment of projected resources with the Kenyan curriculum. One numeracy teacher from a medium usage school in Makueni explained that one factor that makes him choose not to use the projected resources is that he feels there are gaps in the resource content, especially for the upper grades:

> *'Mostly for the upper grades, standard 7 and 8, (resources) are a bit limited, a bit shallow, so there needs to be more content for 7 and 8. If I only use the portal content I cannot prepare my learners for the national exams.'* (Teacher, medium usage school, Makueni)

This issue was also identified by a teacher in a low usage school in Kilifi, who said that there were gaps in Maths-Whizz content for standard 7 and 8, and so she had to resort to analogue methods in order to cover the whole curriculum. However, other teachers reflected broadly that the portal content is in line with the Kenyan curriculum.

The employment of classroom management techniques was the least selected factor for both male (39.0%) and female (46.5%) teachers in the survey in contributing to a well-executed whole-class lesson. Interestingly, however, monitoring student behaviour and maintaining 'control of the classroom' emerged from the teacher KIIs as an important factor for a successful lesson.

Barriers for achieving a well-executed whole-class lesson

Data from the digital teacher survey demonstrates that the majority of teachers surveyed (48.9%) are able to use the projector and computer to conduct whole-class lessons as much as they would like to. The graph below reveals there are some variations by gender, county

and age of teacher:

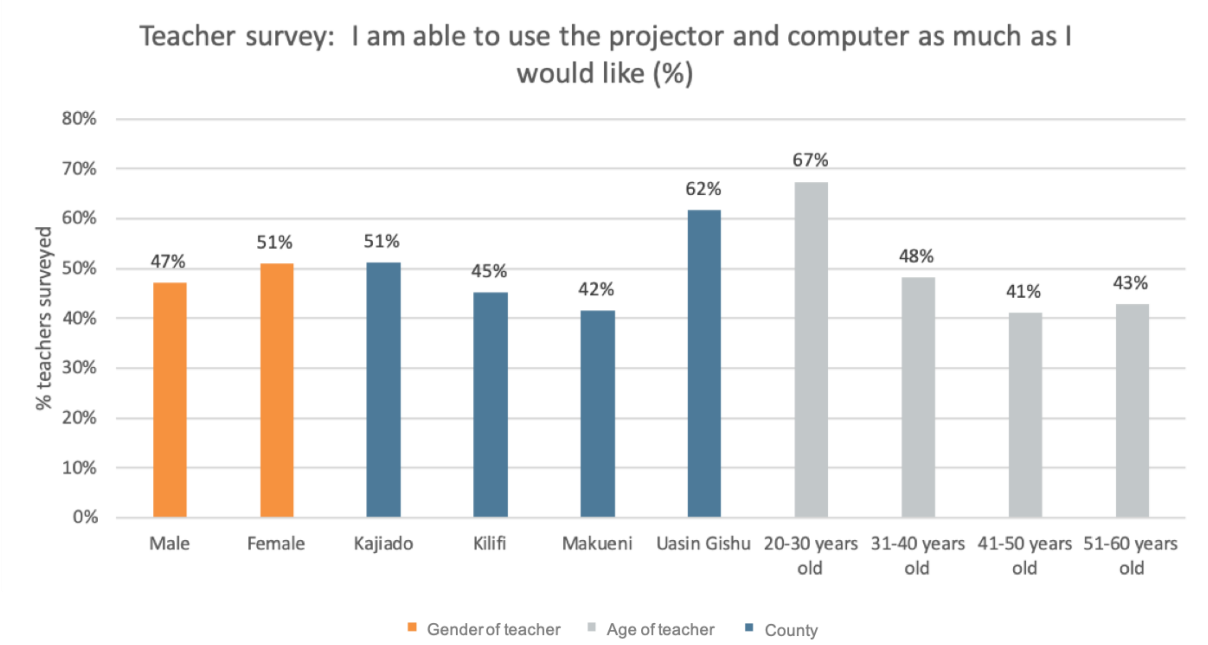


Figure 23: Availability of projector for teacher use

A slightly higher percentage of female teachers report that they can access the projector as much as they want when compared with male teachers. Uasin Gishu has the highest percentage of teachers reporting they can always access the projector and Makueni the lowest. Younger teachers report that they can use the projector more than any other age bracket. A higher percentage of teachers in A and C schools report accessing the projector as much as they would like to as compared to teachers in B schools: 52.8% compared to 38.8%. This is in slight contrast to the KIIs with teachers, however, where several teachers expressed that they would like to use the projectors more frequently if they had the chance:

> *'Once per week is not enough, you get to a point where you wish you had the opportunity to go for all 7 lessons! That would give you a better way to do it. For example language patterns you can get a lot of material e.g. longhorn which is aligned with the curriculum, so you can identify what you want to teach and take them there, project examples of sentences, you can see illustrations, etc., so it is much easier! If we had extra time it would be a big advantage.'* (Teacher, high usage school, Kilifi County)

Data from both interviews with teachers and the digital teacher survey reveal that teachers face similar barriers to implementing successful whole-class lessons as they do for ICT lab sessions: i.e. unreliable electricity and internet connectivity and challenges related to infrastructure.

Unreliable electricity was the main barrier cited by teachers (33.2%) in the digital teacher survey for delivering a whole-class lesson using ICT resources. This is the most selected barrier for literacy teachers (34.5%), numeracy teachers (37.3%) and teachers of both literacy and numeracy (29.6%). Regionally, there are differences in the percentage of teachers experiencing unreliable electricity as a barrier to delivering whole-class lessons using ICT. A much higher percentage of teachers in Makueni experience this, 60.4% compared to 32.5% in Kilifi, 21.7% in Uasin Gishu and 17.1% in Kajiado.

Infrastructure was additionally cited as a barrier for the delivery of effective whole-class lessons. For several teachers, only having two projectors in a large school was not conducive to success as teachers were very limited as to how often they could use the projected resources. This finding is supported by interviews with iMlango consortium partners, who report the distribution of equipment as a barrier to successfully implementing whole-class lessons. Interviews with iMlango consortium partners also revealed that infrastructure challenges include some ICT classrooms for whole-class teaching having been converted back to normal classrooms, meaning that they are no longer available for whole-class learning.

Teacher confidence in using whole-class resources

RQ 2.4: To what extent do teachers feel confident in their ability to use numeracy and literacy whole-class resources as a tool to support pupil learning within a lesson (particularly as they relate to lesson objectives, teaching the whole class, alignment with curriculum, pace, formative assessment, etc.)?

Several teachers interviewed had some prior experience using ICT, either through training or as part of their studies, however very few had prior experience using ICT specifically as a teaching tool. Overall there was a high level of enthusiasm for the project across teachers in different school usage bands (i.e. high usage, medium usage and low usage schools). Teachers saw the value in using ICT for teaching and expressed positive attitudes towards the project activities. Both of the above may be skewed by the selection process in choosing teachers to take part in the interviews [teachers were chosen by FOs - and it is likely that the FOs chose those teachers that are most engaged with the project from each school]. However, some teachers mentioned that they had seen some resistance by other teachers to engage fully in the project activities: *'Some feel it is difficult to use the computers and they have stuck to having no participation and relying on chalk and talk'* (Teacher, medium usage school, Kilifi County). A head teacher at a high performing school in Kilifi suggested that older teachers had less interest and incentive to engage with the project activities:

> *'70% of teachers are really interested in the project. The others are not so interested. The ones who are not interested are about to retire, they are old and feel they have no stake in the new things that are coming in. And some had been transferred from schools with no computers so they are scared to interact with the computers. But one major issue is that they are about to retire.'*

A head teacher from a high usage school in Uasin Gishu made a similar observation, saying that around half of the teachers at his school are *'scared' to* use the projector, which he suggested was because of their age. iMlango consortium partners similarly reported that younger teachers were more accepting and enthusiastic about the iMlango project. They were considered to be more digitally literate and as recent graduates of teacher training colleges appeared to be used to adapting their teaching methods to embrace new methods.

In the school KIIs, several teachers said that they felt confident using the projected resources: *'I feel confident in using the resources in my lessons. I use projected content as frequently as I can as I find it assists the lessons and keeps the students attentive'* (Teacher, medium usage school, Kilifi County). One teacher in a medium usage school in Makueni suggested that having access to the iMlango resources had helped to build his confidence as a teacher: *'As a teacher I have accessed content I didn't even know existed. And this improves me as a teacher and improves my confidence'* (Teacher, medium usage school, Makueni County).

Teacher enthusiasm and confidence in using ICT was also discussed in project-level KIIs as related to attitudes and prior experience of using ICT. Field officers report that there are challenging attitudes which hinder teacher engagement with ICT interventions. For example, field officers report that some teachers struggle to conceptualise how ICT links to teaching and how the resources provided can be helpful: *'One of the main challenges is that mindset and difficulties in changing attitudes and habits'* (iMlango Field Officer).

Another finding is that integrating ICT into lessons is perceived by some teachers as additional work. Field officers report that they have received feedback from teachers that taking attendance digitally, taking pupils to the school ICT lab and showing pupils how to log into the portal, is extra work:

> *'One particular school, the deputy told me didn't want the project in the school - too much extra work. Supposed to mark the register and not take the tablet - it's tiresome. [...] Training assisted a lot but [it's a] gradual process - not everyone came on board at the same time.'* (iMlango Field Officer)

Field officers report that teachers' prior experience with ICT affects their attitude towards the project. For example, teachers who had limited experience of using ICT in teaching or in their personal lives and therefore had only basic skills were initially resistant or hesitant of the project. One field officer recounted how this has changed over time:

> *'At the beginning of the project, most teachers didn't have knowledge of ICT - some had basic skills but never used them. Seen teachers who now can confidently pick up a laptop, search for resources online, I could see teachers sending in test results. Seen changes and seen teachers embracing ICT - majority of skills at beginning teachers using old phones - but right now you go to a staff room about 90% has embraced technology.'* (iMlango Field Officer)

5.6. Influential factors for using projected content

RQ 2.5: What influences a teacher's decision as to whether or not they use projected content in a planned lesson? In particular, how does a teacher's confidence with the topic of the lesson influence their decision as to whether or not to use a projector?

Teachers who participated in the digital teacher survey were asked to what extent they agreed with the statement, *'My confidence with the topic of a planned lesson influences my decision of whether or not to use the projector for the whole-class lesson'.* Overall, 95% of teachers reported that their confidence with the topic of a lesson is a factor in their decision of whether to use the projector.

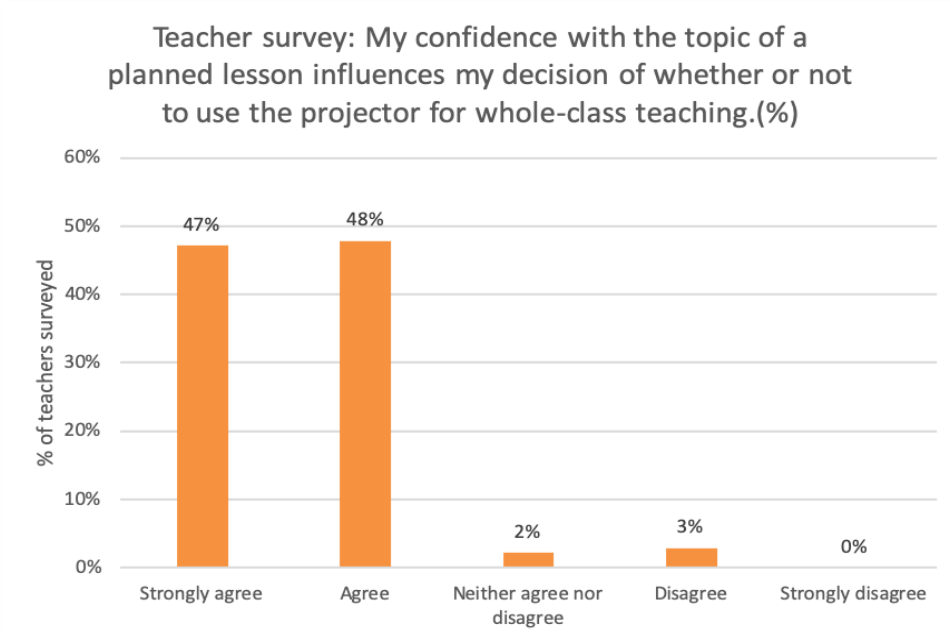


Figure 24: Teacher confidence with topic of a planned lesson and influence on use of projector

A slightly higher percentage of female teachers agree or strongly agree with this statement than male teachers: 97% compared to 92%. There is no notable variation between type of teacher, county, age or intervention type.

Interviews with teachers explored the factors influencing their decision to use projected content. For most teachers interviewed, the choice whether to use projected content in a planned lesson appeared dictated by the timetable for projector use. Teachers used projected content when they were timetabled to do so. In addition, one teacher from a low usage school in Kilifi indicated that one of the factors that influenced her use of the projected resources (alongside issues with power supply) was a lack of knowledge: '*The other problem I have is that I am not personally trained in computer science (I trained as a normal teacher) so do not have all the ICT knowledge'* (Teacher, low usage school, Kilifi County). In addition, a teacher from a high usage school in Kilifi expressed that, particularly at the beginning of the project, the teachers in his school with limited ICT experience and skills lacked confidence in using the resources. However, he explained that he and his colleague - both of whom are school champions - were able to mentor and support other teachers in the school to slowly build their confidence in using ICT:

> *' I had some knowledge in advance, so in our case, some of the teachers have not gone through much training, so at times they feel it is difficult to do, but with time we have managed to come out of that, people have become more confident. If there is a small problem you try to assist and they continue with the class. I think that people are becoming more confident because from previous years, the numbers of teachers who are confident are increasing. I have to go and help less now!'* (Teacher, high usage school, Kilifi)

The teacher explained that he and his colleague supported teachers first by providing demonstrations of using the resources to the teachers, and then by letting the teachers practice themselves while he and his colleague could supervise. Due to this increased confidence amongst teachers, he now has to go and help less frequently during lessons.

This kind of strong support system was also present in another high usage school. A teacher at a high usage school in Uasin Gishu also had previous experience using ICT, and had developed a high level of confidence using the project resources. This teacher explained that after taking part in a training of trainers offered under iMlango, he had since conducted training for several other teachers not just in his school but in other schools as well:

> *'The first training I did was the training of trainers when the project started. That one helped me to help other teachers. It was face-to-face training. Since then I have trained over 6 different schools [participating in the iMlango project] - this is face-to-face training. When I train them, we cover internet access using iMlango portal, teaching them about the numeracy part and how to use the teacher resources, literacy part on how to use the encyclopaedia, and how to support the learners. Help them to form probes.'* (Teacher, high usage school, Uasin Gishu)

RQ 2.5.A: To what extent do teachers understand what projected content is available for their use and how it can be used to support specific objectives of the lesson?

The digital teacher survey asked teachers to what extent they agreed with the statement: "*I understand what digital resources and content are available to use with the projector in my classes and how they can be used*". Overall, 99% of teachers understand what digital resources and content is available to use with the projector and how to use it.

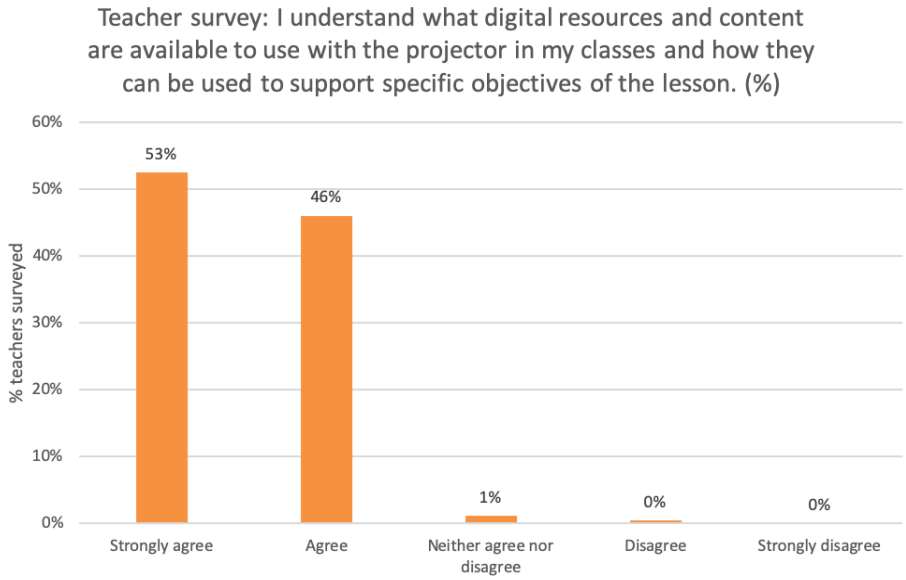


Figure 25: Teacher understanding of available resources

Indeed, 93% of teachers report that they search online for resources to use with the projector to support their lesson learning objectives. This suggests that there is a high level of awareness of the resources available. There is some support for this in the qualitative data, as several teachers mentioned accessing resources online to use with the projector. One teacher from a medium usage school in Kilifi explained that he plans his lessons using the computers and then uses the projector to display the materials he has sourced during his lesson planning. Another teacher at a medium usage school in Makueni said, *"When I am doing personal research for whole class lessons I will research available content and I might be on for more than an hour."* However, this teacher also noted that only two

teachers are able to access the online content at a time, which makes it very hard for all teachers to gain adequate access to the content.

There is no notable variation by gender, county, teacher type, age or intervention type. Note that further analysis regarding teacher use of resources is included in Appendix L.

RQ 2.5.B: What are teachers' perceptions of whether using this content helps or hinders their a) preparation of the lesson, b) delivery of the lesson, and c) ability to evaluate the lesson and what children learnt (or did not learn)?

Interviews with teachers explored perceptions of the helpfulness of the projected content for lesson planning, however these responses were limited and broad. One teacher from a low usage school in Uasin Gishu specifically referred to lesson planning in relation to iMlango portal content and said that the resources make it easier and quicker to plan lessons. A small number of other teachers did refer to lesson planning and specifically the use of the student data generated by the project as something which guides their lesson planning. The digital teacher survey explored teacher use of class-level reports for the planning of literacy and numeracy whole-class lessons, however these findings are presented in Teacher Use of Data under research theme 3.

Teachers responding to the digital teacher survey were asked to what extent they agreed with the statement: *"projecting online resources helps the delivery of my lesson"*. Overall, 99% teachers believe that projecting online resources supports the delivery of their lessons.

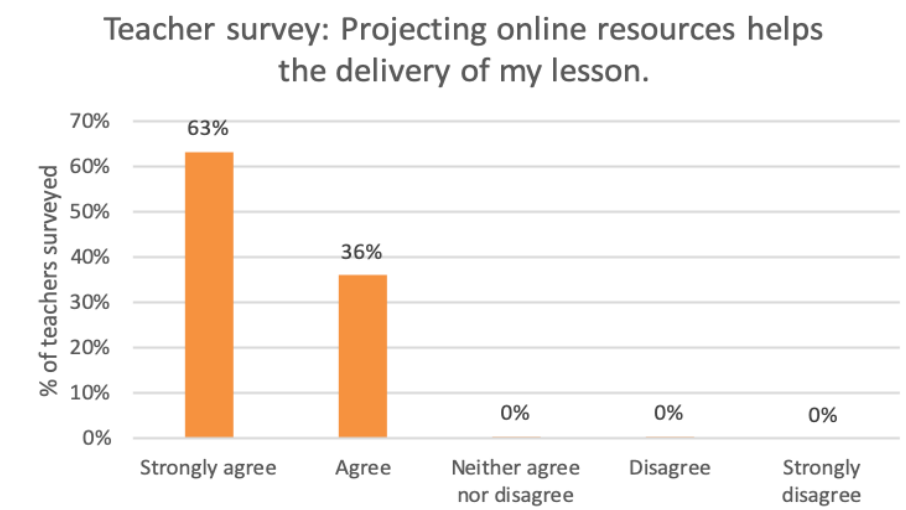


Figure 26: Teacher perception of projected resources helping lesson delivery

Several interviews with teachers across different schools expressed that the iMlango portal content, and in particular the ability to project this content, was beneficial for lesson delivery.

> *'I use the projector to help me teach mathematics. The class size is large so it helps me to present the information clearly to the whole class at the same time....It enables us to show visually what we are talking about. When the students see with their own eyes and don't solely rely on theory, they don't forget as easily. It creates a greater depth of learning.'* (Teacher, medium usage school, Kilifi County)

A literacy teacher in a medium usage school in Makueni said that the projector was particularly useful because previously they did not have enough textbooks for all the children in her classes, but with the projector everyone is able to have access to the content. Several teachers also mentioned that lesson delivery is made easier because the children are more interested in the projected content so it improves the attentiveness of the children.

Several participants also mentioned that one of the benefits of the projectors is that they can be, and are, used for other lessons and not just literacy and numeracy classes. A literacy teacher from a medium usage school in Makueni explained:

> *'I also teach Christian education, and at times I google stories or a topic we are learning, and sometimes take them to use the projector and use that. I find it very helpful.'* (Teacher, medium usage school, Kilifi County)

This also demonstrates that some teachers are searching for teaching resources online outside of those which the portal provides, which iMlango consortium partners note that is something that the project encourages.

5.7. Key learning points

This chapter draws on teacher portal data, the digital teacher survey and project and school-level KIIs to present findings regarding teaching approaches and practices, school ICT lab sessions, whole-class lessons, teacher confidence using whole-class resources, and influential factors for using projected content.

Teaching approaches and practices: School ICT labs, where available, and whole-class lesson resources are used by teachers on a regular basis and are becoming embedded in teacher approaches to improving pupil learning. However, teachers perceive that projected resources are less impactful on pupil learning than ICT lab resources. In addition, teachers are not using sQuid's iMlango portal consistently, as evidenced by low time per login and the percentage of teachers only logging in one or two active teaching months. There is scope to increase teachers' use of some available approaches, such as the Children's Encyclopaedia and Gender Responsive Pedagogy.

School ICT lab sessions: Two broad themes emerged as enablers for achieving a well-executed ICT lab session: preparing for the session and having support systems in place, such as student champions and supportive senior management. Four themes emerged as barriers to lab use and to achieving a well-executed session in the ICT lab: availability of the lab, hardware (low number of working and available computers), unreliable electricity and internet connectivity, and technical skills of teachers (i.e. the necessary digital and technical skills to adequately supervise and support students).

Whole-class lessons: Four themes emerged as enablers for achieving a well-executed whole-class lesson: preparing for the lesson, teacher confidence in the use of the equipment and resources, teacher familiarity with the available content and how it aligns with the curriculum, and the employment of classroom management techniques. Two themes emerged as barriers, which were similar to those of the ICT lab session: availability of projectors and unreliable electricity and internet connectivity.

Teacher confidence and influential factors for using projected content: Five factors emerged as influencing a teacher's decision to use projected content: (i) availability of the projector, (ii) teacher confidence, although most teachers surveyed and interviewed expressed confidence in using the projector, (iii) use of a timetable (i.e. teachers used

projected content when they were timetabled to do so), (iv) power supply and internet connectivity, and (v) digital literacy and prior experience using ICT in the classroom. The majority of teachers understand what digital resources and content is available to use with the projector and how to use it.

6. Research theme 3: school management and use of data for decision-making

6.1. Overview

This chapter presents thematic findings regarding school management practices and the use of data to inform decision-making at project, administrative and classroom levels. It begins with an overview of the associated research questions. It then provides findings regarding administrative support of the project, followed by a discussion on the use of individualised student data for decision-making at project, administrative and classroom levels. The chapter draws on KIIs with iMlango consortium partners and at the school and the digital teacher survey. The chapter closes with key learning points regarding school management practices and their use of data.

6.2. Research questions

The research questions regarding this research theme are presented in the table below.

Table 10: Research questions regarding school management practices and use of data

RQ#	Research theme 3 research questions
3.1	To what extent are reports with automatically generated individualised student data used for school management purposes? How does the data inform decision-making at the school level? What are the perceived advantages and challenges?
3.2	How is individualised student data used at the classroom level by teachers?

6.3. Administrative support for the project

This section presents insights regarding administrative support of the iMlango project interventions, which was a prevalent theme that emerged in dialogue with project stakeholders. While administrative support does not relate to a specific research question, it has emerged as a critical area for project intervention usage, engagement and sustainability and cuts across many research questions. Relevant findings from project and school-level KIIs as well as the digital teacher survey are presented below.

The support from school leaders was cited as the most critical factor in school usage and uptake in project-level KIIs and *'the key point for performance... if the administration doesn't support the teachers, they will not perform well'* (iMlango Field Officer). It is considered however that this is not just an EdTech-related success factor, but one associated with wider achievements in pupil learning.

This perspective is supported in the digital teacher survey, where teachers also cited the support of the school administration as the main factor which enables their students to receive the recommended 30 minutes of Maths-Whizz (64.2%).

In school-level KIIs, the importance of support from the school administration and management was echoed through the beneficiary KIIs as an overarching element of successful implementation. High levels of support from the school administration and management was evident in all high usage schools, and some medium usage schools.

For example, at a high usage school in Kilifi, the head teacher gives a small token, in the form of 100 or 200 shillings, to those children who get certificates from Maths Whizz through the iMlango project in order to incentivise good performance. They also do the same for those teachers who are actively engaged in the project, in order to reward their active participation. At this school, the head teacher also set up an income generating activity growing trees to help the school financially, and some of the money from this activity goes towards sustaining the project activities. The BoM at this school are involved in the implementation of this income generating activity, and have also successfully fundraised amongst parents to pay for the high electricity bills that the project activities produce. In another high usage school in Uasin Gishu, school administration and management have developed a farming business, and use the money raised through this enterprise to contribute to the school's electricity bills.

The head teacher at a high usage school in Kajiado had only moved to the school at the beginning of 2020 (from another iMlango school). She indicated that her previous school was also very high performing and was clear that she believed that the support of the school administration was a key ingredient for the successful use of iMlango resources at her school. The examples of this support that she gave were: (i) the teacher board developing a monitoring and feedback process to appraise the work of the teachers at the school, which involves monitoring of ICT integration in teaching and learning, and (ii) using school assemblies as a venue to promote the use of ICT and to encourage learners to embrace the project activities.

Participants from high usage schools also demonstrated a high degree of ownership of the project activities, with two participants from different high usage schools stating that the school identifies specific issues and then contacts the project to request support, which the project then provides.

In medium usage schools, the level of support from the school administration was more variable, with some head teachers seemingly more engaged with project activities than others. In one medium usage school in Kilifi, the head teacher was unavailable for an interview, however a teacher from the same school specifically mentioned that the school administration was not supportive of the project:

> *'[The administration] believe it is a waste of time to include ICT. The teachers are not all on board with the benefit of it and the administration are simply interested in performance and meeting goals. It is frustrating because if they embraced it more they would see that it will improve performance across the school, but they currently fear it will distract and take up too much time!'* (Teacher, medium usage school, Kilifi County)

However, there was also some evidence of school management support in other medium usage schools. For example, the BoM member from a medium usage school in Makueni also listed a number of ways in which the school management support the project activities, from fundraising to pay electricity costs, taking responsibility for the security of the project resources and hiring a watchman ensure the resources are not stolen, and organising for the repair and maintenance of project resources and related infrastructure.

There was little evidence of support provided by head teachers in low usage schools,

although it is worth noting that one interview from a low usage school in Uasin Gishu was cut short because of connectivity issues. However, there was equally no evidence of negative attitudes or opinions of the project by head teachers in these schools. Head teachers in low usage schools did tend to give shorter, less detailed responses regarding project activities, which perhaps points to a lower level of engagement with the project. In two low-usage schools, head teachers indicated that they had joined the school after the iMlango project had already started, and were therefore not present for the inception process. However both head teachers had now worked at their respective schools for over a year and a half.

6.4. Use of data to inform decision-making

Overview of real-time data

The use of reliable real-time data (e.g. Maths Whizz data, attendance data, etc.) was cited by a number of project partners as the distinctive contribution of iMlango because of its capacity to provide immediate insight into what is happening within schools in order to adapt project interventions efficiently. This data is used in a number of ways, presented in the sections that follow.

Use of data at the project level

While the use of data at the project level was not a central area of focus within the research questions, it emerged as an important and valuable area of the project. It is described briefly in this section, however this does not offer a detailed analysis.

Project-level KIIs indicate that the ability for iMlango to adapt its interventions and activities due to the availability of meaningful, real-time continuous data in tandem with rich contextual knowledge gained from engagement in local communities has the potential to transform the education sector. According to iMlango partners, adaptations to the project have been built in through the intentional use of continuous data and knowledge of the context with project managers specifically tasked with coordinating and circulating the data and contextual insight within teams to inform changes. Interviewees were unable to point towards one significant adaptation, but rather 'a series of incremental adaptations whose cumulative impact has been enormous' (iMlango consortium partner). This includes areas such as using project data to strengthen teacher professional development.

Project monitoring data includes specific assessment methodologies implemented by Whizz Education that are unique to the Whizz model. This is helpful in the sense that it is internally comparable over time and between country contexts (since the calibration remains unchanged), however it is also challenging to compare this with external data for two reasons: (i) much external data is still typically based on discrete, staggered data collection (following the traditional baseline, midline, endline format) unlike the real-time data collection employed by Whizz Education (ii) detailed information about the data collection model and methods employed by Whizz Education is complicated and based on internal formulas, which presents a barrier to the accurate external replication of these methods that would be required for comparison of datasets. Research theme 1 presents this methodology in further detail, but further transparency and understanding is needed to be able to examine how the sector can learn from the assessment methodology employed by Whizz Education.

This use of project monitoring data to adapt project interventions according to the specific needs of the beneficiaries is supplementary to the evaluation procedures set for the GEC, and is an important area of learning for the GEC more widely. This is built on in the recommendations section at the end of the report.

Use of data at the administrative level

RQ 3.1: To what extent are reports with automatically generated individualised student data used for school management purposes? How does the data inform decision-making at the school level? What are the perceived advantages and challenges?

This section presents the use of pupil attendance data first and then the use of pupil usage data available to schools through iMlango.

Real-time attendance monitoring was introduced as a project component to address a significant need in the Kenyan system because of myriad challenges with paper-based systems (e.g. high margin of error; time-intensive; etc.). Developing a new and reliable attendance monitoring system to be able to present whether or not children are actually in school has the potential to provide extremely valuable data, which can be disaggregated by gender to reveal differences in boys' and girls' attendance as well as indicate trends of how children may gradually drop out of school. This provides a framework for discussion and decision-making at the classroom, school, district, and national levels to spot these trends before children drop out of school. Schools are encouraged to use this data by the project through interactions around the data reports, with Field Officers reporting that they *'share portal usage data, attendance data. Every time I go to a school sit down with head teacher and deputy to discuss challenges "why is this percentage of pupils not attending school?" then we can discuss reasons'* (iMlango Field Officer).

Field Officers offered anecdotal evidence of school administrations using attendance data *'to look at attendance trends of pupils in their school and are able to see what would be the challenges and what's contributing to 'Pupil A' missing school on Wednesday every week. And then can follow-up with the parents'* (iMlango Field Officer). While an in-depth analysis of attendance data was not within the remit of this midpoint research study, this will be an important area for consideration in future monitoring and evaluation reports.

School-level KIIs indicated that school administrators use data on pupil usage and attendance, particularly in high and medium usage schools. Actions taken relating to this data mainly focused on engaging individual students, rather than for any broader decision making or school-level planning purposes. For example, a number of head teachers mentioned using attendance data to monitor individual students' attendance, and personally addressing those students with low attendance, and on occasion also their parents, in order to try and address the cause of their absenteeism.

It is important to note, however, that although digital methods are generally considered to reduce the high margins of error commonly observed with paper-based attendance monitoring, these digital methods are not immune to inaccuracies and human error. For example, the head teacher in a high usage school in Kilifi said that one of the challenges they have faced with digital attendance monitoring is that teachers forget to collect attendance using the smart cards, resulting in gaps in the digital attendance data. iMlango consortium partners note that it is for this reason that the project developed a methodology for allowing for data gaps, otherwise a lower than actual attendance would be shown.

In terms of familiarity with the data generated by the project, head teachers at the high usage schools in Kilifi and Kajiado knew immediately what data the interviewer was referring to when asked about individualised student data generated by the project. The head teachers in these high usage schools provided a high level of detail regarding use of student data and required little prompting on this question. The head teacher of the Kilifi school stated that the data is sent to the school email address on a daily and weekly basis,

and the data tells the school administration where they are doing well and where they need to make efforts to improve. He then offered a specific example with regards to the lab sessions - the school administration uses the data to trace whether teachers and pupils are going to the labs during their scheduled time, and if not they follow up with individual teachers and pupils to address any issues. The head teacher also explained that they have a weekly briefing at the school, where the teacher who is leading the project discusses any challenges identified through the data with the other teachers in the school. Head teachers in two high and medium usage schools also explained that they have weekly meetings with teachers during which they discuss the data provided by the project on usage and attendance and try to resolve any issues.

Head teachers in low usage schools were less likely to provide a high level of detail when discussing use of student data, and required a lot more prompting.

Head teachers were overall less likely to discuss the data on student performance when discussing the data produced by the iMlango project. However, head teachers in two low and medium schools did refer to the data on student performance, and indicated that this data influenced certain decisions made at the school. For example, the head teacher at a medium usage school in Makueni said:

> *'In my school we have special needs children. This information for individual children, we have one autistic student - so I can get information about this boy. And if we find that a special needs child has improved we can put them back into mainstream class. It is vital for my office to make wise decisions concerning particular children and students, and every discussion I am able to refer to that data.'*

Regarding student portal data, project-level KIIs indicated that reports are shared with schools that include progress rates of pupils and include recommendations for schools with low usage rates. Schools are also shown their ranking in their sub-county. School-level KIIs provided some evidence that school administrators are using the data to inform the planning of project activities. For example, the head teacher at a high usage school in Kajiado used the individualised student data for lab timetable scheduling purposes - scheduling extra time for those learners who require more attention. However, there was little evidence across any of the schools that the data was being used to inform longer term school planning at a managerial level. Indeed, even at high usage schools, the level of understanding of project data demonstrated by BoM and PTA members overall appeared relatively low. The small number of BoM and PTA members who said that they made use of the project data referred to using the digital attendance records to track attendance and following-up with individual students and their parents.

Use of data to inform decision-making at the classroom level

RQ 3.2: How is individualised student data used at the classroom level by teachers?

Project-level KIIs noted that at the classroom level, Field Officers sit down with teachers on a regular basis and share and discuss the implications of classroom-level data. Field Officers noted teachers' willingness to actively engage in this discussion and their willingness to use the data to inform their classroom decisions and approaches, for example:

> *'Teachers are impressed by all the data. If the teacher can see at the level of their class, and come up with a plan on how to assist data on topics and see the weakest learners, and through that they can focus their teaching, and tailor their lessons accordingly.'* (iMlango Field Officer)

Field Officers also shared anecdotal evidence regarding the use of student data disaggregated by gender to frame conversations with teachers. One described the use of data *'to ensure that there is equity of access'* (iMlango Field Officer), i.e. to show teachers how many female and male students are accessing the portal in order to begin a dialogue about equity.

Although this study was unable to triangulate these findings in significant detail (e.g. via classroom observations or in-depth interviews and focus group discussions with teachers and pupils), school-level KIIs showed that one way in which a number of teachers referred to using data for decision-making purposes was in their lesson planning. This was mentioned by teachers in two medium usage schools, and two high usage schools. For example, the teacher from a high usage school in Uasin Gishu explained how he uses the student data to identify collective gaps in understanding, which he then uses to inform his lesson planning:

> *'I can use the data from the portal too - then I will be able to see from my class how they are doing on algebra or fractions, for example, and whether I need to supplement the portal session with a whole-class lesson.'* (Teacher, high usage school, Uasin Gishu County)

Another teacher from a medium usage school in Makueni said that he consults the portal data and subsequently sets up revision lessons either on an individual, group or class basis to address the gaps in understanding. He also said that he identifies high performing students through the data and then provides them with additional work to challenge them. An ICT teacher at a high usage school in Kilifi said that he uses the data in the portal to identify students who are struggling, and then assigns other children to assist and monitor them during the lab sessions.

Other teachers across usage bands mentioned using the data to check on student performance, though teachers from low usage schools were more likely to say that they use this data infrequently. For example, one teacher in a low usage school in Makueni when asked about looking at students' maths class learning profiles stated that *'it has been a challenge. Sometimes I don't know how to navigate the system. I find it confusing. I rarely see the data'* (Teacher, low usage school, Makueni County).

In medium usage schools, use of data was more variable, with some teachers expressing detailed knowledge of the data generated and describing its use in lesson planning, whereas other teachers said that they use the data infrequently, sometimes due to a lack of available time:

> *'I used it last year, this year I have not had time. This [my class] is a candidate class, we have so much to do. Last year I tried, at least checking it. I used to check once or twice a week.'* (Teacher, medium usage school, Kilifi County)

Teachers who participated in the digital teacher survey responded that they found the Maths-Whizz class-level data reports helpful for lesson planning. Across all teachers, 90% of teachers consider the Maths-Whizz class-level data reports helpful (21.1%) or very helpful (68.9%). A small percentage, only 6.4% of teachers surveyed, report that they do not use the class-level data reports. Male teachers report finding the Maths-Whizz class-level data reports more helpful than female teachers. Overall, 95% male teachers find the reports helpful or very helpful compared to 86% of female teachers. This may suggest that more male teachers are making use of the data reports for lesson planning. More male teachers find the reports "very helpful", 75.6% compared to 63.2% of female teachers.

There is some variation at the county-level. Teachers in Makueni find the class-level data

reports less helpful than teachers in other counties: 81% compared to 94% in Kilifi, 90% in Kajiado and 88% in Uasin Gishu. Numeracy teachers find the Maths-Whizz class-level data reports helpful: 95% of numeracy teachers and 96% of teachers of both literacy and numeracy. A slightly higher percentage of teachers in A and C schools find the class-level data reports more helpful than teachers in B schools: 92% compared to 84%. Due to the lack of ICT labs in B schools, the reports shared with B schools only contain information on attendance, which could explain the lower rates of perceived usefulness amongst B school teachers.

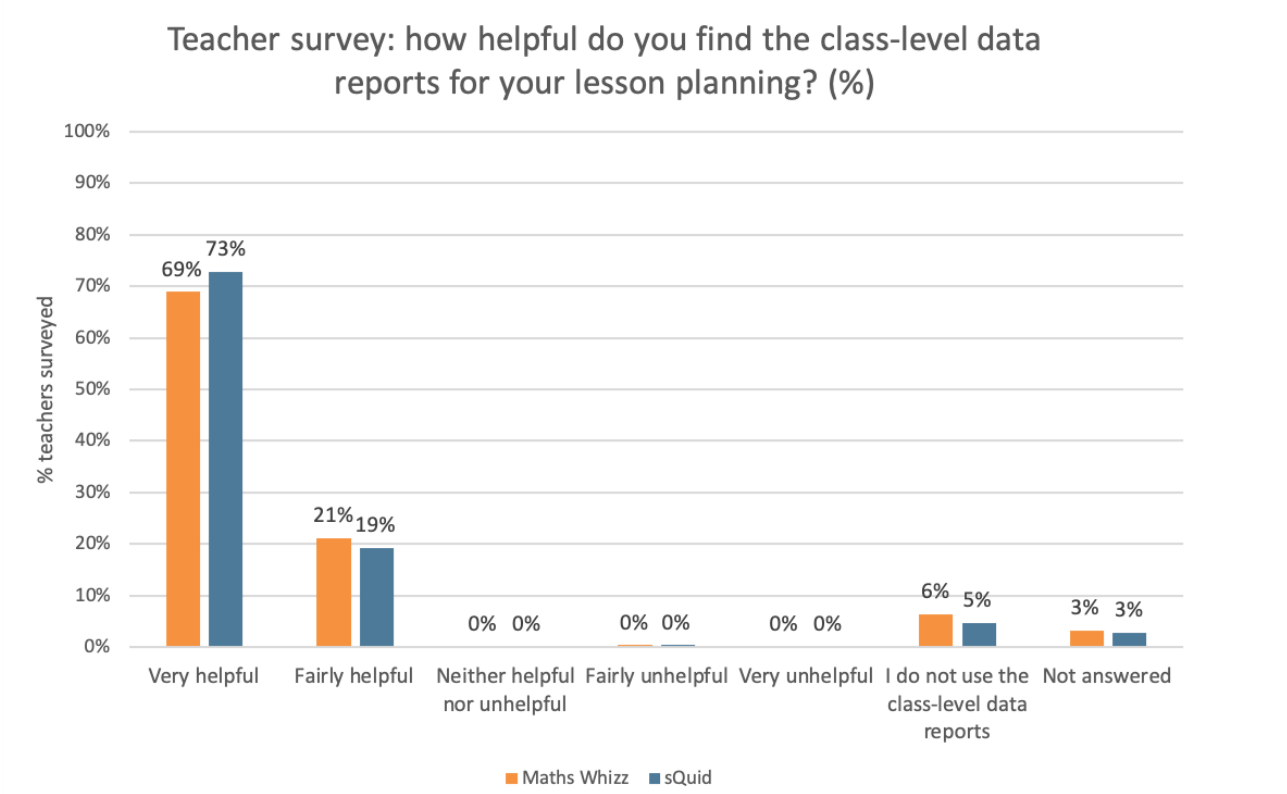


Figure 27: Teacher perception of helpfulness of classroom-level data reports for lesson planning

Similarly, teachers report finding the sQuid class-level reports helpful for planning literacy lessons. Teachers find the literacy class-level data reports helpful for lesson planning: 92% of teachers consider the resources "fairly helpful" (19.3%) or "very helpful" (72.9%). Only 4.6% of teachers report not using the class-level data reports from sQuid. For sQuid class reports there is no notable variation by gender, county or intervention type. Literacy teachers and teachers of both literacy and numeracy find the class-level data reports helpful: 94% and 96% respectively. Older teachers find the literacy class-level data reports less helpful for lesson planning than younger teachers. Of teachers aged 51-60, 86% find them "fairly helpful" or "very helpful" compared to 98% of teachers aged 20-30, 92% of teachers aged 31-40 and 41-50. This suggests these teachers might use the class-reports less.

6.5. Key learning points

This chapter draws on the digital teacher survey and project- and school-level KIIs to present findings on school management practices and the use of data to inform decision-making at project, administrative and classroom levels.

School management practices: Support from school administration for the project was identified as a key ingredient of success for project implementation through partner and school-level KIIs, and the digital teacher survey.

The use of data to inform decision-making at the project level: Project-level KIIs indicate that the ability for iMlango to adapt its interventions and activities due to the availability of meaningful, real-time continuous data in tandem with rich contextual knowledge gained from engagement in local communities has the potential to transform the education sector. According to iMlango partners, adaptations to the project have been built in through the intentional use of continuous data and knowledge of the context with project managers specifically tasked with coordinating and circulating the data and contextual insight within teams to inform changes.

The use of data to inform decision-making at the school level: Knowledge and use of school data by school administrators was present across most schools, but was most clearly observed in high and medium usage schools. School-level KIIs indicated that the use of data to monitor and follow-up on attendance and portal usage of individual students was common amongst head teachers. However, there was little evidence that project data was being used for longer-term school planning and decision-making at the school management level.

The use of data to inform decision-making at the classroom level: The digital teacher survey indicated that the majority of teachers found class-level data reports produced by the project helpful for their lesson planning, and only a small minority reported that they do not use the reports at all.

7. Research theme 4: project sustainability and scalability

7.1. Overview

This chapter presents thematic findings regarding project sustainability, value for money and scalability. It begins with an examination of the sustainability of the iMlango project and the likelihood of sustained school-level usage of iMlango resources after the project ends. Sustainability is explored at the school, community and government levels. The chapter then presents an analysis of the value for money of the iMlango project and necessary conditions for a shift in learning practices and outcomes to take place. Lastly, the chapter explores the scalability of the project. Findings are drawn from project and school-level KIIs and the digital teacher survey. The chapter closes with key learning points regarding project sustainability, value for money and scalability.

7.2. Research questions

The research questions regarding this research theme are presented in the table below.

Table 11: Research questions regarding project sustainability and scalability

RQ#	Research theme 4 research questions
4.1	To what extent is iMlango sustainable? What is the likelihood of school-level sustained usage of iMlango resources and content after the project ends?

4.2	To what extent does iMlango provide good value for money with regard to the cost required to shift learning practices and outcomes? What conditions are required for a shift in learning practices and outcomes to take place?
4.3	To what extent is iMlango scalable? What scenarios exist for scaling the project, including implications of the Government of Kenya taking the project to scale? (I.e. What would the costs likely be? Would this represent good value for money for the government given the findings above on effectiveness and impact?)

7.3. Project sustainability

RQ 4.1: To what extent is iMlango sustainable? What is the likelihood of school-level sustained usage of iMlango resources and content after the project ends?

Overview of iMlango project activities regarding sustainability

iMlango project partners shared several valuable insights regarding project sustainability and key lessons learned. Project activities related to sustainability involve specific initiatives and emphases at the school, teacher, community (including microfinancing), government, and system levels. These are each discussed in turn in the sections that follow, with relevant data presented from KIIs with iMlango consortium partners, teachers, head teachers and PTA/BoM representatives as well as findings from the digital teacher survey. Data sources are included next to their associated findings.

School-level sustainability - planning for the future

The data collection demonstrated that there is a wide range of levels of preparedness for project sustainability within schools, with some actively planning for the future and others entirely unaware that the project is nearing completion.

For example, in a medium usage school in Kajiado, the head teacher explained that she had led discussions with both the Board of Management and with parents about how to continue the project activities post project completion. She also said that she was trying to find 'friends of the school' who would be able to contribute to the wifi costs. In a low usage school in Kilifi, the head teacher explained that he had convened a committee meeting with the Board of Management to explore ways to sustain project activities in the event of iMlango pulling out. He said that they had not yet devised a clear plan, but that during the committee meeting they had explored the possibility of developing an income generating activity within the school based on cultivating maize and beans to meet the activity costs.

Project-level KIIs indicated that in-school activities focused on project sustainability have taken place in some schools. One example of this is the series of ongoing conversations that have been held between iMlango Field Officers and school leaders around the project closure and what it means for the school. However these activities have been interrupted due to COVID-19. iMlango Field Officers explained the importance of these conversations in encouraging schools to take ownership of elements of programme costs. In addition, there is indication that iMlango has placed an emphasis on building teacher capacity, both around the use of technology as well as pedagogical approaches, as a foundational component of project sustainability. This includes teachers who have designated roles as ICT leads or ICT lab facilitators and providing them with offline resources and guidance for their use as well as trouble-shooting guidance. The importance of having an ICT champion in the school was also expressed by Whizz Education in a White Paper that argues that designated individuals who champion the use of ICT in schools "represent a tangible shift away from project

dependency towards ownership" (p. 11).[22] These intended activities are commendable, yet it appears that these plans have yet to be concretised and therefore materialise within the project. This has of course been impacted by COVID-19 and the resulting school closures, however.

However, alongside these encouraging activities, several head teachers indicated that no one from the iMlango team had spoken to them yet about the end of the project, despite iMlango partners stating that engagement lunches in term one of 2020 included this information about project closure and sustainability. For example, in one medium usage school in Makueni, the head teacher said, 'We have not heard from the iMlango project yet if they are pulling out but if they pull out we would proceed and plan with a way forward.' The fact that some schools had no awareness of the impending end of the programme is noteworthy and should be addressed as a priority. There is inevitably a direct link between the lack of awareness about project close and the lack of preparation for ensuring the continuity of school-level activities.

School-level sustainability - financial contributions

Several schools indicated that they are actively preparing for the future in a range of different ways. One head teacher in a medium usage school in Kajiado explained that the BOM at her school had attended a workshop with the project partners to discuss the continuation of project activities and said that the school was aware of the next steps they needed to take towards continuation:

> *'In fact, iMlango trained the Board of Management and they went for a three day training and told all about ideas to continue, and the parents are back trying to help me look for how to sustain it. If the company can help us to retain the wifi that would help … This year we are supposed to be making a budget with the board of the school, but for now we have not made that budget to see how much we need to sustain the programme. At least we know we are supposed to have a budget.'*

Although several interviewees noted that they were shocked by the news of the project ending, they also said that they would now start planning through speaking to parents in the local community, setting up budgets to set aside money for maintenance, etc. (iMlango Field Officer). Another Field Officer explained that schools have varying capacity and enthusiasm for sustaining the activities of the programme, some actively preparing and others with no plans in place. They illustrated this through the example of a school which has created an irrigation system to sell plants at market and now will use the income to cover future electricity and internet bills associated with the project.

As may be anticipated, the main challenge that many head teachers and BoM/PTA members mentioned related to the money required to continue the project activities after the project completion. Several participants specifically mentioned that there would be an ongoing need for technical support (for computer maintenance and repairs) which schools would have to pay for in the absence of the project. Participants had varying levels of optimism regarding the capacity of their schools to raise the required funds for continuation. For example, the PTA representative from a low usage school in Makueni said that the school would not be able to continue the project activities because '*some parents are not able to pay the costs needed to support the activities - electricity. And there is a lack of knowledge of the technical components'* (PTA representative, low usage school, Makueni County).

[22] Whizz Education (2020). Why do some schools adopt EdTech? Lessons for the development sector. Accessed: https://www.whizzeducation.com/wp-content/uploads/Why-Do-Some-Schools-Adopt-EdTech-Lessons-for-the-Development-Sector-Whizz-Education.pdf

In contrast, the BoM Chair in a high usage school in Kilifi explained:

> *'It might be not easy, but because we are the parents, we will try our best. But [the project's] assistance has been so great. As parents we normally make activities to earn money, like planting trees that we can sell to be able to earn money to run the activities.'*

However a teacher at the same school expressed his fear that they would struggle to maintain the project activities after the end of the project:

> *'We have been told that the project will end soon, and the staff from iMlango told us they won't be there. And our concern is if iMlango goes, the gains will not be sustainable. This is our fear. That we are not able to pay for internet, and all those materials. That is a very big worry to me.'* (Teacher, high usage school, Kilifi County)

Several head teachers expressed ideas for fundraising that they had been thinking about, and a small number of head teachers and/or BoM/PTA members said they had talked about the continuation of project activities and how they might prepare. For example the head teacher at a medium usage school in Makueni offered the following:

> *'I am sure that if the donor pulls out we would not stop there, we would have to come up with a plan. We were thinking of having our own activities running in the school where we can employ someone to do computer services to generate income. And our school exams - we can be printing, offering typing services.'*

The research indicates that all the ideas for school-based sustainability activities are at the initial stages, and no concrete plans for continuation have been developed in any of the schools. The lack of substantive planning should be a concern to iMlango because of the limited window of time before the completion of project activities.

It is clear that the overall ability for schools to self-generate the required revenues to sustain the in-school project activities and infrastructure remains unproven and undocumented. Despite the examples provided above, there does not appear to be any precise plan in place regarding the nature of the anticipated school-generated contributions and the strategy for obtaining it. It is clear that very few, if any, participating schools will be in a position to generate enough revenue to sustain all the current activities of iMlango without on-going external funding and support. iMlango consortium partners indeed have this awareness and have reached the same conclusion during internal discussions. This presents significant limitations for the school-level sustainability of the project. However, it is possible that the hardware provided to schools through the DLP may enable aspects of the programme to continue without the need for significant new spending from individual schools.

The midpoint research indicates that the majority of participating schools are not prepared for the closure of the project, and have not got realistic and sufficiently-developed plans in place for how activities will be continued. It is therefore an urgent priority to communicate clearly with all schools that the project is approaching completion, and to give as much guidance as possible regarding the anticipated role of schools within future activities.

School level sustainability - hardware

Initial conversations have taken place regarding what will happen after project completion to the in-school hardware that have been part of the iMlango inputs. However, there does

not yet appear to be an agreed strategy in place for what will happen and how it will happen.

Several iMlango consortium partners noted the importance of either removing the equipment entirely or leaving it in place with clear systems established to ensure that it is likely to be maintained and utilised in an on-going manner. Suggestions for these systems included the creation of a guide on how to use the projectors outside of the portal, instructions for teachers for using offline learning resources, and guidance for maintenance and repairs of devices. The decision regarding the future of the hardware in iMlango schools should be made as a priority, and communicated swiftly and effectively to all schools. The work underway to link the programme with the hardware provision from the DLP is encouraging. However, more clarity is still required, and schools cannot be expected to plan effectively for project closure without clear information about the resources they are likely to be left with.

There is a long history of EdTech projects which become 'hardware graveyards' within schools post-completion. If this were to happen with iMlango it would be both a crucial failing of the programme and also a major reputational risk for the partners and the donors. It is important to be realistic regarding the significant amount of work required to actually maintain hardware post-project completion. While guidance resources for teachers may be of some value, ensuring widespread on-going usage of the hardware will be dependent on also providing a level of on-going technical personnel to support each school. It may be possible to approach the government regarding the possibility of providing this technical support within the activities of the Digital Literacy Project. Without on-going in-school technical support, in the majority of cases, the computer labs will rapidly become derelict.

Community-level sustainability - parental buy-in

Project-level KIIs indicate that there is a varied community response, although the communities in which iMlango operates are largely positive towards the project. Efforts to secure community buy-in have focused on engaging parents and inviting them and other community members to participate in iMlango school meetings (iMlango Field Officer). Working closely with the community to get their buy-in was noted by other project stakeholders as integral to achieving success in project uptake: *'We've learned that you have to work with the whole community around the school in-depth'* (iMlango consortium partner).

Across schools of different usage bands in school-level KIIs, participants said that their communities have positive attitudes towards the project activities, for example a PTA representative from a medium usage school in Makueni, when asked about the community response to the project, explained:

> *'They are very happy about it. And two they want it to continue. Because we are in a rural area where these things are not common, so to bring your child to a school with a computer, it is appreciated quite highly and we are very happy about it.'* (PTA representative, medium usage school, Makueni County)

Across high usage schools within the study, parents appear to be engaged with the project activities, and there are some reports of parents visiting school specifically to check on the project activities. While the majority of parents support the iMlango project and the use of computers, data from the digital teacher survey shows that there is scope to build upon and expand this support. Of all teachers surveyed, 48.6% report that parents are "supportive" and 23.2% are "very supportive". Some 16.4% reported that parents are only "somewhat supportive". Only seven teachers reported that parents are "unsupportive".

Community-level sustainability - financial support

Field Officers noted that some communities would be very willing to provide financial support towards sustaining project activities. However this is not universal, and Field Officers cited income and education levels as distinctive factors for whether or not a community is likely to be engaged with the project.

According to the school-level KIIs, the Boards of Management in three high usage schools (in Kilifi, Uasin Gishu, and Kajiado), had successfully raised funds from parents to contribute to electricity costs. This points to a possible link between usage and the willingness, and also the ability of parents to contribute extra money to the school to support the project. If this is decided to be a viable sustainability strategy for iMlango then it will be necessary to explore in more detail the link between poverty levels in communities and school usage numbers. This is also linked to the quality of school administration and management, and the willingness and ability of the school administration and management to respond actively and effectively to parental initiative.

The Board of Management Chair from a high usage school in Kilifi explained their success in fundraising amongst parents to raise money for electricity bills:

> *'The parents, normally we have parents' meetings, we go to the classes and the teacher tells the parents about what is going well and what needs repairs, and the parents sit together and try to figure out how to fix it, so the parents might fundraise if there is no electricity and find a solution.'*

This is in significant contrast to the situation expressed by a teacher in a low usage school in Uasin Gishu:

> *'The school where I am, we've got some challenges. Sometimes the head teacher has a plan of saying while we're waiting for the government for these funds [to provide us electricity so we can use the ICT lab and projector], let's ask the parents to chip in but can't meet the payment because of their financial situation … At the end of the day, they embrace it but challenge of poverty, but you know from their talk that they're positive.'* (Teacher, low usage school, Uasin Gishu County).

Community-level sustainability - micro-finance

iMlango has also introduced a microfinancing intervention in a selection of communities, with an aim to scale it to all iMlango communities. The intention is that this will be able to contribute to project sustainability through bringing financing into a community that can be used to improve businesses and livelihoods. The additional resources can then be invested into improving education provision. A detailed analysis of the efficacy of this intervention is beyond the remit for this midpoint research. However, it is clear that further assessment, incorporating the Fund Manager, will be necessary to understand whether, and in what circumstances, this is likely to be a viable option for ensuring the sustainability of the project.

Community-level sustainability - new applications

An iMlango mobile application has been developed as part of the project's response to COVID-19 and the associated widespread shut-down of schools in Kenya. It is positive that the project partners have been able to respond rapidly to the changing context to supply a potentially useful contribution to sustain out-of-school learning. However, it will be necessary to conduct rapid and iterative user-based research to ensure the offering is appropriate for the new context. Consideration should be taken regarding issues such as

availability of devices in the home, other barriers to engagement, sustainability of the cost model, scalability and others. It is possible, but not inevitable that the same content will lead to the same learning outcomes when accessed in school and at home. If the app is deployed then there is likely to be significant interest across the sector regarding how to most effectively build and deploy an educational app in the midst of school shutdown. Therefore, alongside the launch and all associated user research it may be beneficial to actively track and disseminate the 'lessons learned' for the wider EdTech community. There is potential that the app could help to create equitable distribution of quality educational materials, or could exacerbate pre-existing inequalities because of varying access to devices and viable home-learning environments. The effectiveness and impact of the app will depend on the detail of how it gathers user feedback and pivots accordingly.

Government-level sustainability

It is clear from the project-level KIIs that government buy-in and relationship building has been a particular focus in the second phase of the iMlango project. Specifically, this involved a focus on consortium partners establishing relationships at the district and county level as well as at the national level. At present, iMlango does not have a formal affiliation with the Ministry of Education, but there is an established iMlango working group with Ministry staff. The project has invested significant time to build relationships with the curriculum authority, teachers services commission, and other government bodies. In addition, the project has worked to link technology interventions with local education contexts through alignment of resources with the curriculum - leading to the Maths-Whizz and literacy content being approved by the Kenya Institute Of Curriculum Development (KICD). This was an appropriate decision, however it will be helpful to review findings from the digital teacher survey and KIIs regarding the alignment of content to curriculum as gaps in content were discussed by research participants.

Despite these significant achievements, most partners interviewed stated that iMlango would have benefited from having closer alignment and commitment from the government from the outset. It was noted that buy-in from the government would have been valuable, even if budget commitments were contingent on the future achievement of specific learning outcomes. Partners agreed that securing a nominal but multi-year financial contribution from the government at the outset would have increased the prospects for sustainability. Various stakeholders considered that the lack of this links to a design constraint across the GEC, with projects required to establish their own in-country relationships with government independently, after the projects had launched. It will therefore be necessary to engage in strategic dialogue across the consortium regarding the best way to align project activities with the current government strategic priorities for EdTech. Whatever form this takes, it will likely require providing a detailed cost model to the government, tied to specific learning outcomes.

Consortium partners also noted that while a partnership is in place, the fact that iMlango is not seen as a ministry project has an effect on district and county level engagement, particularly in relation to building school accountability for the use of project interventions. Field Officers reflected on the challenges associated with building relationships with district and county-level government officials and having their consistent support in holding schools accountable to project intervention usage and engagement. They noted that County Education Officers *'didn't know about the project yet these are the representatives known by head teachers. Now that support exists, but needed it from the beginning'* (iMlango Field Officer). This was in part because of the additional difficulty in seeking school buy-in, which iMlango partners explain took a significant amount of time.

Another Field Officer supported this perspective and added:

> *'If we have schools who are not cooperating there is little we can do, because we don't have support from the ministry. We have difficult situations and have resistance, we can try and try, but if it is not working and you can't get through to the teachers, we need a place to get support.'* (iMlango Field Officer)

The completion of iMlango coincides with a particularly strategic period for the EdTech environment in Kenya because of the introduction of the high-profile Digital Literacy Project. The significance of this was noted several times during project-level KIIs. For example, one consortium partner expressed the sentiment that *'we need to marry the project with the government strategy on ICT since the MoE is expanding its programme on having ICT in school'* (iMlango consortium partner). However, there were a range of different perspectives expressed as to the detail of how this should be done. It will therefore be necessary to engage in strategic dialogue across the consortium regarding the best way to align project activities with the current government strategic priorities for EdTech. Whatever form this takes, it will likely require providing a detailed cost model to the government, tied to specific learning outcomes.

Sustainability implications of COVID-19

The spread of COVID-19, and the associated temporary shut-down of the majority of schools globally, has had a significant impact on education in Kenya. It has inevitably had major implications for the delivery of the normal iMlango programme activities. It should be noted that the sustainability implications of COVID-19 was not part of the scope of the midpoint review. However, because of its current prominence it inevitably informed both the midpoint methodology and findings. The implications for the study methodology are explained in detail in that chapter, and the implications for the study findings are woven throughout the analysis. This section provides an additional brief summary of supplementary reflections.

As a result of COVID-19, iMlango is required to operate in a context of increased uncertainty regarding current and future activities, and is encountering all the resulting operational challenges. This is common across all GEC programmes, but the technology focus of iMlango provides specific constraints and opportunities regarding what is possible within the final stages of the programme. There is a specific need to focus on sustainability in light of COVID-19 and for the consortium to focus on how they can make a contribution not just to sustaining activities, but also to the wider dialogue across the sector regarding how to 'build back better' in terms of education delivery and overall system-reform.

Additionally, in light of the current context, it should be a high priority for the consortium to engage with the FM regarding the requirements of the endline evaluation, the timing of any learning assessments, and the potential to learn from other GEC projects regarding alternative and more qualitative methodological approaches. The level of digital data available on iMlango may make it easier, if required at the time, to pivot the methodological approach and adopt a more distance-based approach to the endline, drawing on lessons learned during the midpoint review. A decision on the approach to the endline should be made rapidly in order to avoid a repeat of the previously encountered challenges regarding appointing an external evaluator. In light of the on-going uncertainty, it may also be sensible to adopt a two-scenario approach when planning the endline evaluation: the methodology to be adopted if school visits are viable, and the methodology to be adopted if school visits are not viable.

7.4. Value for Money

RQ 4.2: To what extent does iMlango provide good value for money with regard to the cost required to shift learning practices and outcomes? What conditions are required for a shift in learning practices and outcomes to take place?

Overview

It was agreed during the scoping stage that providing a definitive assessment on the cost per beneficiary or overall cost-effectiveness analysis of iMlango would be beyond the remit of the midpoint review. However, this section presents initial considerations regarding VfM across the project. It was not possible to obtain the full financial details of the project from the partners, and so this analysis is based solely on the qualitative insights provided by relevant individuals in interviews. This section considers, in light of the enabling and constraining factors, the extent to which the project provides a cost-effective intervention within a resource-constrained environment.

Cost-effectiveness of the programme

In project-level KIIs interviewees were asked to give their retrospective assessment on project costs and overall VfM of the set-up of the project, and their assessment of how the financial investment may help the project achieve learning outcomes in a cost-effective manner going forward.

Various cost saving measures were introduced at the outset of the programme, notably the decision to supply the schools with refurbished hardware for establishing computer labs. However, multiple interviewees expressed that the initial costs were still significantly higher than they would have ideally been. As may be expected, the consortium partners have a range of perspectives on which components within iMlango provide the best cost-effectiveness, and how cost should be calculated. Reflecting back on the progress of the project, one partner noted that 'there has been significant inefficiencies, duplication and complexities within the project which could clearly all be simplified for improved value for money - and sustainability - and even improved project outcomes.' However, gaining agreement regarding the precise nature of the inefficiencies is more complex than simply identifying that they exist.

Another expressed the view that costs would be reduced significantly 'if we really reduce the training/hands on support - if the government takes on responsibility for that' (iMlango consortium partner). However, another cautioned that without this support only a minority of schools would be able to continue successfully in the programme. It is clear that on-going in-school support for teachers is crucial, but there may be ways in which responsibility for delivering this can gradually be transferred to government, thereby reducing the ongoing operating costs for the programme.

The significant point is that the cost-per-child is dictated to a significant degree by the aspects of wrap-around support provided by the intervention. Highlighting this, and considering future operating models, one partner noted that 'cost-effectiveness works very well in a simplified version of iMlango, it has already been costed in various models and is increasingly attractive as you reach to national scale'. Another explained that 'we now have a community model that we think can be cost-neutral to run a basic continuing iMlango programme - but we do need more time to prove it' (iMlango consortium partner).

Several consortium partners were optimistic about the future value proposition of iMlango, explaining how much had been learned through the previous years about the best way to

implement the project effectively. The overall value of the learning that has been gained from iMlango depends on what is now done with it, both to shape the future implementation of the project and also to influence effective decision making and promote good practices across the wider sector. If the learning from iMlango can 'be extracted and articulated effectively to empower the global community … then the value for money is amazing' (iMlango consortium partner). The potential to capture and disseminate this learning so that it results in genuine and widespread change in practices beyond the programme is a significant opportunity but also a major undertaking that will require dedicated resources and expertise to accomplish.

Transparency of costs and cost calculations

It appears that the aspiration for increased efficiency has not yet translated into full disclosure and visibility of costing between project partners, and to external parties. It is a priority for the consortium partners to develop and distribute fully transparent and detailed cost models, so that external parties can make their own assessment of the cost-effectiveness of the approach. In addition, this will enable more focus within the programme on how the cost of each component might be reduced. In relation to future similar donor-funded education programmes involving technology, it would be helpful for the Fund Manager or equivalent to make sharing specific cost data a requirement of all partners from the outset, so that the required ongoing comparative assessment can be completed.

Similarly, and specific to helping gauge comparative cost-effectiveness across the GEC programmes, it would be useful to have technical guidance from the Fund Manager regarding the most appropriate way to retrospectively calculate sunk-costs within cost-per-beneficiary calculations. In a project like iMlango, the outcome of cost calculations is influenced by the way in which the initial investments are costed. These include things like the cost of establishing internet connectivity through satellites and building computer labs. To enable reliable comparison across the GEC portfolio, this would require a consistent approach across all projects on how to calculate 'technical debt' and depreciation rates, and clarity on ownership of assets after the completion of projects. Ultimately, and most significantly, cost calculations are dependent on how the assets which have been invested in are utilised in an ongoing manner beyond the project end date.

It is worth remembering that the very configuration of the iMlango consortium exists, at least in part, as a positive response to an experimental delivery design from DFID and the FM. Central to the logic behind the development of the Strategic Partnerships Window within the GEC was exploring the potential to engage partners who may be less established in working with international donors and be less familiar with the associated operating and reporting requirements and learning lessons about how this can be done most effectively. In light of this emphasis on long term experimentation, it is worth noting in brief some of the things that have been learned that are also of wider relevance. In a consortium with multiple private sector organisations there is likely to be significant reluctance to have full transparency regarding costs - both within the partnership and more widely. This should not be surprising because sharing cost data like this is not necessarily conventional within the private sector and it would often be counter-intuitive. Any approach needs to be sufficiently rigorous for the donor and sufficiently incentivising for the partners. To improve this in future funding windows, it may be helpful to ensure at the outset of projects that there is clear guidance, both informal and within contracts for all partners, that explains the requirements on transparent cost data sharing. Without this foundation in place it will remain difficult across the edtech sector to complete the kind of detailed multi-year, cost-effectiveness assessments that will enable progress in establishing comparative value for money between programmes. Although iMlango is now approaching its conclusion within the GEC, it would also be beneficial for the project partners to conduct a retrospective on how

they have navigated this issue, what they would do differently if starting again, and what they could change for any future configuration of the current consortium.

7.5. Scalability of iMlango

RQ 4.3: To what extent is iMlango scalable? What scenarios exist for scaling the project, including implications of the Government of Kenya taking the project to scale? (I.e. What would the costs likely be? Would this represent good value for money for the government given the findings above on effectiveness and impact?)

Overview

Understanding and increasing the scalability of iMlango has been an on-going concern of the consortium. There has been a general aspiration to grow, without a consistent strategy for how this could be achieved. This is not surprising and the challenge of growth is considerable: very few comprehensive edtech interventions have successfully scaled within low-income contexts. This is largely due to sector-wide constraints around cost, capacity, infrastructure, and broader operating context. iMlango was established as a complex and experimental project, and the cost per school means that it is unlikely to scale significantly (such as a national roll-out) in its current configuration. This is simply due to the level of financial investment required per school to introduce all the components of the entire iMlango offering. It is considered most likely that future scaling should come not through schools introducing the entire iMlango offering, but through identifying specific parts of the iMlango inputs that can be used in specific contexts, to address specific needs.

The section provides a series of qualitative reflections on project scalability, informed by multiple interviews with consortium partners, to help inform iMlango in relation to whatever the project decides regarding the most effective route to scale. To do this it briefly considers the issues which may contribute to or hinder the scaling of the intervention. This should not be interpreted as any form of definitive advice, rather as introductory framing for issues that it would be pertinent for iMlango to consider.

Some individuals involved in strategic leadership positions within the consortium did not have previous understanding of the international development sector at the outset of iMlango. This is to be expected considering the aforementioned nature of the Strategic Partnerships window. However, it meant that it took some time to build and communicate programme evidence in a way that is appropriate for a donor-funded context. Some consortium partners expressed that the implications of this early context were still felt – and that as a result of the lack of initial focus on sector-appropriate evidence-building, some of the earlier opportunities to scale the programme may have been lost.

As previously mentioned, it is worth considering the ways in which the project interventions can be simplified to reduce cost. One consortium partner emphasised that it would be possible for the programme to adopt a more focused approach and simplify the programme through a 'ruthless discarding of bells and whistles' (iMlango consortium partner). In addition they explained the need for 'alignment of funding stakeholders, particularly government to ensure local stakeholder investment and buy in and ultimately, ownership' and expressed how this is a long-term endeavour that requires more time.

It is clear that it will not be possible for iMlango to be sustained to the current level in the project schools without significant new funding, or the decision from partners to re-work their operating models and provide some services at reduced cost. It is not realistic to think that schools will continue to make significant use of the iMlango offering if all the support is removed. The evidence from the midpoint suggests that there are likely to be several

noteworthy instances of positive deviance - where schools continue to engage more than anticipated regardless of the support. However, these will be the minority rather than the norm and therefore overall decisions and projections should not be made on the basis of their existence.

The role of the DLP is also a significant factor in considering project scaling. As noted, the provision of hardware within iMlango creates challenges because it increases the cost-per child. Now that the DLP is actively distributing tablets it may be possible for the educational benefits of iMlango to be sustained without needing additional on-going expenditure on new hardware to update the computer labs. This is clearly dependent on whether the tablets distributed within the DLP are in place and able to be utilised effectively for learning. It is a strategic priority for iMlango to monitor and seek to actively engage with the DLP to explore potential collaboration now that the relevant hardware is much more widely available within schools. This is of relevance in relation to sustaining the project activities in current iMlango schools, and also possibly scaling to new schools, working with the DLP.

7.6. Key learning points

This section draws on the digital teacher survey and project- and school-level KIIs to present summary findings on project sustainability, value for money, and scalability. The key learning points presented here are only brief and the majority are incorporated within the following chapter. This is because the qualitative nature of the insights regarding project sustainability and scalability link closely to the overall midline conclusions and recommendations.

Sustainability: It will not be possible for iMlango to be sustained to the current level in the project schools without significant new funding, or the decision from partners to re-work their operating models and provide some services at reduced cost. Similarly, it is not realistic to think that the majority of schools will continue to make significant use of the iMlango offering if all the current support is removed. The evidence from the midpoint suggests that there are likely to be several instances of positive deviance - where schools continue to engage more than anticipated regardless of the support. However, these will be the exception rather than the norm and therefore overall decisions and projections should not be made on the basis of their existence. There have been some notable efforts made to promote school-level income generation - but it is unlikely that a school-based revenue generating model will be effective as the primary means through which the project is sustained. The nature of operating in very low-income, rural and marginalised environments - the kind of environment where satellite-based interventions have most distinct comparative advantage - is that it is rarely possible or desirable to have a cost-recovery strategy based largely on community contributions.

Project Value for Money: Consortium partners were optimistic about the future value proposition of iMlango, explaining how much had been learned through the previous years about the best way to implement the project effectively. The overall value of the learning from iMlango depends on what is now done with it to shape future project design and decision making across the sector. One particularly important part of a positive future will be iMlango's success in linking effectively with other complementary initiatives - such as the Kenya DLP - which can enable some of the benefits to be achieved without requiring the full cost-outlay. In order to achieve this, it will be necessary to have more transparency regarding costs, and more detailed cost models. Specifically within this, it may be worth considering whether there is appetite for approaching governments and other donors with a proposal based on payment-by-results linked to pre-agreed impact on learning outcomes.

Project scalability: The future of the project is likely to involve specific parts being used in

certain contexts, not a comprehensive national-level rollout of the whole iMlango offering. As a result, a central determining factor in future success will be how effectively the project can identify the educational impact that can be achieved through implementing specific parts, draw on the learning from iMlango to maximise the efficiency of this, and re-package the offering for new contexts. This will require a focused attention on determining the unique value proposition of iMlango. If necessary, reduce the project to a minimum viable product which can deliver on that proposition - removing the elements which do not contribute directly to achieving this.

8. Conclusions and recommendations

8.1. Conclusions

The conclusions section provides a summary of the key learning points from each of the four research themes, followed by a summary of five operating conditions which appear to be required in order for iMlango to function most effectively.

Research theme 1: pupil learning

Numeracy learning improvements were measured through Maths-Whizz progress rate data and EGMA/SeGMA scores. The average number of minutes spent on the portal per week is 17 per student, which is lower than the recommended 30 to 90 minutes of usage per week. For students who used the portal for the recommended time per week, the findings suggest this results in a higher than expected Maths-Whizz progress rate. The learning assessment data additionally suggests that portal usage may influence the rate of improvement in numeracy. This implies a link between exposure time and improvements in learning, however it is not necessarily the case that the learners that are performing well or even those who are improving fastest are doing so because they are getting the recommended time per week of lab learning.

Literacy learning improvements were measures through an analysis of literacy portal data over time and EGRA results. Findings indicate that there is a positive correlation between time spent on the platform and learning outcomes in literacy, although the trend is not completely linear. The findings related to portal usage and changes in learning outcomes are mixed, showing a decrease in results for some students with higher usage of the platform. As such, while there is some evidence of literacy learning improvements, this is not yet fully clear. For usage of sQuid's iMlango portal, on average each student spent an average of 15 minutes per month, with an average number of 2.3 minutes per login.

For students who are unable to access the portal content for the recommended length of time, the findings suggest that the main limiting factors are unreliable electricity and internet connectivity, and the limited number of devices within schools. Teachers did not report a clear trend of students receiving or not receiving the recommended lab time because of gender bias.

Research theme 2: teacher practices

School ICT labs, where available, and whole-class lesson resources are used by teachers on a regular basis and are becoming embedded in teacher approaches to improving pupil learning. However, teachers are not using sQuid's iMlango portal consistently, as evidenced by low time per login and the percentage of teachers only logging in one or two active teaching months. There is additional scope to increase teachers' use of some available approaches, such as the Children's Encyclopaedia and Gender Responsive Pedagogy.

Two broad themes emerged as enablers for achieving a well-executed ICT lab session: preparing for the session and having support systems in place, such as student champions and supportive senior management. The main barriers are availability of the lab, hardware limitations (low number of working and available computers), unreliable electricity and internet connectivity, and technical skills of teachers (i.e. a lack of the necessary digital and technical skills to adequately supervise and support students).

Four themes emerged as enablers for achieving a well-executed whole-class lesson: preparing for the lesson, teacher confidence in the use of the equipment and resources, teacher familiarity with the available content and how it aligns with the curriculum, and the employment of classroom management techniques. Barriers were similar to those of the ICT lab session: availability of projectors and unreliable electricity and internet connectivity. Factors that appear to influence a teacher's decision to use projected content include the availability of the projector, their confidence, the use of a timetable, power supply and internet connectivity, and their digital literacy and prior experience using technology in the classroom.

Research theme 3: school management practices and use of data to inform decision-making

The role of the school administration is a critical factor in determining the success of project intervention uptake. This includes the level of support they provide to teachers, as well as their own use of the available project data to inform decision-making. Knowledge and use of school data by school administrators was present across most schools involved in qualitative data collection, but was most clearly observed in high and medium usage schools. The use of data to monitor and follow-up on attendance and portal usage of individual students was common amongst head teachers, however there was little evidence that project data was being used for longer-term school planning and decision-making at the school management level.

The use of data to inform decision-making at the classroom level was seen to a certain degree. The digital teacher survey indicated that the majority of teachers found class-level data reports produced by the project helpful for their lesson planning, and only a small minority reported that they do not use the reports at all.

Research theme 4: project sustainability and scalability

It will not be possible for iMlango to be sustained to the current level in the project schools without significant new funding, or the decision from partners to re-work their operating models and provide some services at reduced cost. Similarly, it is not realistic to think that schools will continue to make significant use of the iMlango offering if all the support is removed. There are likely to be instances of positive deviance - where schools continue to engage more than anticipated regardless of the support. However, these will be the minority and therefore overall decisions and projections should not be made on the basis of their existence. There have been some notable efforts made to promote school-level income generation - but it is highly unlikely that a school-based revenue generating model will be effective as the primary means through which the project is sustained. The nature of operating in very low-income, rural and marginalised environments - the kind of environment where satellite-based interventions have most distinct comparative advantage - is that it is rarely possible or desirable to have a cost-recovery strategy based largely on community contributions.

There is optimism amongst consortium partners regarding the future value proposition of iMlango. The overall value of the learning from iMlango depends on what is now done with it

to shape future project design and decision making across the sector. One particularly important part of a positive future will be iMlango's success in linking effectively with other complementary initiatives - such as the Kenya DLP. This will require transparency regarding costs, more detailed cost models, and consideration of a form of payment-by-results model that is linked to pre-agreed learning outcome targets.

The future of the project is likely to involve specific parts being used in certain contexts, not a comprehensive national-level rollout of the whole iMlango offering. A central determining factor in future success will be how effectively the project can identify the educational impact that can be achieved through implementing specific parts, draw on the learning of iMlango to maximise the efficiency of this, and re-package the offering for new contexts. This will require a focused attention on determining the unique value proposition of iMlango, and perhaps reducing the project to a minimum viable product which can deliver on that proposition - removing all elements which do not contribute directly to achieving this.

Operating conditions necessary for iMlango effectiveness

In the findings above there are a wide range of contextual and internal enablers and barriers presented. These are the factors which, in combination, have an influence on whether schools, teachers and pupils are able to successfully engage with iMlango. These things are briefly summarised below as five key conditions, drawing from the findings of all four research themes. Prioritising each of these conditions will strengthen the future of iMlango.

Condition 1: Reliable electricity, internet, and functioning devices. Reliable electricity and internet emerged as one of the key barriers for use of iMlango project interventions. Reliable electricity includes both the quality of the supply (i.e. some schools cite having regular power outages) and the ability of schools to fund the costs of the electricity bills that the project generates that are not covered by the government. In addition, having access to available and functioning devices (i.e. computers and projectors) is necessary as well as regular access to the ICT lab. Several schools saw success through the use of timetabling to ensure availability for more teachers and pupils.

Condition 2: Empowered teachers and students. Teacher attitudes and confidence affects their uptake of project interventions. For confident individuals, having them be a champion of the project or of ICT more broadly can also help encourage others. Indeed, the importance of having a designated individual responsible for ICT within the school was cited as a crucial factor by several high performing schools.

Condition 3: Strong school leadership. There are many ways this increases project effectiveness, such as by ensuring teachers follow a timetable for the use of the ICT lab and ensuring teachers have enough time to engage with the iMlango interventions appropriately. The qualitative analysis indicated that some teachers felt that they did not have adequate time to take on the "additional burden" of the project into their schedules. Strong school leadership also links to the general financial situation of the school, and them paying electricity bills on time. If a school is financially healthy and has effective governance structures, with successful income-generating activities and parent fundraising, they are much better equipped to deal with the extra costs that may occur with the project.

Condition 4: On-going teacher professional development. This should include a focus on technical skills regarding the use of ICT for teacher and maintenance to resolve minor technical issues, as well as pedagogy to deliver quality learning through the ICT. The use of classroom management techniques emerged as a key enabler for successful whole-class lessons. Training should also ensure teacher familiarity with the available content and how it

aligns with the curriculum.

Condition 5: Parent and community buy-in. Positive engagement from parents and communities to the project, and their overall attitudes towards ICT, are important factors in determining pupil engagement in the project. An additional factor for project success is ensuring that activities are contextually appropriate and are aligned with the unique needs of the local community.

8.2. Recommendations

The intention of the midpoint review has been to provide insight throughout regarding the possible ways in which the project can be adapted for the future. This final section provides a summary of these insights in the form of summary recommendations for the project and wider sector. It should be noted that each of them is explained in more detail in the supplementary deliverables.

Recommendations for the project

R1: The majority of schools are not yet equipped to self-fund project costs. Providing high-quality training in the coming months will help more of them to embark on income-generating activities. However, it should not be anticipated that the majority of schools will be able to self-fund the project post-completion. As a result, it is recommended that iMlango decides quickly and communicates what form of commitment it can make to sustaining activities in the participating schools.

R2: The cost of sustaining current activities beyond project completion will be high. It is therefore necessary to decide what elements of the project have most significant positive and cost-effective impact, and prioritise these as part of a minimum viable product. The future of the project will need to be less complex, and with significantly reduced monthly costs per child.

R3: The end of the current stage of the project provides the opportunity to reduce investment in schools that have not demonstrated buy-in, and potentially increase investment in schools that have demonstrated sustained uptake. It is recommended that iMlango decide the criteria for determining whether or not a school has shown sufficient buy-in to continue their participation in the programme. In addition, it will be useful to build on the midpoint to assess the factors that have led to success in certain schools, and use this as the criteria for deciding any new schools that join a future expansion of iMlango.

R4: It is recommended that the project continue to consider the benefits of investing in and promoting the new mobile application, to see if it is possible to embed this aspect of iMlango as a provider of choice in Kenya for home-based mobile learning during school shut-down through high-quality curriculum-based education content, potentially utilising the micro-payments cost model. If this is pursued, attention should be paid to how the most-marginalised are included, particularly those without access to the required mobile devices to access to the content.

R5: It is recommended that any new schools introduced to the project should be selected from the rural and marginalised locations where satellite is likely to have a long-term comparative advantage over other forms of internet provision. Prioritising schools in remote areas is likely to make iMlango a more distinct and compelling offering for the DLP. However, this should come with a recognition that operating in very low-income rural and marginalised environments will mean it is rarely possible or desirable to have a cost-recovery strategy based largely on community and school-based financial contributions.

R6: As noted throughout the report, the Kenya DLP is likely to be highly significant for the iMlango future because of the government strategic focus on technology in education and the new increased availability of tablets in schools. It is recommended that iMlango prioritise engaging with the DLP to explore potential collaboration.

Recommendations for the endline

R7: The challenges that have been faced by iMlango are not unique and are shared by others undertaking large-scale implementations using technology in education. As a result, the lessons learned about how to overcome the challenges will be highly relevant for other projects working in the sector. Because of the value in the learning from iMlango it is recommended that the project decide how the 'lessons learned' can be disseminated most effectively. It may be possible for the endline evaluation to incorporate a significant focus on capturing and sharing the key lessons iMlango in order to inform good practices across the broader sector.

R8: The scope of the midpoint review did not cover a detailed examination of attendance or analyse available attendance data. However, improvements in attendance was a key theme that emerged from the school-level KIIs. It is therefore recommended at endline to explore this issue in further detail, and if possible to analyse change in attendance rates over time for iMlango schools. It is also recommended to cross-check attendance rates with portal usage data. Some participants said that low attendance rates negatively affect portal usage rates in their schools and this would also have implications for the inferences made from any learning assessment data.

R9: It is likely that the endline may be influenced by the ongoing context of COVID-19, both for iMlango and the GEC more widely. It is recommended that at endline the project build on the methodological innovations used in the midpoint review to undertake effective remote data collection if this is needed. However, there is a major ethical challenge in evaluating the project without engaging directly with the girls who are benefitting from it. It is recommended that this is considered for endline, and efforts are made to find a way to include the voice of participating girls within the methodological parameters for the evaluation.

Recommendations for the GEC and the wider sector

R10: As noted throughout, iMlango was established as a somewhat experimental project within the Strategic Partnerships window of the GEC. It is recommended that the Fund Manager systematically capture the lessons from iMlango – both in relation to edtech and in relation to the consortium - so that these can be used to shape future portfolio designs and implementation. One example of this is that in future portfolio design, more emphasis should be placed at the outset on securing detailed commitment from a consortium for how they intend to actually achieve school-based sustainable use of technologies beyond the funding of the project.

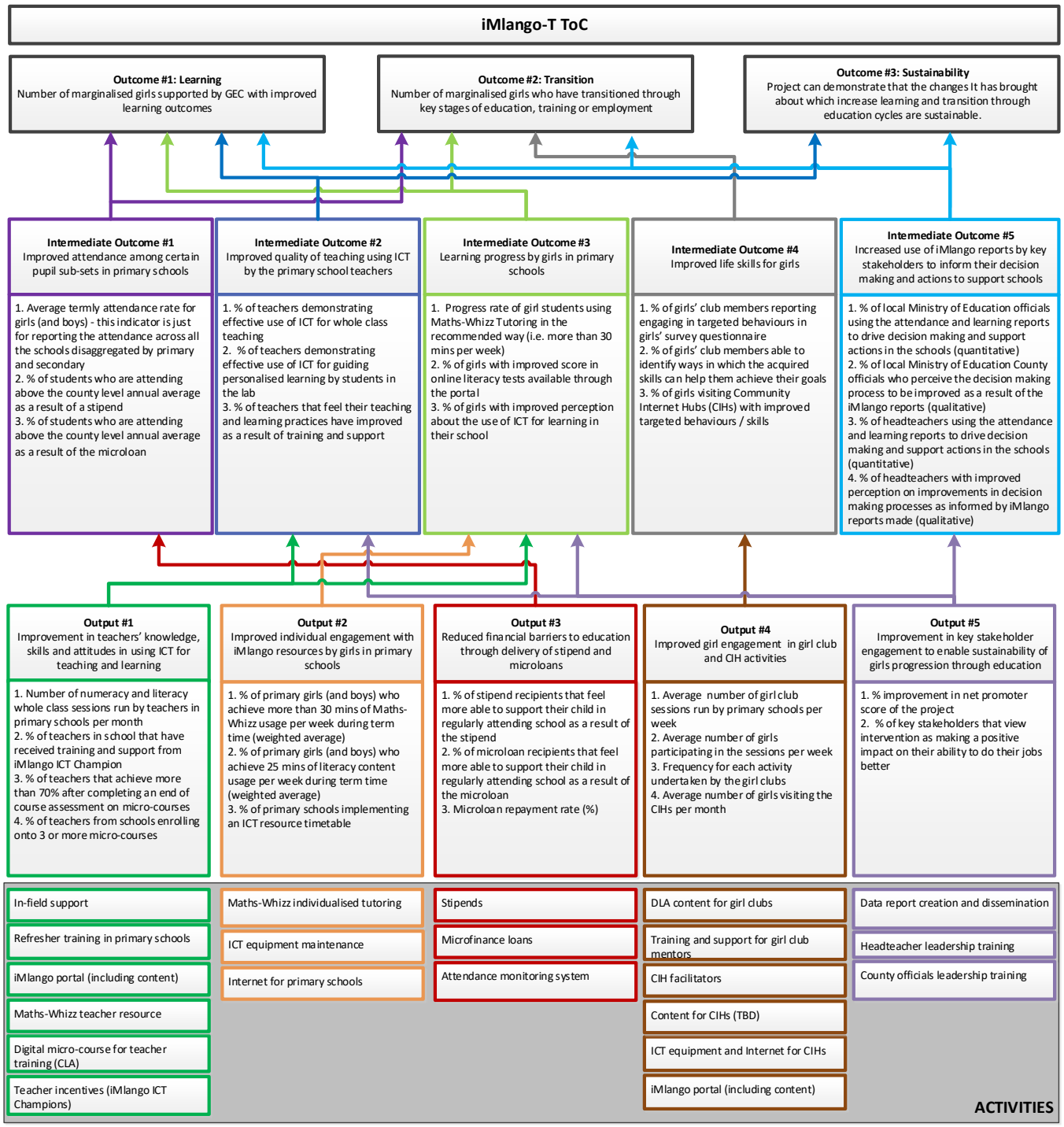
R11: There has been a data and reporting challenge throughout iMlango because of the divergence between the on-going project monitoring data that is avalable through the portal and the fixed points of the GEC evaluation process. As access to real-time learning data becomes more normal for large-scale education programmes, it will be necessary for standardised evaluation frameworks to adapt accordingly. It is recommended that the Fund Manager explores the potential to reduce the learning cycles within projects and facilitate more rapid iteration in approach through incorporating real-time data into external evaluations. Doing this effectively requires attention at the design stage and affects the nature of project accountability. It may be helpful for the Fund Manager to engage with Whizz Education to understand how real-time data could be built effectively into evaluation

frameworks in the future.

Appendices

Appendix A: Project Theory of Change

Note that the Theory of Change was taken from the 2017 iMlango-T MEL framework (v2.4).



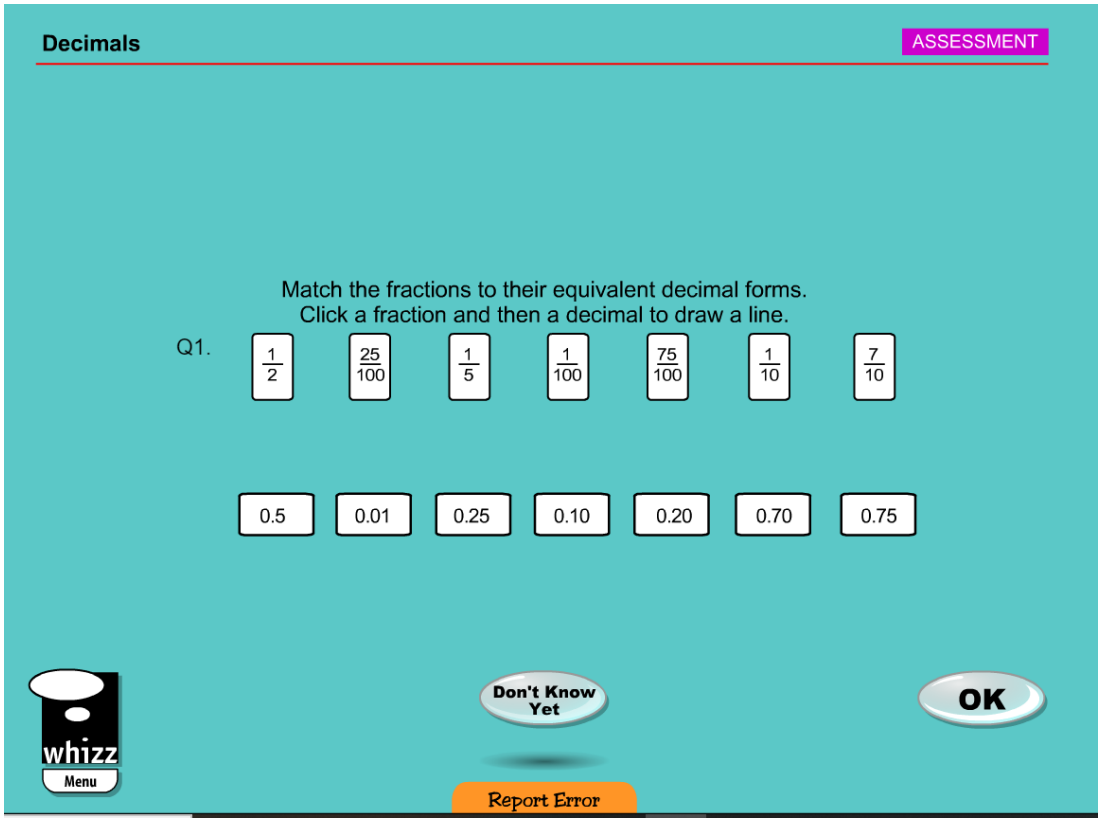
Appendix B: Research study Terms of Reference

The Terms of Reference is attached as a separate document

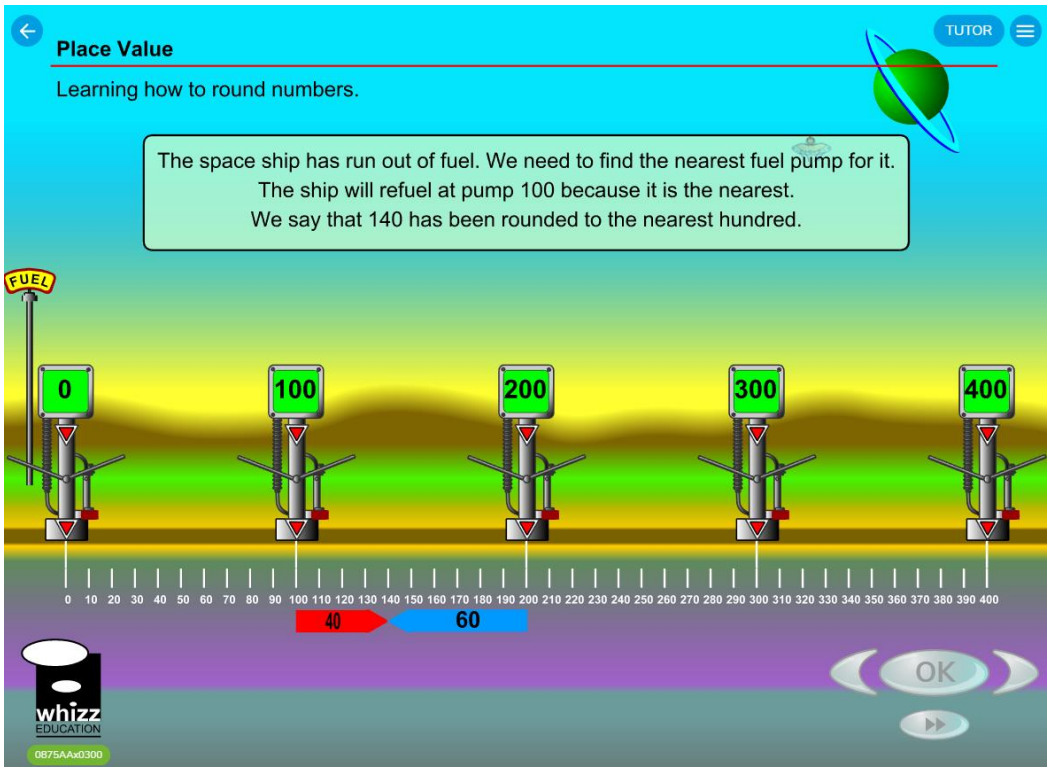
Appendix C: Maths-Whizz portal user visuals

This appendix presents a range of pictures from the Maths-Whizz user portal to give the reader insight into the user's experience. Both student and teacher experiences are captured. Each screenshot is introduced with a caption to explain the context of the picture.

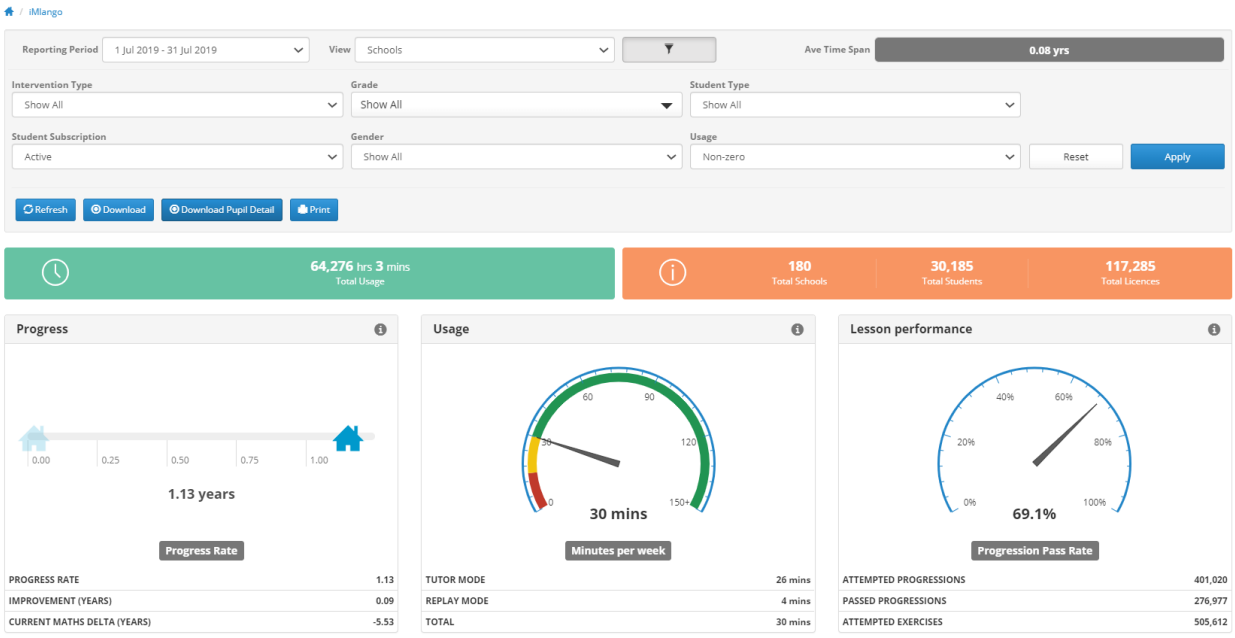
Screenshot 1: Maths-Whizz Tutor: student portal. This offers an example of the assessments / tests within the portal.



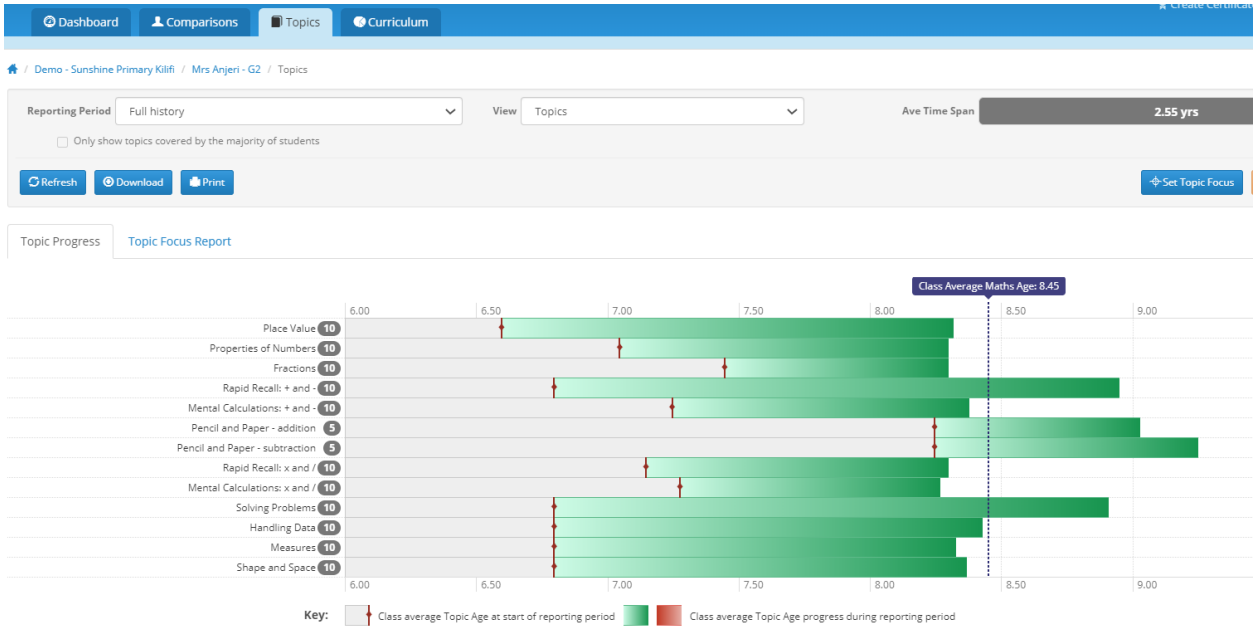
Screenshot 2: Maths-Whizz Tutor: student portal. This offers an example of exercises in a lesson.



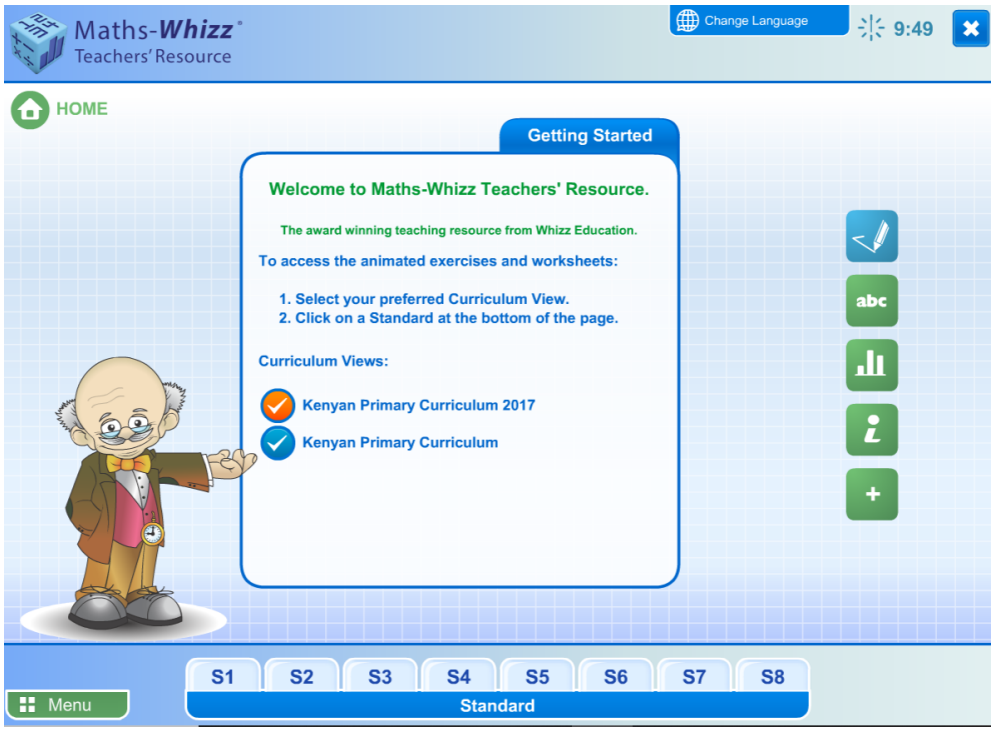
Screenshot 3: Maths-Whizz Central Reports Dashboard

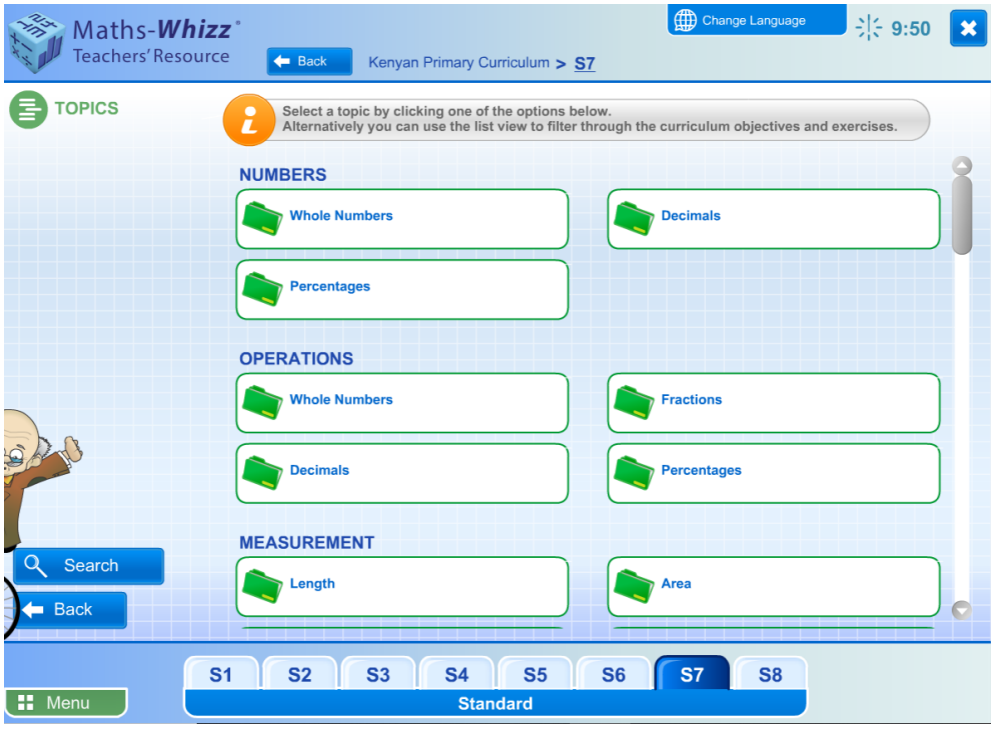


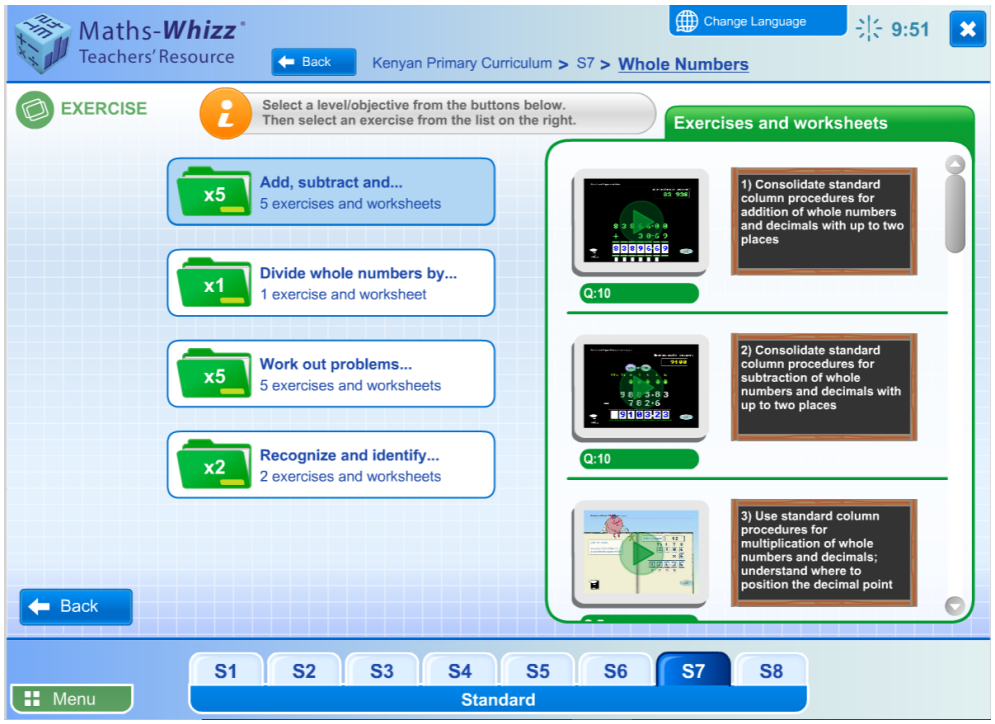
Screenshot 4: Maths-Whizz class-level topic chart.



Screenshot 5 to 7: These screenshots offer various views of the Maths-Whizz Teachers' Resource




Maths-Whizz
Teachers' Resource
Change Language
9:50
Back
Kenyan Primary Curriculum > S7
TOPICS
Select a topic by clicking one of the options below.
Alternatively you can use the list view to filter through the curriculum objectives and exercises.
NUMBERS
Whole Numbers
Decimals
Percentages
OPERATIONS
Whole Numbers
Fractions
Decimals
Percentages
MEASUREMENT
Length
Area
Search
Back
Menu
S1
S2
S3
S4
S5
S6
S7
S8
Standard


Maths-Whizz
Teachers' Resource
Change Language
9:51
Back
Kenyan Primary Curriculum > S7 > Whole Numbers
EXERCISE
Select a level/objective from the buttons below.
Then select an exercise from the list on the right.
Exercises and worksheets
x5
Add, subtract and...
5 exercises and worksheets
x1
Divide whole numbers by...
1 exercise and worksheet
x5
Work out problems...
5 exercises and worksheets
x2
Recognize and identify...
2 exercises and worksheets
1) Consolidate standard column procedures for addition of whole numbers and decimals with up to two places
Q:10
2) Consolidate standard column procedures for subtraction of whole numbers and decimals with up to two places
Q:10
3) Use standard column procedures for multiplication of whole numbers and decimals; understand where to position the decimal point
Back
Menu
S1
S2
S3
S4
S5
S6
S7
S8
Standard

Appendix D: Sampling strategy

This appendix provides an overview of the sampling strategy, presented within school-level quantitative data, project-level qualitative data, and school-level qualitative data.

School-level quantitative data sample

Student numeracy data

Following data cleaning, 50,039 individually registered students were included in the final sample in 140 schools, of whom 49% are female and 51% are male. At baseline the total number of beneficiaries in A and C schools was calculated to be 95,692. The dataset therefore contains 52% of the total number of beneficiaries.[23] Of these entries, 678 had both 2019 and 2020 learning assessments**.** Further characteristics regarding this dataset are as follows:

- The number of students per school registered on the portal ranges from 28 to 724, and the average number of students per school is 347.
- There are more male than female students on the portal in 84 of the 140 schools. On average across these schools there are 22 more boys than girls registered on the platform.
- Kajiado is the lowest proportion of the sample, with 12% of the sample from the county. The county with the highest proportion of students in the sample is Kilifi, whose students make up 42% of the sample. Makueni makes up 17% of the sample and Uasin Gishu makes up 28% of the sample. This is aligned with the proportion of schools in the counties.
- Grade 3 students comprise 15% of the sample, and grade 7 students comprise 7% of the sample.

Student literacy data

Following data cleaning, 43,198 individually registered students were included in the final sample in 140 schools, of whom 48% are female and 52% are male. At baseline the total number of beneficiaries in A and C schools was calculated to be 95,692. The dataset therefore contains 46% of the total number of beneficiaries. Students that completed a learning assessment in either July 2019, September 2019, or January to February 2020 are a small proportion of the total dataset:

- 191 of entries had July 2019 learning assessments (across 31 schools total),
- 110 entries had September 2019 learning assessments (18 schools)
- 250 entries had January to March 2020 learning assessments (38 schools)

The proportion of students with multiple sets of learning assessments is smaller:

- 22 students with three sets of learning assessments in July, September and January to March (6 schools)
- 60 with two sets of learning assessments, in September and January to February (12 schools)
- 68 with July and January to February (14 schools)

The sample of 68 students is used for analysis of change over time in learning outcomes and portal usage. This subset was selected as it provides the largest available sample size

[23] NB: iMlango consortium partners note that since the baseline, approximately 25,000 students graduated from primary school in December 2018 and 2019.

and thereby increases analytical rigour. It should be noted, however, that the sample is not representative. Further characteristics regarding this dataset are as follows:

- The number of students per school on the portal ranges from 17 to 852, with an average of 309 students per school on the portal.
- There are more male than female students on the portal in 104 of the 140 schools. The difference between the number of female to male students using the portal ranges from a difference of 97 more boys than girls, to 76 more girls than boys. On average across 104 schools in which there are more boys than girls on the platform, there are 25 more boys than girls registered on the platform.
- Kajiado represents the lowest proportion of the sample, with 13% of sample students from the county, and students from Kilifi represent 36% of the sample. Makueni represents 22% of the sample and Uasin Gishu represents 28%. This is aligned with the proportion of schools in the counties.
- The largest proportion of students are in standard 8, at 42%. The lowest proportion of students is in grade 3, representing 1% of the sample. Grade 4 is 10%, standard 5 is 12%, standard 6 is 16% and standard 7 is 18%. I.e. there are more registered users in higher grades. This division is similar when disaggregated by gender.
- 53% of the sample is from intervention C, and 47% from intervention A. This division is the same when disaggregated by gender.

Teacher portal data

Following the removal of extreme values, a total of 1526 entries were included in this dataset from June 2019 to March 2020. Female teachers make up 61% of the sample compared to 39% for male teachers. There are 205 schools represented in the dataset. The distribution of teachers across the counties aligns with their proportion of schools. Kilifi has the highest proportion of the sample, with 41% of teachers. followed by Uasin Gish (27%). Kajiado and Makueni have the lowest representation in the sample, with 16% of the sample each.

Digital teacher survey

Response rates for the digital teacher survey were anticipated to be low based on the results from previous surveys administered by the project during school term time (i.e. not with added limitations caused by COVID-19). A purposefully wide sample strategy was thus utilised with 'convenience' sampling as the technical approach, and a link to the survey on Google Forms was sent to all participating iMlango teachers in all intervention school types (i.e. A/C and B), regardless of gender.

The intended sample size was calculated by using the number of 1664 teachers on the portal (or approximately 8 teachers per iMlango school), with a 95% confidence level and 10% margin of error. This resulted in just under 100 responses as an ideal sample size to present representative findings. A total of 305 responses were received for the digital teacher survey. However, a total of 25 responses were removed from the dataset due to not having provided consent, not meeting the sampling criteria, school name not recognised as a iMlango school, or duplicate entries. Therefore, the sample size of the clean digital teacher dataset was 280 entries.

Project-level qualitative data sample

The sampling approach for project-level KIIs was purposive in conversation with the iMlango MEL lead. Interviews were requested with representatives from all relevant partners to ensure that the consortium was represented in full and there was an equitable distribution of voices. Field Officers were also interviewed and their insights regarding impact at the

school level were leveraged when refining the digital teacher survey, school sampling strategy for the KIIs, and KII templates. The final number of respondents was 17, with 6 from Whizz Education, 5 from sQuid, 2 from Avanti, 3 from the FM, and 1 from DFID.

School-level qualitative data sample

Available school-level quantitative data from Whizz Education and sQuid regarding overall school usage in Term 1 of 2020 was used by the research team for quota and purposive sampling to select schools to interview key informants from. The dataset used for the sampling included three separate usage categories (average minutes per week of usage): student maths usage, student literacy usage, and teacher portal usage. Schools that did not have data from each of the three indicators were removed from the list, and the average scores using all three indicators were calculated. In addition, the school had to be an intervention A or C school (i.e. it has received the full set of iMlango interventions), and schools were prioritised that had lesson observation data available to provide background information for the interviews. Further sampling is detailed for each usage band as follows:

- High-usage schools were sampled by using an overall average usage figure above 20 minutes per week. I.e. the school's average of student maths, literacy and teacher usage had to be above a score of 20. From this list, any school with low usage scores for any one of the categories were eliminated. Similarly, any school ranked as medium usage for more than one category was eliminated. The top scoring schools were taken, divided by regional location. This resulted in one priority school and one alternative school for Kajiado, Kilifi and Uasin Gishu.
- Medium-usage schools were sampled by using an overall average usage figure between 10 and 20 minutes per week. These schools provided the research team with an opportunity to elicit information regarding the efficacy of certain elements of the intervention. Therefore, schools were selected that had a significant difference in usage between the different scores: the largest negative difference between students maths and literacy (i.e. student usage is significantly higher in literacy than maths); the largest positive difference between students maths and literacy (i.e. student usage is significantly higher in maths than literacy); and the largest positive difference between both student scores and the scores of teachers (i.e. significantly higher student usage than teacher). This resulted in one priority school and one alternative school for Kilifi, Makueni, and Kajiado.
- Low-usage schools were sampled by using an overall average usage figure of less than 10 minutes per week. Out of these schools, the lowest usage results for each of the three categories were included, i.e. the school with the lowest usage for maths, the school with the lowest usage for literacy, and the school with the lowest teacher usage. To ensure regional variation, the first ranking was not always used. This resulted in one priority school and one alternative school for Kilifi, Makueni, and Uasin Gishu. Note that Kilifi was included in all three bands with other counties included in two because it has more iMlango schools.

The table below provides an overview of usage bands and averages by county.

County	High usage	Medium usage	Low usage	*Total schools*
Kajiado	• 3 schools • Average: 26.82	• 10 schools • Average: 14.75	• 2 schools • Average: 7.52	*15*
Kilifi	• 9 schools • Average: 24.98	• 19 schools • Average: 13.46	• 23 schools	*51*

			• Average: 6.56	
Makueni	• 3 schools • Average: 21.43	• 14 schools • Average: 13.37	• 9 schools • Average: 8.05	*26*
Uasin Gishu	• 4 schools • Average: 22.93	• 29 schools • Average: 13.45	• 9 schools • Average: 7.9	*42*
Total	*19*	*72*	*43*	*134*[24]

iMlango Field Officers were given the list of priority and alternative schools to contact key informants. A script for Field Officers (Appendix H2) was provided by the research team for these initial conversations, that was adapted by Field Officers accordingly. Field Officers were asked to provide contact details for a minimum of one numeracy or literacy teacher, one head teacher, and one PTA or BoM member from each school resulting in an ideal of 27 interviewees. Field Officers provided contact details for a total of 29 beneficiaries from eight priority schools and one alternative option (9 schools in total). Three were high usage schools, three were medium usage, and three were low usage. It is important to note that Field Officers selected the teachers and PTA or BoM representatives to take part in the research, and this selection process was therefore not random and was likely skewed towards people that the Field Officers had an existing relationship with. This has potential implications for the data and should be kept in mind when interpreting the data from this source.

Prospective participants were then contacted by members of the research team using WhatsApp or Skype to call their mobiles. Of the 29 prospective participants, 26 took part in an interview. Of the three people that did not take part, one was reached, but said he was busy and unavailable for an interview, and the other two were uncontactable despite several attempts. Of these 26 participants, 14 were teachers, 8 were head teachers (including one deputy head), and four were PTA or BoM members. For some schools, contact information was provided for two teachers. Where contact information for two teachers from the same school were given, both teachers were interviewed. For some schools, contact details for a PTA or BoM representative were not obtainable.

Appendix E: Research ethics framework

Jigsaw Consult seeks to protect the dignity, rights and welfare of all those involved in research, and is guided by the principles in the Belmont Report (1979), including:

- Potential research subjects must be treated as autonomous agents, who have the capacity to consider alternatives, make choices, and act without undue influence or interference from others.
- The two basic principles of beneficence: (i) do no harm, and (ii) protect from harm by maximising possible benefits and minimising possible harm.
- Fairness in the distribution of the burdens and benefits of research.

The table below details the ethical framework for this midpoint research study, including the

[24] Note that these are A and C schools only and schools were removed that did not have usage data, resulting in the figure of 134 schools in total.

general protocols followed and specific considerations. This draws on the following sources:

- The British Education Research Association guidelines and charter[25]
- The United Nations Evaluation Group Ethical Guidelines for Evaluation[26]
- The GEC-Transition Monitoring, Evaluation and Learning (MEL) Guidance Part 2[27]
- The TRUST Project's Global Code of Conduct for Research in Resource-Poor Settings[28]

It is the responsibility of the entire research team to uphold and maintain the ethical standards set out in this framework. It is the responsibility of the Project Manager to follow up on reported incidents of ethical breaches, and to amend and update the framework where necessary.

Commitments	Protocol	Application to this study
Informed consent	Ongoing and voluntary consent is sought from all research participants. Consent for research with children and adults at risk will be assessed on a case-by-case basis; Jigsaw believes that children and adults at risk should be consulted for consent where appropriate. Participants are able to withdraw their consent at any stage of the research.	Digital teacher survey: written consent was sought from teachers participating in the online survey. KIIs: oral consent was sought from key informants at the beginning of the interview, which was an included section of the interview template and transcript. To ensure consent was informed, details were provided to participants in the survey and at the beginning of interviews including: the purpose of the project; management of participants' data, including limitations to confidentiality; and the participants' right to withdraw consent at any time.
Sufficient staff training	Jigsaw staff are trained in research ethics and current best practice in research.	The research team undertook additional research and training in remote data collection during the COVID-19 pandemic through a review of literature and attendance at relevant webinars. An extended methodology (Appendix O) was produced to capture this learning.

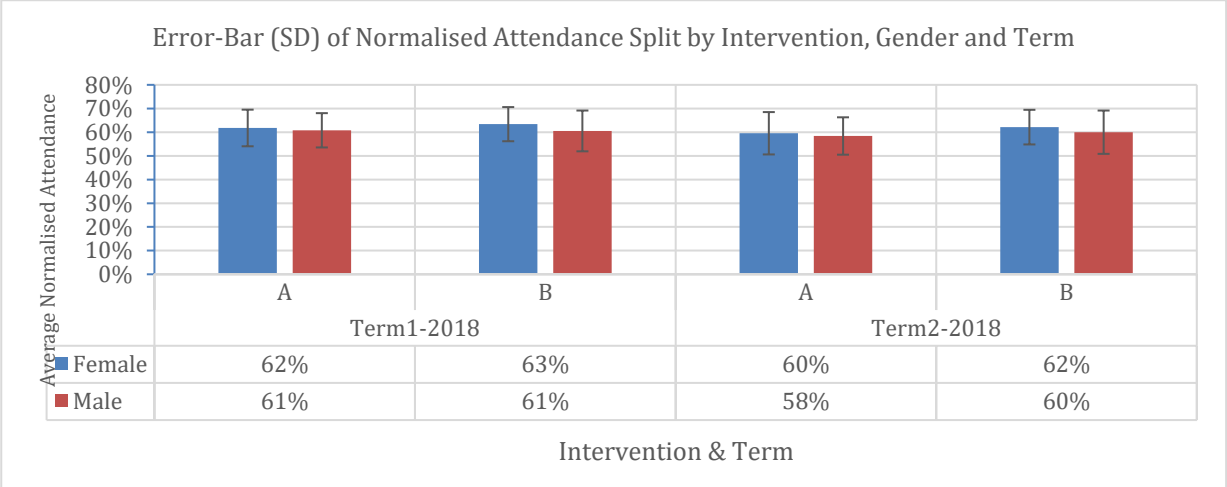
[25] https://www.bera.ac.uk/resources/all-publications/resources-for-researchers
[26] http://www.unevaluation.org/documentdownload?doc_id=102&file_id=548
[27] https://www.lcdinternational.org/sites/default/files/user-uploads/gect_mel_guidance_part_2.pdf
[28] http://www.globalcodeofconduct.org/wp-content/uploads/2018/05/Global-Code-of-Conduct-Brochure.pdf

Appropriate data collection tools	Jigsaw uses innovative and project-appropriate data collection methods. Data collection is often participatory. The tools are developed to be inclusive and accessible to all participants. Data collection tools are appropriate to the local context.	The data collection tools were developed in conversation with iMlango consortium partners and informed by the insights of Field Officers. In addition, a sequenced approach to data collection was utilised whereby the digital teacher survey, project KII templates and school KII templates were informed by previous rounds of data collection and analysis.
Data protection	Jigsaw has a comprehensive Data Protection Policy. Data is stored on a secured server, and access is restricted to staff who require it.	This study adhered to the Jigsaw data protection policy, whereby all collected data is stored on a secured server. This is accessible internally only - i.e. by the Jigsaw team. The report and other deliverables are anonymised. Participants were fully informed of how their information would be used.
Confidentiality and anonymity	All information provided in data collection is treated confidentially and anonymously, except when safeguarding procedures are triggered.	Participants were informed that their names would not be reported and their individual responses would not be disclosed to anyone outside of the research team. No individual names or school names were used in the final report. Rather, data was presented by usage band and county (e.g. a high-usage school in Kilifi).
Independence	Jigsaw upholds high standards with respect to research independence. Jigsaw staff are expected to disclose any actual or perceived conflict of interest with their private interests and the research, including but not limited to, the research objectives and stakeholders.	There is no perceived or actual conflict of interest that arises from Jigsaw's involvement in this research.
Use of financial reimbursements for survey participation	Jigsaw develops methodological approaches in line with the values that underpin the organisation. It is outside of Jigsaw's normal protocol to use financial	Very low response rates were anticipated for the digital teacher survey because COVID-19 resulted in school closures, so teachers were unable to use their school's internet connectivity to

	reimbursements for survey participation. However, in line with Jigsaw's values of treating people with dignity and commitment to learning whilst recognising the local context in the midst of COVID-19, a decision was made to honour the contributions of participants, resulting in an approach that incorporated financial reimbursements for survey participation.	complete the survey. It was additionally considered that COVID-19 may affect household finances including challenges regarding the cost of mobile phone data. To mitigate this, a mobile transfer of 500 KSH was offered to teachers who completed the survey to reimburse them for the cost of their data. The amount for the reimbursement was decided in conversation with in-country colleagues, which considered the approximate time to complete the survey, battery consumption, and data consumption. The funds were distributed to the teachers' mobile phones using m-pesa transfers the week after the submission of all surveys. Information regarding the reimbursement was communicated clearly to teachers directly by Field Officers and on the survey itself both at the beginning and the end. The research team ensured that all respondents who submitted a completed survey received the required reimbursement. While this is not standard protocol for Jigsaw, learning regarding the use of reimbursements was captured and is included in the extended methodology in Appendix O.

Appendix F: Attendance data

Appendix F1: Attendance data for 2018



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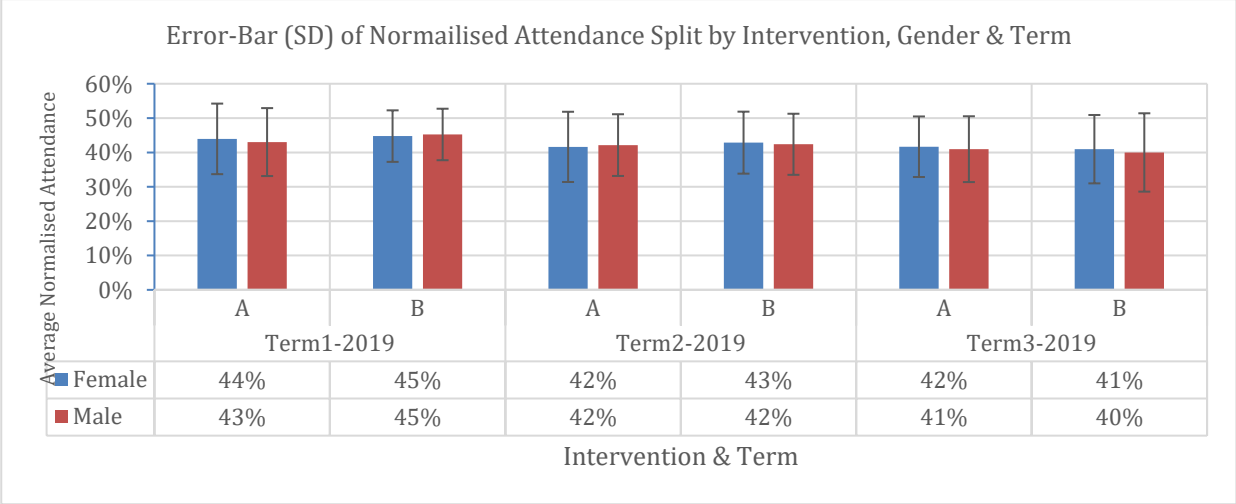
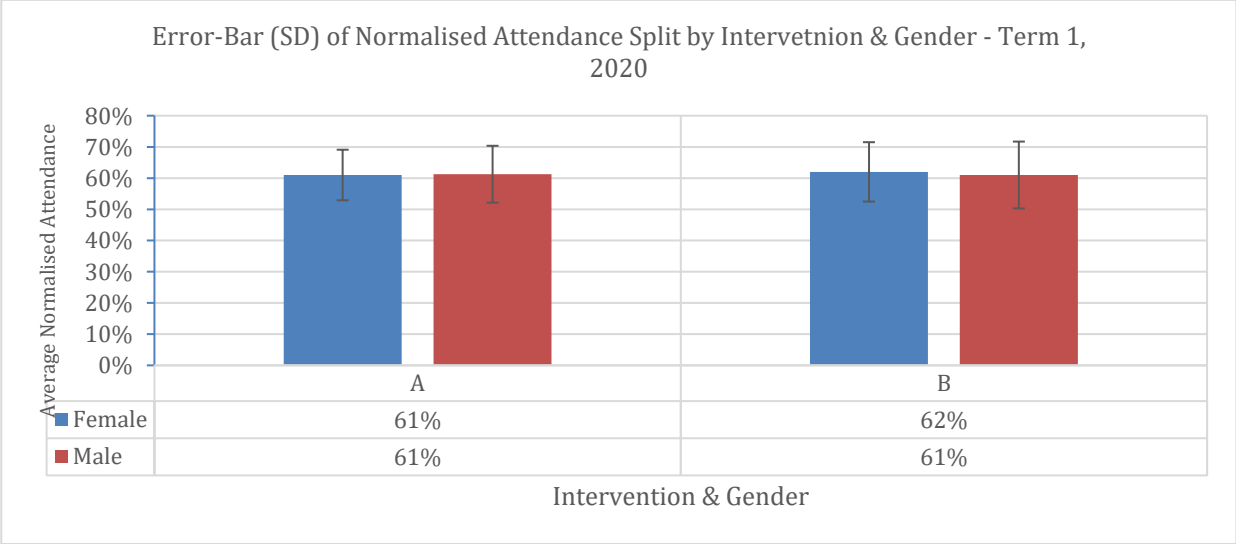
Appendix F2: Attendance data for 2019



Appendix F3: Attendance data for 2020



Appendix G: Digital teacher survey

The pdf version of the digital teacher survey is attached as a separate document.

Appendix H: Key informant interview templates

Appendix H1: Interview template for iMlango consortium partners

iMlango consortium partner interview template
Guidance for interviewers:
The KIIs with iMlango consortium partners seek to address the following research questions: • 4.1: To what extent is iMlango sustainable? What is the likelihood of school-level sustained usage of iMlango resources and content after the project ends? • 4.2: To what extent does iMlango provide good value for money with regard to the cost required to shift learning practices and outcomes? What conditions are required for a shift in learning practices and outcomes to take place? • 4.3: To what extent is iMlango scalable? What scenarios exist for scaling the project, including implications of the Government of Kenya taking the project to scale? (I.e. What would the costs likely be? Would this represent good value for money for the government given the findings above on effectiveness and impact?) Following the introduction and consent, the interview is divided into 3 sections: the distinctive contribution of iMlango and defining success, adaptations to the project and continuous learning, and project sustainability and scalability. It closes with an additional three questions to wrap-up the interview. Note that this template is a guide for interviews with iMlango consortium partners and includes a wide range of questions, which will not be relevant to all interviewees. Templates should therefore

be adjusted based on the role and areas of responsibility within iMlango for the interviewee. A range of additional questions is included at the end of the template to draw on where relevant. Make notes in this section prior to a scheduled interview using the background documentation and where relevant, initial findings from the analysis.

Interview details (Researcher to record the following details for each interview):

- Date (DD/MM/YY):
- Attendees:
- County (if interview is with a Field Officer):
- Researcher name:

Interview script

Introduction	1. Discussion re: difficulty around coronavirus 2. Introduction to the purpose and scope of the study 3. Introduction to the purpose of the interview 4. Review informed consent
Distinctive contribution of iMlango and defining success	5. What is the distinctive contribution of iMlango within the GEC and more broadly for education in low-income contexts? 6. How do you think success should be defined for iMlango? 7. To what extent does iMlango provide good value for money, how could this be improved, and how do you think it can be best articulated? 8. How does the availability of real time data within a programme change the future of the education sector, and what are the challenges for this when operating within DFID M&E frameworks? 9. What are the ingredients for a successful consortium/partnership when delivering an EdTech intervention?
Adaptations to the project and continuous learning	10. What have you learned from other parts of your work in EdTech that has been, or should be, applied to iMlango? 11. What do you see as the most significant ways in which iMlango has adapted through the course of the programme? How do you ensure continuous learning and improvement? 12. How do you ensure that the significant amount of available data is used effectively and informs the future of the project?
Project sustainability and scalability	13. How did you get government buy-in? Can you walk us through the government engagement process and how those relationships were built and maintained at district and national levels? 14. To what extent is iMlango sustainable? What is the likelihood of school-level sustained usage of iMlango resources and content after the project ends? 15. To what extent is iMlango scalable? What scenarios exist for scaling the project, including implications of the Government of Kenya taking the project to scale? (I.e. What would the costs

	likely be? Would this represent good value for money for the government given the findings above on effectiveness and impact?) 16. What are the biggest barriers to scaling the EdTech interventions? 17. To what degree is it possible to go into more schools? What needs to take place in order for this to happen? 18. What would you do differently next time to set up iMlango for sustainability and scalability from the outset? 19. Where iMlango is at now, what do you think are the most significant things that can be done to increase future sustainability and scalability?
Close of interview	20. What have other monitoring reports or evaluations missed that you want to ensure this study captures? 21. What do you think will be our biggest challenge in conducting this study? Why? 22. Is there anything else that you have not had a chance to talk about that you think is important for our study? *Thank the participant for their time.*
Additional questions (where relevant and time allows)	*If relevant to the interviewee, the following questions can be drawn on during the interview:* **Pupil learning:** 23. Can you walk us through the key outcomes and impact on student learning that you've seen from the EdTech interventions in iMlango? Has there been anything unexpected? Has there been anything that you expected to see but haven't? **Teacher practices in the classroom:** 24. What is the impact of the iMlango project on the teachers who are involved in the project? 25. What are the critical success factors for why this project works in some schools and doesn't work in others? **School management practices:** 26. What is the impact of the project on school management and administration? How has the school administration responded to these new ways of working? **Community response:** 27. What is the impact of the iMlango project on the local school communities? 28. How has the community received this project? Has this changed over the years of the project running? 29. What are the ingredients for success for community engagement? 30. Has there been a wider shift in the way that people and communities are perceiving EdTech? Can you describe this to us? Has this happened at governmental level as well?

Appendix H2: Field Officer script for contacting school key informants

Field Officer script for contacting key informants

Purpose of the script:

This script is for Field Officers to use when contacting teachers, head teachers, and PTA or BoM representatives from the selected sample schools to ask for their time to participate in an interview. Teachers and head teachers should also be encouraged to complete the survey (head teachers only if they teach in ICT labs and whole-class lessons) if they have not done so already. Reimbursements will be available for survey participants who complete the survey in full, but those who participate in an interview will be asked to do so voluntarily to help the project progress and improve, and will not be offered a reimbursement for their interview participation.

Field Officers are invited to adapt the script as required based on their relationship with the individual. The following is meant as guidance, which captures the purpose of the interview and information around consent.

Script:

A research team from the UK called Jigsaw Consult is currently conducting a midpoint study about the iMlango Transitions project. Because of the coronavirus pandemic the researchers are unable to travel to Kenya, and so the study is taking place remotely. The research team is therefore looking for *[teachers / head teachers / PTA/BoM representatives]* to take part in the research study by answering questions about the iMlango project over the phone. This interview will take around 20 minutes of your time. The researcher will make notes during the interview, and the information you give will be used to write a report on the iMlango Transitions project. Findings will be presented by county, and your name will not be used in the report nor will what you say be shared with anyone outside of the Jigsaw Consult research team.

The research team knows that this is a difficult time for many people, and does not wish to disturb anyone who is facing additional pressure or stress as a result of the current situation. This is also a very important study for the project to improve and your expert knowledge and insights would be incredibly valuable to include.

[If relevant]: If you have not seen it already, the research team has also developed an online survey, which you are encouraged to complete *[for head teachers: if you are also teaching (that is, using the ICT lab for sessions and the iMlango portal and projector for whole-class lessons)]*. They are offering 500 KSH for the completion of the survey, but note that there will be no further payment for your participation in this interview. We are hoping that you will be willing to share your reflections and insights into the project to help it improve.

Do you give me permission to pass your name and phone number on to the research team so they can contact you? *[Please record whether or not the interviewee is able to use WhatsApp for the interview.]* You are free to change your mind later, just let the team know when they call that you don't wish to take part.

[If yes]: Great, thank you. Someone from the team will call you in the next week, and together you can arrange a time that is convenient for you to carry out the interview.

Please provide the name, contact details, whether they can take the call via WhatsApp or through their mobile, if they have a preferred date and time for the call, and any further observations regarding this individual or their school from your experience there that would be relevant for us to know ahead of the interview.

Appendix H3: Pre-interview information and consent

Pre-interview information and consent
Purpose:
The following script is for researchers to use when contacting interviewees following an introduction from the Field Officer. Note that priority questions are included in bold which should be asked to all interviewees for comparability and internal notes and probes have been included in italics. The questions not in bold are still very important so please do try to get to them all if possible. They should also be tailored according to the school's unique portal usage history.
Script:
Hi, my name is *[name of researcher]* and I work for an organisation called Jigsaw Consult. We are responsible for conducting a midpoint study of the iMlango transitions project in Kenya. I was given your contact details by *[name of Field Officer]*. First of all, thank you very much for expressing an interest in taking part in our research, and for allowing me to contact you. In usual circumstances our team would have travelled to Kenya to conduct this research, and I would be speaking to you face-to-face. However due to the global coronavirus outbreak we are unable to travel. I know that because of the outbreak this is a difficult time for many. I therefore particularly thank you for taking the time to speak with me during this period of uncertainty and think that your insights will be incredibly valuable for our research. Let me give you some more details about the research and what is required of you, then you can let me know whether or not you wish to take part. The purpose of this interview is to find out how the project is going so far. I will ask you questions about the iMlango project activities and their impact at your school. As *[name of Field officer]* will have already told you, the interview will last around 20 minutes. I will make notes during the interview and the information you give will be used to write a report on the iMlango Transitions project. Findings will be presented by county, and your name will not be used in the report. Do you wish to take part? *[If yes: arrange a time and date that suits the participant to conduct the interview. If they express that they are available on the spot, this is ideal so the interview should begin.]* *[If no]:* Thank you, if you feel comfortable do you mind sharing why you do not wish to take part in the interview?

Appendix H4: Interview template for head teachers

Head teacher interview template	
Guidance for interviewers:	
The KIIs with head teachers seek to address the following research questions: • 3.1: To what extent are reports with automatically generated individualised student data used for school management purposes? How does the data inform decision-making at the school level? What are the perceived advantages and challenges? • 3.2: To what extent is iMlango sustainable? What is the likelihood of school-level sustained usage of iMlango resources and content after the project ends? Following the introduction and consent, the interview is divided into 3 sections: school management, use of project data, and sustainability. This template should be adjusted and adapted according to the level of engagement of the school in the project activities. Probes are included throughout and priority questions are written in bold. Make notes in this section prior to a scheduled interview using the sampling strategy, the school usage data and analysis, and lesson observations where available from the corresponding project google drive folders. Also request insight from Field Officers where possible.	
Interview details (record the following details):	
• Date (DD/MM/YY): • School name: • County: • Qualitative specialist name: • School code: • Gender of Head teacher:	
Interview script	
Introduction (if a follow-up interview time had been scheduled)	This is *[name of researcher]*. We spoke *[insert time frame e.g. yesterday, last week, a few days ago]* about the research I am conducting on the iMlango project. Is now still a good time for you to speak? *[If yes]:* I will take around 20 minutes of your time today and will be asking you some questions about the iMlango project activities and their impact at your school. I will make notes during the interview, and the information you provide will be used to write a report on the iMlango transitions project. Findings will be presented by county, and your name will not be used in the report. Does that still sound okay and are you happy to continue?

	[If yes]: Great, thanks so much for taking the time to speak to me today. *[If the participant is not unavailable, reschedule.]* *[If they withdraw consent, make a note of this]:* Thank you, if you feel comfortable do you mind sharing why you have changed your mind about taking part in the interview?
Opening questions	1. How long have you been a Head teacher at *[school name]*? 2. What experience did you have with ICT before iMlango started at your school?
Using digital resources	**3. Do you think that using ICT and digital resources helps students learn? How? Do you have any examples of this at your school?** 4. Can you tell me about any ways in which you support the teachers to use the iMlango project resources?
School management and use of project data	5. **Can you tell me about the individualised student data that is generated by the iMlango project on learning and attendance?** *[NB: we want to understand the extent to which this data is being used for school management purposes and how it informs decision-making at the school level.]* **a. What (if anything) do you use this data for? What do you achieve by using this data?** *[Probe for specific examples of how this data was used for school management or to take specific actions (e.g. prevention of student drop-out, engaging with students' parents to discuss their performance, engaging with County Officials, etc.)]* b. **How useful do you find this data? What are the advantages of having it? Please explain.** *[Probe for informing decision-making at the school level]* c. **Is this data shared with teachers? Please explain.** **d. *[If not]:* Why don't you use it?** **6. Do you collect data on learning and attendance using written methods as well as digital?** a. *[If yes]:* why do you continue to collect data using both written and digital methods? **b. How would you compare the project's way of collecting data on learning and attendance to more traditional written methods?** c. *[If no]:* is that because of the iMlango project?
Sustainability	**7. Which of the project activities and resources would you like to continue using after the project ends? Why?** **8. Has anyone from the project spoken to you about**

	what will happen after the project ends? **9. How likely is it that you will be able to continue using these resources/implementing these activities after the project ends?** **10. What are the main barriers to the continued use of these resources/activities at your school after the project ends? What would need to happen to overcome these barriers?** **11. What steps have you/the school management taken to ensure that these activities will be sustained once the project ends?** **a. What steps do you intend to take?** **12. Is there any support that the project could give you now to help you to prepare for the continuation of activities after the end of the project?** *[Probe from whom – e.g. CSOs, other country officials, parents, etc.]* 13. Which of the project activities do you think has been the most successful? Why? *[Probe for their understanding of what success in this case means.]* 14. Which of the project activities do you think has been the least successful? Why? a. What could be done to make this activity more successful? 15. Have there been any particular barriers or challenges that have prevented the activities from being successful or as successful as they could have been? *[Probe for individual project components – connectivity; individualised maths tutoring; portal maths and literacy content; teacher training; field teams to provide support to teachers; electronic attendance monitoring; etc.]*
Close of interview	• Ask the participant if they have any questions or anything else to add. • Note down any questions they ask and the answers provided. • If relevant and a candidate for the survey (i.e. they have to teach literacy or numeracy), remind the participant about the online survey in case they have not yet filled it out and tell them that the research team is able to reimburse them 500 KSH for a completed submitted survey for their data usage. *[NB: Make sure that the survey is still live before doing this as it will be closed after 500 responses are received or after the due date.]* *Thank the participant again for taking the time to speak to you.*

Appendix H5: Interview template for teachers

Teacher interview template

Guidance for interviewers:

The KIIs with teachers seek to address the following research questions:

- 1.3: Who is benefiting from the recommended 30 minutes per week, who does not, and what is the process of decision-making around this? How does this relate to issues of gender and social inclusion? What are the key enablers or barriers for how more children can reach this recommended level?
- 1.4: Who is benefiting from the recommended 30 minutes per week, who does not, and what is the process of decision-making around this? How does this relate to issues of gender and social inclusion? What are the key enablers or barriers for how more children can reach this recommended level?
- 1.5: How, why and under what conditions do iMlango inputs contribute to non-numeracy and non-literacy, but direct benefits for learners, such as improved digital literacy or increased enthusiasm for learning?
- 2.1: What approaches have teachers taken (or not taken) in relation to improvements in pupil learning?
- 2.2: What factors contribute to the achievement of a well-executed Maths or English lesson using the school lab? What factors inhibit this achievement? What factors compromise and contribute towards the learning that comes out of such a lesson?
- 2.3: What factors contribute to the achievement of a well-executed Maths or English lesson that uses projected iMlango resources? What factors inhibit this achievement? What factors compromise and contribute to the learning that comes out of such a lesson?
- 2.4: To what extent do teachers feel confident in their ability to use Maths-Whizz whole-class resources effectively as a tool to support pupil learning within a lesson (particularly as they relate to lesson objectives, teaching the whole class, alignment with curriculum, pace, formative assessment, etc.)?
- 2.5: What influences a teacher's decision as to whether or not they use projected content in a planned lesson? In particular, how does a teacher's confidence with the topic of the lesson influence their decision as to whether or not to use a projector?
- *2.5.A: To what extent do teachers understand what projected content is available for their use and how it can be used to support specific objectives of the lesson?*
- *2.5.B: What are teachers' perceptions of whether using this content helps or hinders their: a) preparation of the lesson, b) delivery of the lesson, and c) ability to evaluate the lesson and what children learnt (or did not learn)?*

Following the introduction and consent, the interview is divided into 3 sections: school ICT lab and whole-class teaching, training and support, and student performance and learning. This template should be adjusted and adapted according to the level of engagement of the school in the project activities. Probes are included throughout and priority questions are written in bold. Make notes in this section prior to a scheduled interview using the sampling strategy, the school usage data and analysis, and lesson

observations where available from the corresponding project google drive folders. Also request insight from Field Officers where possible.

Interview details (record the following details):

- Date (DD/MM/YY):
- School name:
- County:
- Qualitative specialist name:
- School code:
- Gender of teacher:

Interview script

Introduction (if a follow-up interview time had been scheduled)	This is *[name of researcher]*. We spoke *[insert time frame e.g. yesterday, last week, a few days ago]* about the research I am conducting on the iMlango project. Is now still a good time for you to speak? *[If yes]:* I will take around 20 minutes of your time today and will be asking you some questions about the iMlango project activities and their impact at your school. I will make notes during the interview, and the information you provide will be used to write a report on the iMlango transitions project. Findings will be presented by county, and your name will not be used in the report. Does that still sound okay and are you happy to continue? *[If yes]:* Great, thanks so much for taking the time to speak to me today. *[If the participant is not unavailable, reschedule.]* *[If they withdraw consent, make a note of this]:* Thank you, if you feel comfortable do you mind sharing why you have changed your mind about taking part in the interview?
Opening questions	1. How long have you been a teacher at [school name]? 2. What experience did you have with ICT before iMlango started at your school? 3. Do you think that using ICT and digital resources helps students learn? How? Do you have any examples of this at your school?
Whole-class teaching	4. **Are you familiar with the iMlango digital resources that you can use in your class with the projector?** 5. **Do you use these projected iMlango resources in your lessons?** a. ***[If yes]:* How often do you use them?** *[Probe for what influences their decision as to whether or not*

they use projected content in a planned lesson – interested in their confidence in the use of ICT and their understanding of what resources are available; also how their confidence of the subject being taught impacts on their decision whether or not to use projected resources]

b. ***[If yes]:*** **Why do you use them? Do they support student learning? How?** *[Probe for specific examples – e.g. how well they related to lesson objectives, alignment with curriculum, pace, formative assessment of student learning, etc.]*
c. ***[If yes]:*** **What stops you from using these resources as much as you would like to?** *[Probe for all barriers and specific examples but also interested in issues relating to confidence – e.g. How do you feel when you think about using them? E.g. nervous, excited, enthusiastic about how they can improve the lesson, etc. Why is that?]*
d. ***[If yes]:*** **Have you faced any additional challenges to using projected resources?** (I.e. specific factors that inhibit an effective maths/literacy lesson using the project resources.)
e. ***[If yes]:*** **When you do use the digital resources and projector, what factors contribute to a successful whole-class lesson?** *[Probe for factors in addition to the equipment and resources. E.g. teaching methods, student champions, etc.]*
f. *[If yes]:* What classes and grades are they most helpful in? What are your favourite resources? Why? What are your students' favourites? Why?
g. *[If yes]:* How well do you think the iMlango numeracy and literacy resources are linked to the Kenyan curriculum? How could the resources be improved?
h. ***[If no]:*** **why don't you use the projected iMlango resources? Please explain any barriers that exist and what needs to happen to improve this.** *[NB: It will be important to capture the second part of this question – i.e. what needs to happen to improve this. Probe for confidence in using ICT and their understanding of what resources are actually available via the portal.]*

6. **What are the main teaching methods you use in class? Have these changed since the start of the iMlango project? Why?** *[NB: this is a very important question – probe for specific approaches in relation to student learning]*
7. **Do you access the maths class learning profile to look at the students' progress?**
    a. ***[If yes]:*** **Do you use available data for anything specific? [Probe e.g. lesson planning]. What has it helped you to achieve? What kinds of decisions has this led to?**

	b. ***[If not]:*** **Why don't you use it?** 8. Do you use lesson plans? Please explain. *[Probe for advantages and challenges in lesson planning and whether iMlango project resources have helped with lesson planning or made it more difficult - elicit examples and details where possible.]* 9. Do you have access to the learning and attendance reports that the iMlango project shares with the Head teacher? 10. *[If yes]:* Have these reports led to any specific changes in your classroom or actions regarding individual students?
School ICT lab	11. **Do you use the school ICT lab with your students?** a. *[If yes]:* How often do you use the ICT lab with your students? b. ***[If yes]:*** **What factors contribute to a successful lab session? How do you ensure that students are able to get the most out of their time in the lab?** *[NB: keep this open at first, but if needed can probe for same responses as survey: student champions supporting others; students working individually; organisation – e.g. students accessing lab in turns]* c. *[If yes]:* What challenges have you faced in conducting lab sessions? *[Probe for factors that compromise the learning that comes out of a lab session.]* d. *[If yes]:* What stops you from using the ICT lab with your students as much as you'd like to? e. ***[If no]:*** **Why not?** *[NB: really try to get to bottom of why the lab isn't being used. Is the equipment not working? Are the teachers not confident in using ICT or do not believe in the effectiveness of ICT for learning?]* 12. **[If yes to above]: How many of your students achieve the recommended 30 minutes / week of Maths Whizz?** a. How do you decide on which students will access the maths tutor at which times? Can you walk me through this process? b. **Are there any students that aren't accessing the maths tutor as much as others?** *[NB: it's very important that we probe for how this relates to gender and social inclusion].* **Why do you think this is?** *[NB: can link to following question.]* c. **What are the barriers that prevent students in achieving this recommended usage? What needs to happen to improve this?** *[NB: the latter part of this question is an important theme for the research – i.e. what needs to be in place for more students to achieve the recommended usage of individualised content.]* 13. **Do you notice a difference in learning outcomes for**

	the children who achieve the recommended time per week of individualised lab learning? Please explain. For the children who aren't getting the full 30 minutes per week, do you still see any difference in their progress and learning outcomes even though they don't get the full recommended amount? *[Probe for specific examples – we want to understand how individualised lab learning can improve learning outcomes of children who don't get the full 30 min.]*
Student performance and learning	14. **Can you tell me about any impact you have seen that the project activities have had on the students at your school?** *[Probe for numeracy and literacy, attendance, but also very important to probe for other non-numeracy/literacy but direct impacts such as improved digital literacy and increased enthusiasm to learn.]* 15. **Can you tell me about any differences you may have observed between girls' and boys' engagement with the project activities?** *[Probe for lab and whole-class.]* **How about children with disabilities? Why is this? What (if anything) have you done to try and address this?** *[Probe for what else the project could do to address this.]*
Training and support provided	**16. What training or feedback have you received from the iMlango project? How was it delivered? (e.g. F2F training; online training; webinars; forum-based interactions; materials disseminated by the project; lesson observations; model lessons; lesson plans; etc.)** a. What have you learnt through this training/feedback? *[Probe for specific strategies helpful for improving teaching and learning.]* **b. How useful have you found this training? Please explain.** **c. What support or training would you have liked more of? What could have been improved?** 17. Have you accessed the remote classroom instruction course for Maths? a. *[If yes]:* Have you completed it? How useful did you find this course? 18. Can you tell me about any support you have received from the school administration related to the project activities? How supportive of the project would you say the school administration is? 19. Do you use the WhatsApp teacher forums? a. *[If yes]:* What do you use the forum for? Is it helpful? How so? How could it be improved? b. *[If no]:* Why not? *[Probe for whether they tried it but did not find it helpful.]*
Close of interview	• Ask the participant if they have any questions or

	anything else to add. • Note down any questions they ask and the answers provided. • Remind the participant about the online survey in case they have not yet filled it out and tell them that the research team is able to reimburse them 500 KSH for a completed submitted survey for their data usage. *[NB: Make sure that the survey is still live before doing this as it will be closed after 500 responses are received or after the due date.]* *Thank the participant again for taking the time to speak to you.*

Appendix H6: Interview template for PTA or BoM representatives

PTA or BoM representative interview template
Guidance for interviewers:
The KIIs with PTA or BoM representatives seek to address the following research questions: • 4.1: To what extent is iMlango sustainable? What is the likelihood of school-level sustained usage of iMlango resources and content after the project ends? Following the introduction and consent, the interview is divided into 3 sections: school governance, sustainability (which is the main section), and use of project data. This template should be adjusted and adapted according to the level of engagement of the school in the project activities. Probes are included throughout and priority questions are written in bold. Make notes in this section prior to a scheduled interview using the sampling strategy, the school usage data and analysis, and lesson observations where available from the corresponding project google drive folders. Also request insight from Field Officers where possible.
Interview details (record the following details):
• Date (DD/MM/YY): • School name: • County: • Qualitative specialist name: • School code: • Gender of PTA or BoM representative:
Interview script

Introduction (if a follow-up	This is *[name of researcher]*. We spoke *[insert time frame e.g. yesterday, last week, a few days ago]* about the research I am

interview time had been scheduled)	conducting on the iMlango project. Is now still a good time for you to speak? *[If yes]:* I will take around 20 minutes of your time today and will be asking you some questions about the iMlango project activities and their impact at your school. I will make notes during the interview, and the information you provide will be used to write a report on the iMlango transitions project. Findings will be presented by county, and your name will not be used in the report. Does that still sound okay and are you happy to continue? *[If yes]:* Great, thanks so much for taking the time to speak to me today. *[If the participant is not unavailable, reschedule.]* *[If they withdraw consent, make a note of this]:* Thank you, if you feel comfortable do you mind sharing why you have changed your mind about taking part in the interview?
Opening questions	1. How long have you been a member of the [PTA or BoM] at [school name]? 2. How many children do you have at the school? 3. What are your main roles and responsibilities within the PTA? **4. Do you think that using ICT/digital resources helps students to learn? How? Do you have any examples of this at your school?** 5. How familiar are you with the iMlango project? What does it provide to the school? **6. What is your perception about the project impact on students?** *[Probe for: attendance, gender equality, pupil outcomes, enthusiasm, digital literacy]*
School governance	7. In what ways (if any) has the PTA been involved in the project? a. Have you personally been involved in the project in any way? How? 8. **Can you tell me about any ways in which the PTA supports teachers to use the project resources?**
Sustainability	9. Which project activities do you think have been most successful? Why? 10. Which project activities do you think have been least successful? Why? *a. [Probe for individual project elements.]* *b. [Probe for specific barriers or challenges and what could have been done differently.]* c. What changes need to happen for these project activities to be successful or more successful? 11. **Which of the project activities and resources would**

	you like the school to continue using after the project ends? Why? 12. **How likely do you think it is that the school can sustain the project activities after the project ends?** a. **What are the main barriers you foresee? What would need to happen?** 13. **Are you aware of any initiatives the school is taking with the aim of sustaining the project activities?** a. Is the PTA/BoM involved in any of these initiatives? How? b. **Can/would parents play a role in sustaining the project activities? Please explain.** 14. **Is there any support that the project could give the school now to help the school prepare for the continuation of activities after the end of the project?** 15. **What do people in your community think about the project?** a. **What (if any) support does the project receive from the wider community?** b. **Are there any plans to ask the community for support to sustain the project activities in the future?** c. ***[If yes]:* Please explain.**
Use of project data	16. Can you tell me what you know about the information about students that is generated by the project activities? 17. *[If they do know about the project data]:* How does the PTA/BoM use this information (if at all)? What has the PTA/BoM achieved by using this information? *[Probe for specific examples.]* a. *[If the PTA/BoM does not use the data]* Why not? What are the main barriers to the PTA accessing and using the project information about the students? 18. Did the PTA/BoM have access to student information on *[data described in Q1 - e.g. attendance; student progress in maths; etc.]* before the start of the iMlango project? a. *[If yes]:* How would you compare the student information from the iMlango project to the student information you received previously?
Close of interview	• Ask the participant if they have any questions or anything else to add. • Note down any questions they ask and the answers provided. *Thank the participant again for taking the time to speak to you.*

Appendix I: Anonymised datasets

Appendix I1: sQuid and Maths-Whizz anonymised dataset

The excel version of this dataset is attached as a separate document.

Appendix I2: Teacher portal usage anonymised dataset

The excel version of this dataset is attached as a separate document.

Appendix I3: Digital teacher survey anonymised dataset

The excel version of this dataset is attached as a separate document.

Appendix J: sQuid's iMlango portal user analysis

Overview

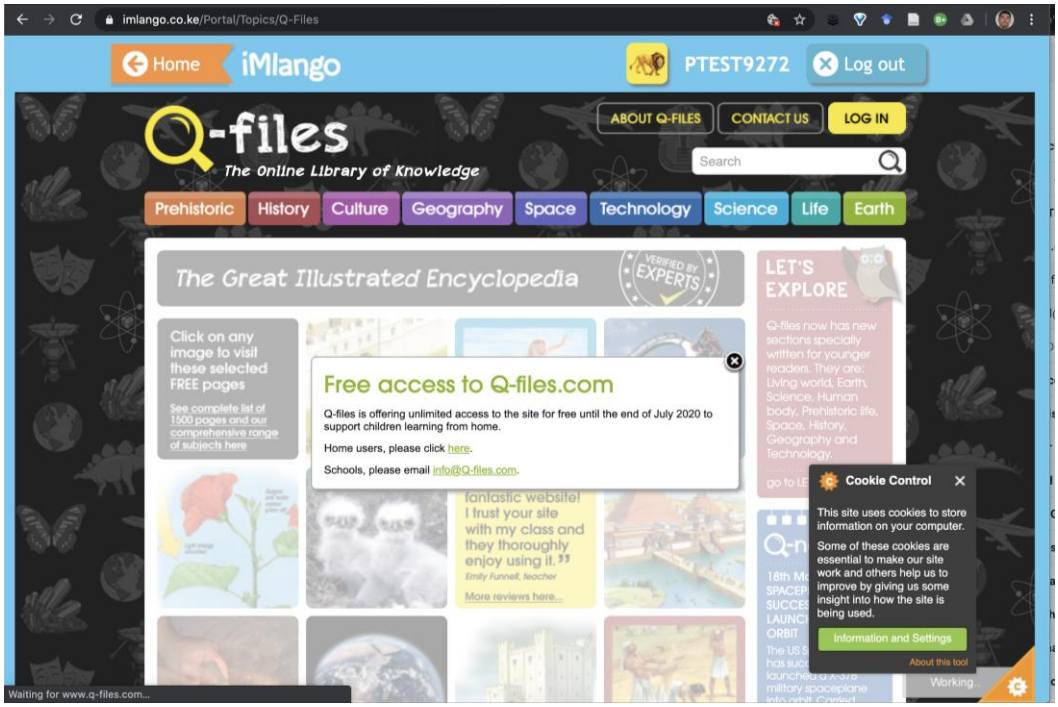
sQuid's iMlango portal is the area where students log in to access learning materials, and teachers access teaching materials. This section provides an analysis of the portal, focused on the user experience, engagement and functionality. The portal was tested on both a web browser on a laptop, and on a mobile phone, although further testing on multiple types of devices is likely to show additional limitations and concerns, given some of the inconsistencies seen in comparing just two devices.

User experience

The user experience in general is relatively straightforward and well organised. It follows many recommended practices around legibility, adaptation to different screen sizes and accessibility (W3C, etc.). There are slight differences in the initial screen following the login (teacher logins then have a brief survey of 3 questions – presumably to verify that the user is in fact a teacher).

Login and initial use

The login username and password are easily entered on both laptop and mobile, but the password/username constraints and requirements could not be tested further. The same username cannot be logged in on two screens simultaneously, which may prevent some ways of working together, or dual-screening to navigate a text and related questions for example. Immediately after login, pop up notifications emerge to ensure consent to cookies and related tracking features. While these were unsightly, distracting and unnecessary for the main functionality of the programme, they can be removed quite easily and once this is done the optimal design is apparent.



Accessibility

The accessibility standards commonly accepted for individuals with SEND requirements are well-documented (W3C, etc.) although these were not extensively tested, as this was outside of the remit of this analysis. However, basic accessibility is achieved through a clear layout with prominent typography and sufficient contrast and colour differentiation.

Navigation

The navigation within the portal once logged in is very hierarchical and sequential, with logical principles which can be grasped quickly and intuitively. Many web users have become accustomed to two or more parallel navigating options, such as turning pages, breadcrumbs, or a sitemap discreetly on the side to follow one's progress without having to use the back and forward functions. However, many of sQuid's iMlango portal users will be inexperienced web application users, who may not be accustomed to this convention. Nonetheless, the divergence from the most common practices in navigation could present challenges with content dead ends and lost users, particularly on mobile devices.

Design

As mentioned previously the design is functional and sufficiently clear for easy and smooth navigation. However, from an aesthetic perspective the design and colours of the portal leave much to be desired. The design metaphor of stacked blocks is uncontroversial, but not necessarily executed well, with the thematic arrangement (topics each in the same stack being grouped together). Unfortunately this leads to imbalances which reinforce the sub-optimal (but functional) design - note the dead space on the bottom left of the screen shot, while on the right one block is cut off on the main page. These are symptomatic of relatively low screen layout responsiveness.

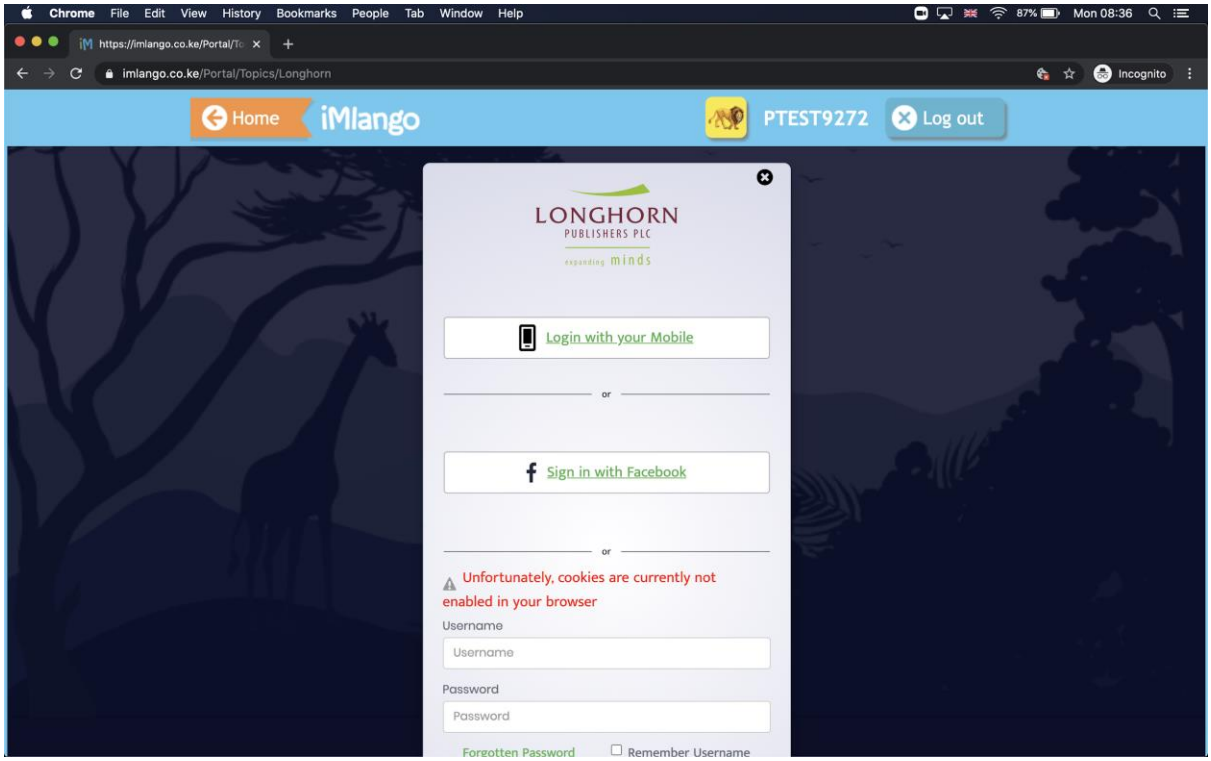
Engagement

Visual elements

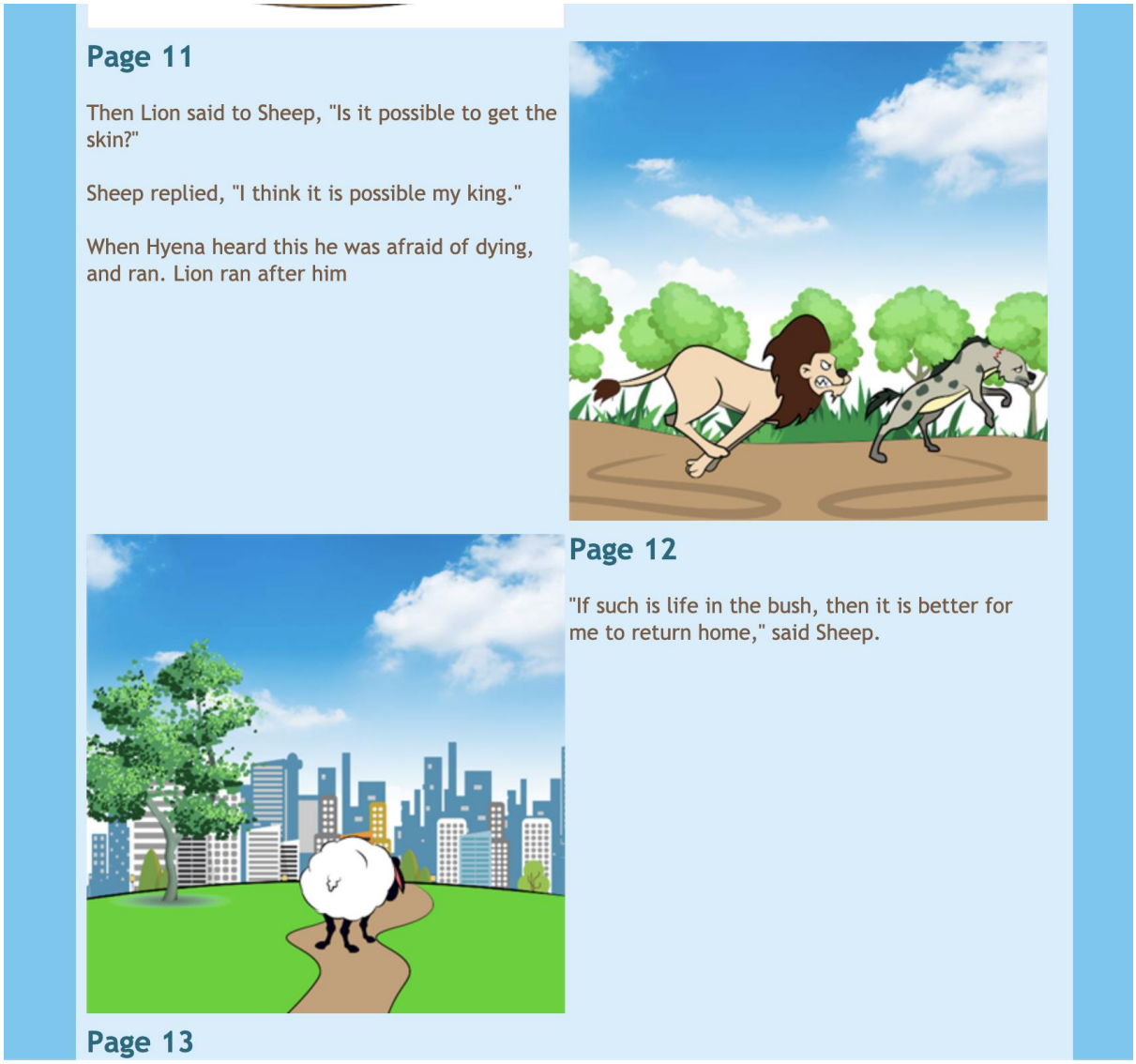
The portal relies solely on images to make the content visually engaging. Opportunities to use typography, scrolling features, iconography and moving images (which could be done with relatively small image file sizes - especially compared to the large PDF file sizes) are not employed, and the visual style is flat.

Session length

Various session journeys were attempted, from very short length, to several hours. These could not incorporate the full typical user experience, due to the Maths-Whizz and Longhorn logins not being available.



Much of the content available is story-based, with a mixture of stories and developed for native elements, and from the MoE. The latter is able to be used and navigated, but is not ideal for the web, since the PDF format is a print format primarily.



Functionality

The functionality of the site adapts to the needs of the user - the teacher portal presents different options, depending on what the teacher selects on the first page in response to three questions. This renders sessions (particularly teacher sessions) very goal-oriented, reducing the scope and possibility for open-ended exploration.

The primary activities that users can engage with (apart from the subsystems like Maths-Whizz and Longhorn, which could not be entered) are reading documents. Although many of these have images or illustrations, these are generally low-quality cartoons.

Whether in longer sessions or shorter, the primary activity is navigation of the file hierarchies to find the relevant information, specifically documents to read. The lack of clarity around sequencing or difficulty level of different reading passages makes this selection process slightly inefficient, and wrong choices requiring navigating to different selections can be tedious.

Other miscellaneous bugs and issues

Other bugs and issues include:

- The Camara portal is not accessible, with the following error message: "kenya.learn.camara.org refused to connect."
- Several pages displayed '500 - internal server error' but not the same pages consistently.
- Many reading pages and exercises mix English exercises and Swahili. In other schools, these subjects are taught separately. The research team wondered whether iMlango's rationale for integrating them align with the way in which they are presented in the portal. The screenshot below demonstrates one of the issues with this as the browser automatically detects Swahili on a primarily English page and suggests a translation. This may be very confusing for the student to select as they would then be unable to distinguish between English reading selections and those in Swahili.

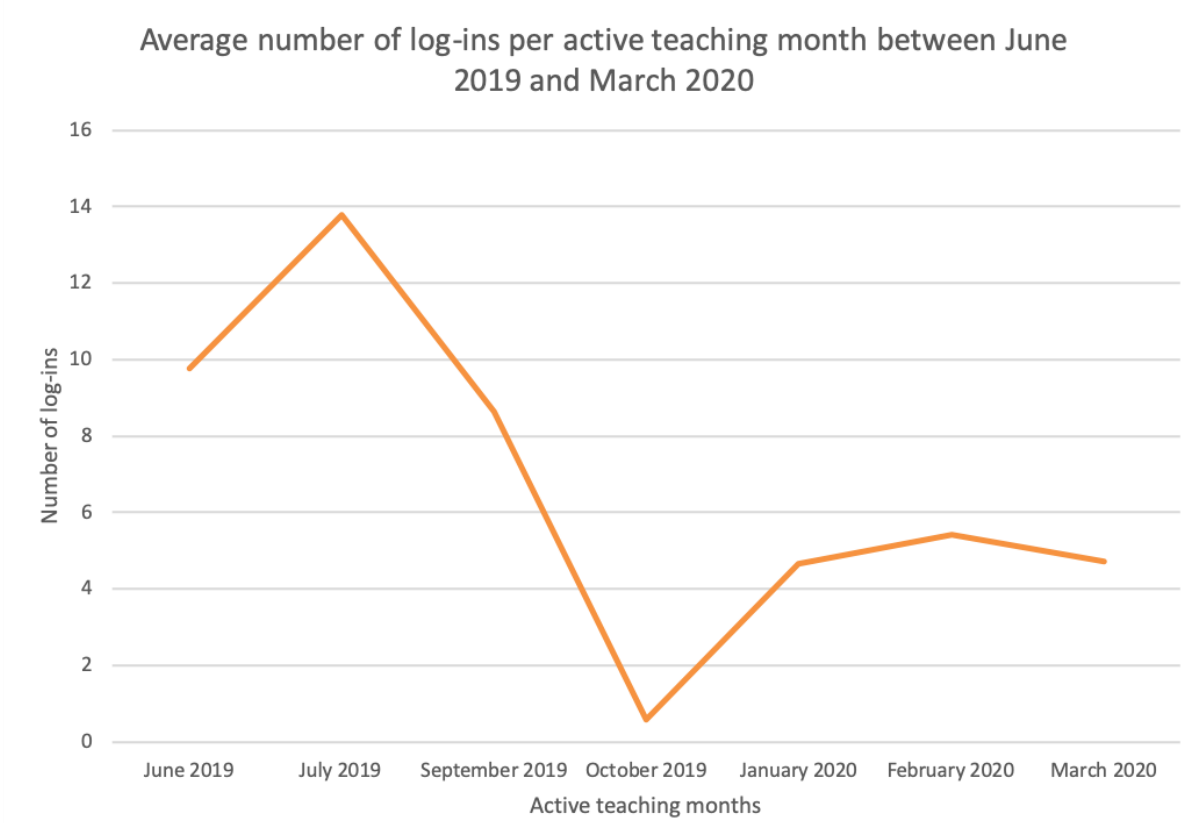
Appendix K: Teacher portal analysis

Across the full dataset of teachers, there was a total of 87,693 logins to sQuid's iMlango portal between June 2019 and March 2020. This is an average of 57.47 logins per teacher. The majority of logins are in active teaching months, with a total of 81,034 logins and an average of 53.10 logins per teacher in active teaching months. There are 48 (3%) teachers in the sample who did not log in at all during any active teaching months.

The month with the highest average number of logins is July (13.77), followed by June (9.76) and September (8.63). The month with the lowest average number of logins is August (0.45), which is expected as a month without active teaching, followed by October (0.57), which is a month of active teaching right at the end of the school year. Other

months without active teaching also have among the lowest average number of logins, as expected: November (0.57) and December (3.21).

The graph below displays the average number of logins per active teaching month (excluding August, November and December). October, the last month of active teaching in the school year, has a much lower average number of logins, suggesting that teachers do not need the resources or see the value of using the resources in the last weeks of the school year. There is a general trend of declining use from the summer months through the end of term and beginning of the new school year.



It is notable that some teachers log in to the portal in August, November and December, which are not active teaching months. A total of 227 teachers (14%) logged into the portal, with a total of 6,458 logins. The average number of logins per teacher was 4.23 during these months.

There are some noteworthy differences when the login data is disaggregated by gender, county and school type. Male teachers have a slightly higher average number of logins than female teachers: 59.92 compared to 55.87. The county with the highest average number of logins is Makueni and the lowest average number of logins is Kajiado although Kilifi has the lowest average number of logins in active teaching months. Kilifi has the highest number of teachers who did not login to the portal in any active teaching month: 30 (4.8%). The comparison between counties is outlined in table below although note that this does not take into account the differences of iMlango school numbers between counties:

County	Average number of logins	Average number of logins in active teaching

		months
Kajiado	51.24	50.55
Kilifi	56.50	49.61
Makueni	67.47	64.91
Uasin Gishu	56.67	52.86

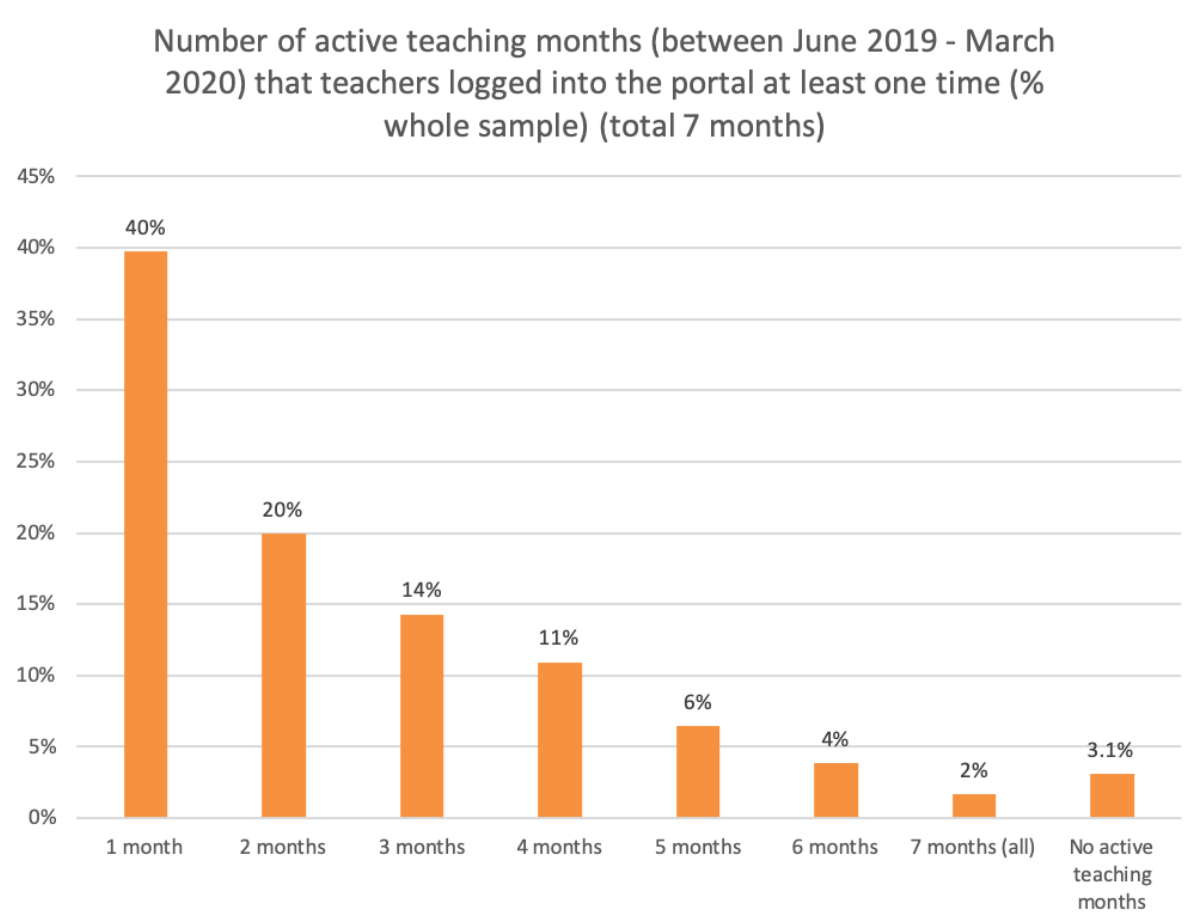
Intervention C schools have the lowest average number of total logins (54.51) and in active teaching months (49.59). Intervention C schools also have the highest percentage of teachers who did not log in at all in the active teaching months: 23 (4.1%). Type B schools have the highest average number of total logins (61.12) and in active teaching months (58.21).

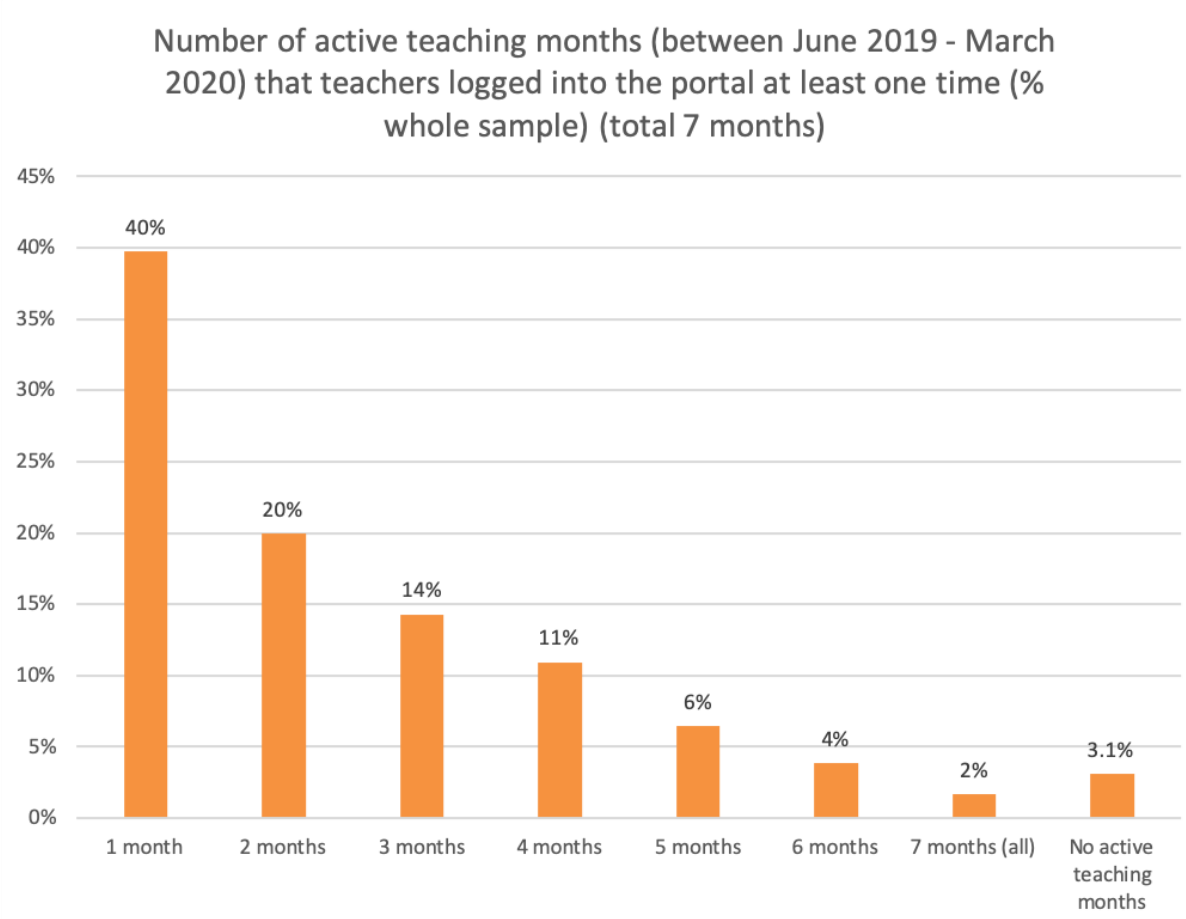
Across the sample, teachers did not log in to the portal on a regular monthly basis. There are no teachers in the dataset who logged in at least once in every month between June 2019 and March 2020. There are 26 teachers who logged in at least once in every month of active teaching, which is 1.7% of the whole sample. This suggests that very few teachers have a consistent routine of accessing the portal on a monthly basis and are more likely to log in to the portal on an ad-hoc basis. It also suggests that there may be barriers which stop teachers from accessing the portal on a monthly basis. As the table below shows, there is a fairly consistent average number of months of at least one login, across all disaggregated variables. Across the whole sample, teachers logged in an average number of 2.5 times and counting only active teaching months this average drops to 2.33. By all disaggregations, the average number of months a teacher has logged in at least once ranges from 2.36 to 2.80.

Sample	**Average number of months teachers logged into sQuid's iMlango portal at least once**	**Number of teachers who logged in at least once in every active teaching month**
Whole sample	**2.50**	**26**
Male teachers	2.71	11
Female teachers	2.36	15
Teachers in Kajiado county	2.54	6
Teachers in Kilifi county	2.34	9
Teachers in Makueni county	2.80	6
Teachers in Uasin Gishu county	2.54	5
Teachers in Intervention A schools	2.47	7
Teachers in Intervention B	2.56	10

schools		
Teachers in Intervention C schools	2.46	9

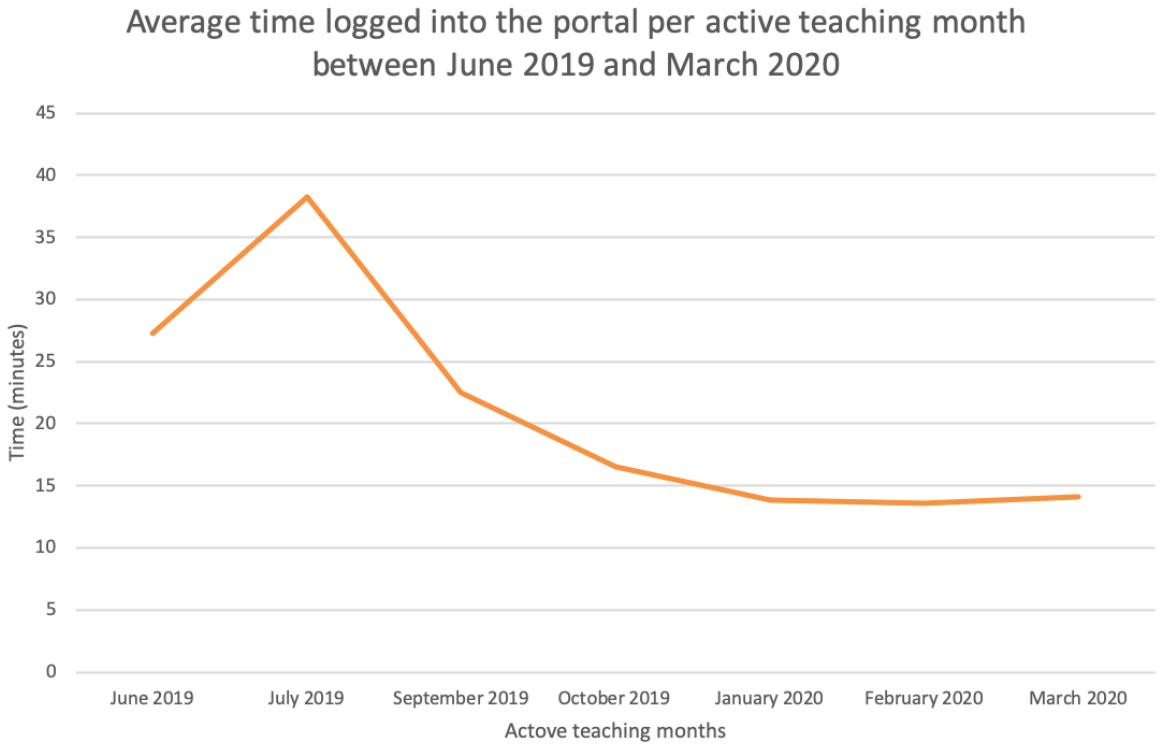
There is a clear trend of decreasing percentage of teachers who have logged in at least once as the number of months increases. There are no teachers who have logged in at least once in all ten months between June 2019 and March 2020. The highest percentage of teachers have logged into the portal in only one month, 41%, which drops to 20% for those who have logged in two months. When non-active teaching months are removed, the decreasing trend remains, as shown below. There are 48 teachers who did not log in to the portal in any active teaching month (3.1%). There are 26 teachers (1.7%) who logged in every active teaching month. The highest percentage of teachers logged in to the portal in just one active teaching month (40%), followed by two months (20%).





Between June 2019 and March 2020, teachers in this dataset spent a total of 244,966 minutes logged into sQuid's iMlango portal. The average time spent on the portal was 160.53 minutes, approximately two and a half hours. In active teaching months, teachers were logged in for a total of 222,945 minutes and an average of 146.10 minutes each.

Time spent logged into the portal follows a similar trend to the number of logins, with more time spent logged in during the summer months and less at the end of the school year and start of the new school year. As expected, the months with the lowest average time spent are the non-active teaching months: November (0.91 minutes), August (1.89 minutes) and December (11.63 minutes). The months with the highest average time spent are July (38.23 minutes), June (27.24 minutes) and September (22.49 minutes). The graph below demonstrates the trend of time spent logged into the portal for active teaching months.



On average, male teachers spend more time logged into the portal compared to female teachers. In total, male teachers spent an average of 171.97 minutes logged into the portal compared to 153.07 for female teachers, a difference of just under 20 minutes. In active teaching months, male teachers spent approximately 25 minutes more logged in than female teachers: 161.65 minutes compared to 135.97. However, female teachers spent more time on average logged into the portal during non-active teaching months: 17.11 minutes compared to 10.33 minutes.

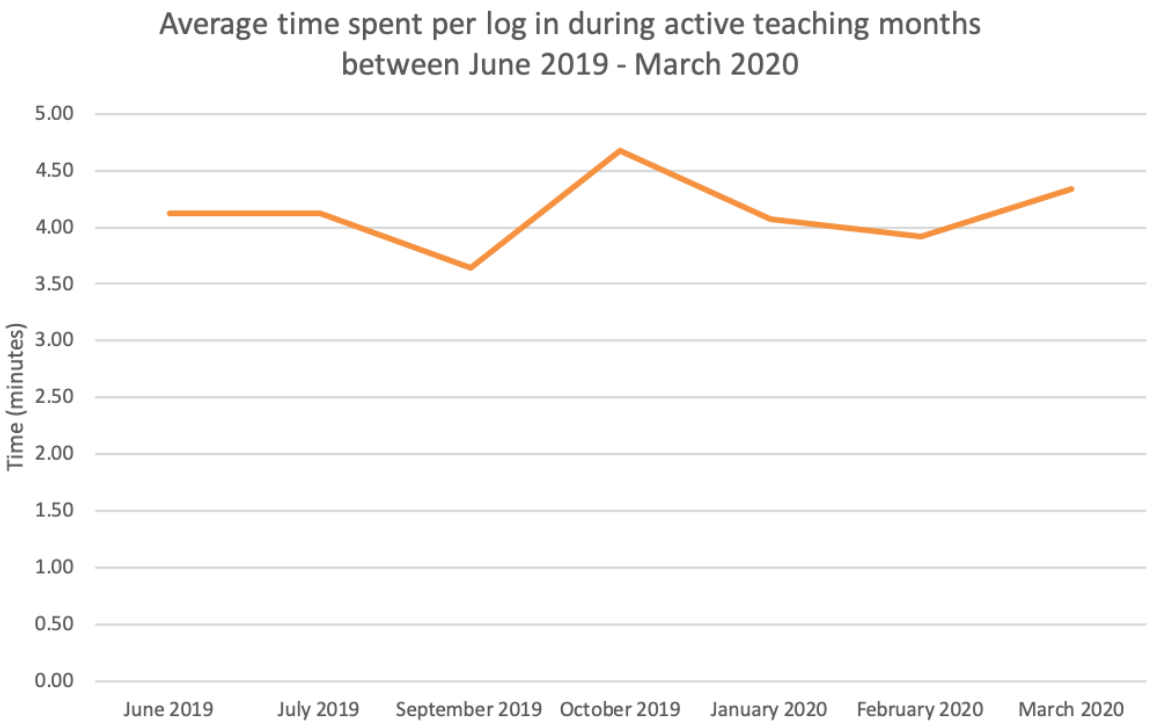
The county with the most time spent logged into the portal is Kajiado. Kajiado had the lowest average number of logins, suggesting that the time per login is higher than in other counties. Interestingly, Makueni had the highest average number of logins in total and in active teaching months, but does not have the highest average time spent, suggesting that the time per login is low. The county with the lowest average total time spent on the portal is Uasin Gishu and the lowest average time spent in active teaching months is Kilifi. There is a difference of 35.53 minutes between the highest and lowest average time spent logged into the portal during active teaching months.

County	Average time spent logged into the portal (minutes)	Average time spent logged into the portal in active teaching months(minutes)
Kajiado	173.17	171.28
Kilifi	159.50	135.75
Makueni	172.88	163.66

Uasin Gishu	147.13	136.19

There is some variation by school intervention type. Intervention B schools have the highest average time spent, with an average of 195.37 minutes and 183.74 during active teaching months. Intervention B schools also had the highest average number of logins. The lowest average time spent logged in is from Intervention A schools, with an average of 130.94 minutes logged into the portal and 117.27 minutes during active teaching months. This is a difference of 66.47 minutes, over an hour, between highest and lowest average time spent logged in during active teaching months.

Across the whole sample, there is a clear trend that teachers do not spend a lot of time per login. In total, the average time spent per login is just 3.61 minutes and for active teaching months it is 3.62 minutes. Teachers who spend less than a minute per login on average make up 13% of the sample. Moreover, 54 teachers (4%) spend under 30 seconds per login. The graph below presents the trend of time per logins in active teaching months. This shows a fairly even trend of time per login, with a difference of 1.04 minutes between the highest and lowest average time per login. The month with the highest average time spent per login is October (4.68 minutes), followed by March 2020 (4.34 minutes), July (4.13 minutes) and June (4.13 minutes). However, October had among the lowest number of logins, which may be skewing the average: 73.7% did not log in at all in October. The month with the lowest average time spent per login is September (3.64 minutes).



Across the sample, there is a high percentage of teachers who did not record any logins or time spent on the portal per month. The highest of these across active teaching months is January (78.7% of sample). The lowest is July (52.4%). This affects the average time spent per login. The table below breaks down the sample sizes per month (non-active teaching months are in italics):

Month	Number of teachers who did not log in and spend any time on the portal (% sample)	Number of teachers who logged in and spent more than 0 minutes on the portal (% sample)
June 2019	871 (57.1%)	655 (42.9%)
July 2019	800 (52.4%)	726 (47.6%)
August 2019	*1461 (95.7%)*	*65 (4.3%)*
September 2019	961 (63.0%)	565 (37.0%)
October 2019	1125 (73.7%)	401 (26.3%)
November 2019	*1490 (97.6%)*	*36 (2.4%)*
December 2019	*1378 (90.3%)*	*148 (9.7%)*
January 2020	1202 (78.8%)	324 (21.2%)
February 2020	1055 (69.1%)	471 (30.9%)
March 2020	1106 (72.5%)	420 (27.5%)

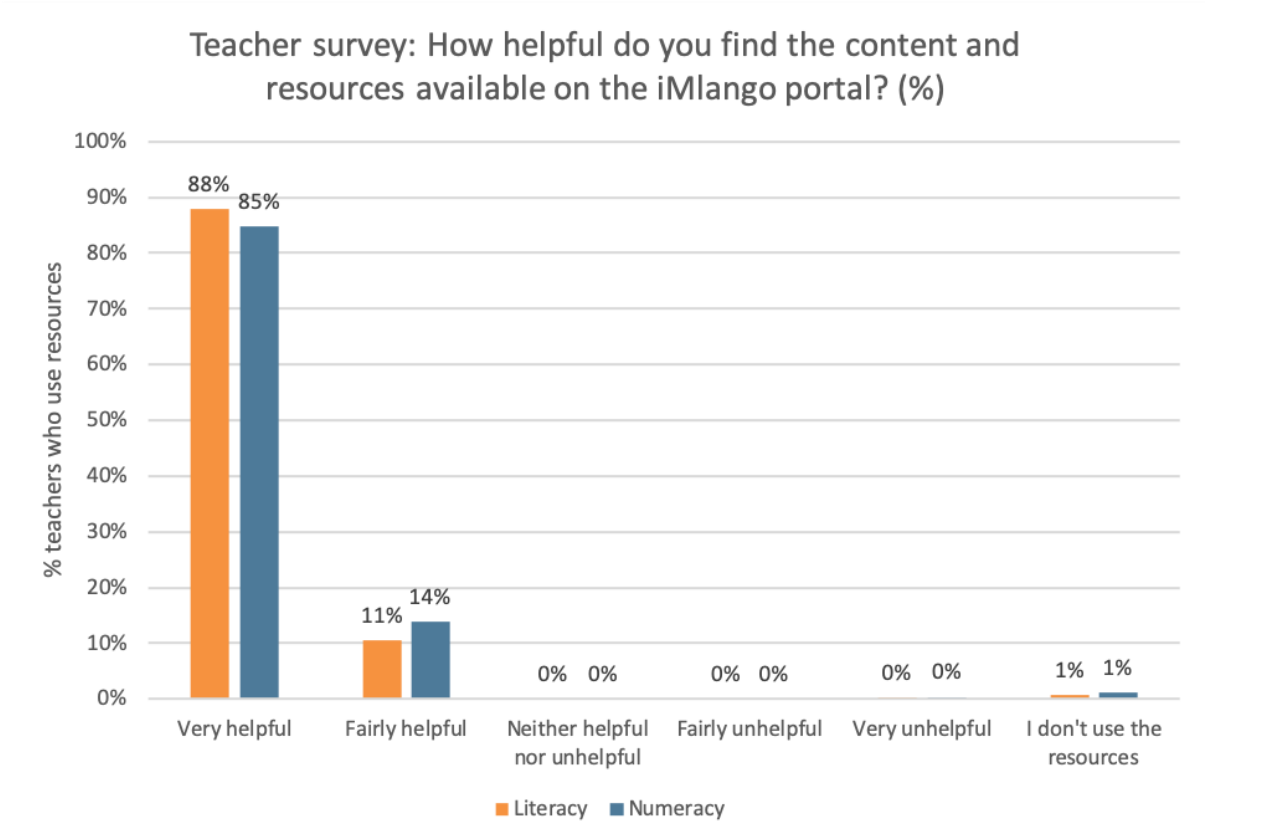
There is no statistically significant variation in time per login by gender, with only 0.14 minutes difference between male and female teachers average time per login in active teaching months. There is no statistically significant variation by county for time per login; all counties average between 3.0 and 3.9 minutes. The county with the highest average time spent per login is Kajiado, with a total average of 3.81 minutes and in active teaching months an average of 3.84. This explains why Kajiado teachers had the lowest average of total number of logins and second lowest average of number of logins in active teaching months, but the highest average time spent for both total and active teaching months. Similarly, Makueni has the lowest time spent per login, with an average of 3.28 minutes per login and 3.42 minutes per login during active months. This explains why teachers in Makueni had the highest average number of logins but not the highest average time spent.

The most notable variation is among school intervention types. Intervention B schools have the highest average time per login, with an average of 4.42 minutes in total and 4.51 minutes per login during active teaching months. This means Intervention B schools have the highest average number of logins, time spent and time per login. The lowest average time per login is from Intervention A schools, with 2.92 minutes per login and 2.94 per login during active teaching months. This means Intervention A schools have the lowest time spent and time per login.

Overall, analysis of teacher usage of sQuid's iMlango portal reveals that many teachers are not using the portal consistently. Time per login is low and many teachers are only logging into the portal in one or two active teaching months. Number of logins and time spent logged in are highest in July and June and decline towards the end of the school year, and start increasing incrementally after the new school year starts.

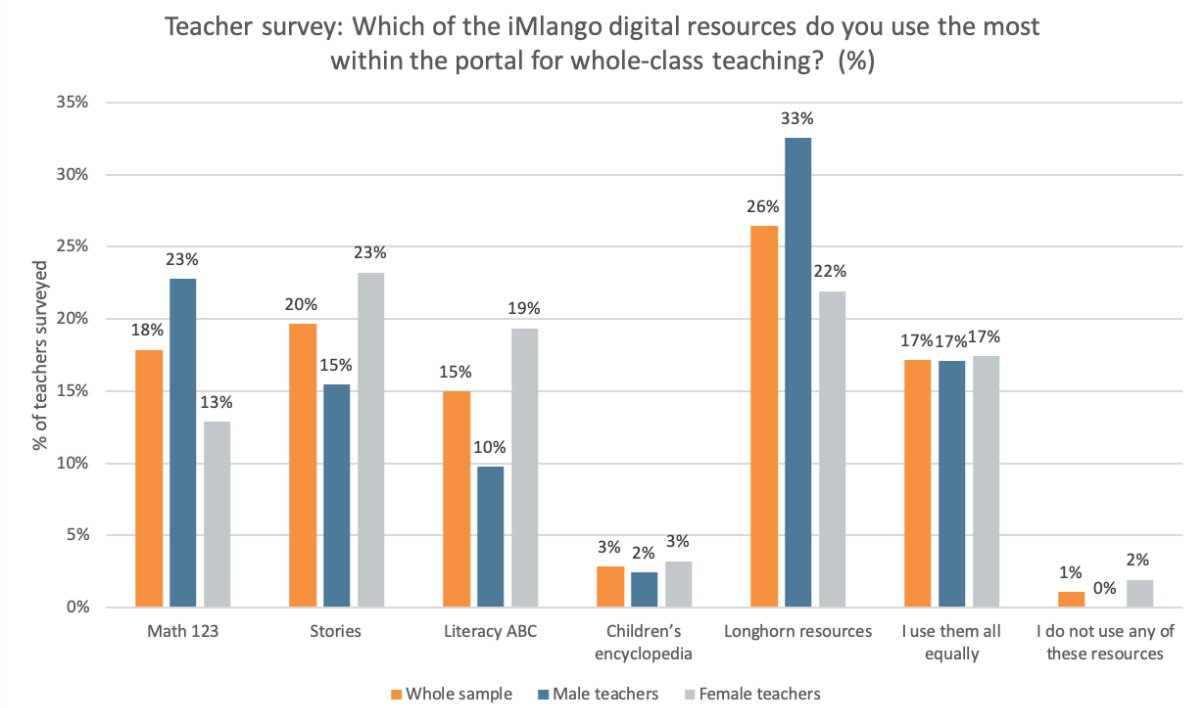
Appendix L: Further analysis of teacher use of resources

The digital teacher survey suggests that there is a high level of engagement and awareness among teachers concerning the availability of digital resources. Ultimately, teachers find the content available on the iMlango portal helpful.



Of teachers who use the projector for numeracy lessons, 98.5% consider the resources "fairly helpful" or "very helpful". The percentage is the same for teachers who use the projector for literacy lessons. Similarly, of teachers who use the projector for literacy lessons, 98.5% consider the resources "fairly helpful" or "very helpful". There is no notable variation by gender of teacher, county, age of teacher or intervention type for either numeracy or literacy content.

Results from the digital teacher survey additionally indicate that teachers use a wide range of iMlango digital resources for whole-class teaching. Among teachers surveyed there does not appear to be one resource which is used significantly more than the others. In fact, 17.1% of teachers report that they use all the resources equally. When asked which resource they used most, the "Longhorn resources" were selected by the most teachers and were the most used resource when disaggregated by county, age of teacher and type of intervention. Teachers reported that the "Children's encyclopaedia" is the least used iMlango digital resource, with only 8 teachers reporting that it is the resource they use the most.



The resource used the most by the highest percentage of male teachers are the "Longhorn resources" (32.5%) and for female teachers it is "Stories" (23.2%). Among literacy teachers, the resource used the most by the highest percentage of teachers is "Stories" (31.0%). Among numeracy teachers, the resource used the most by the highest percentage of teachers is Maths-Whizz Teachers' Resource, "Math 123" (44.1%).

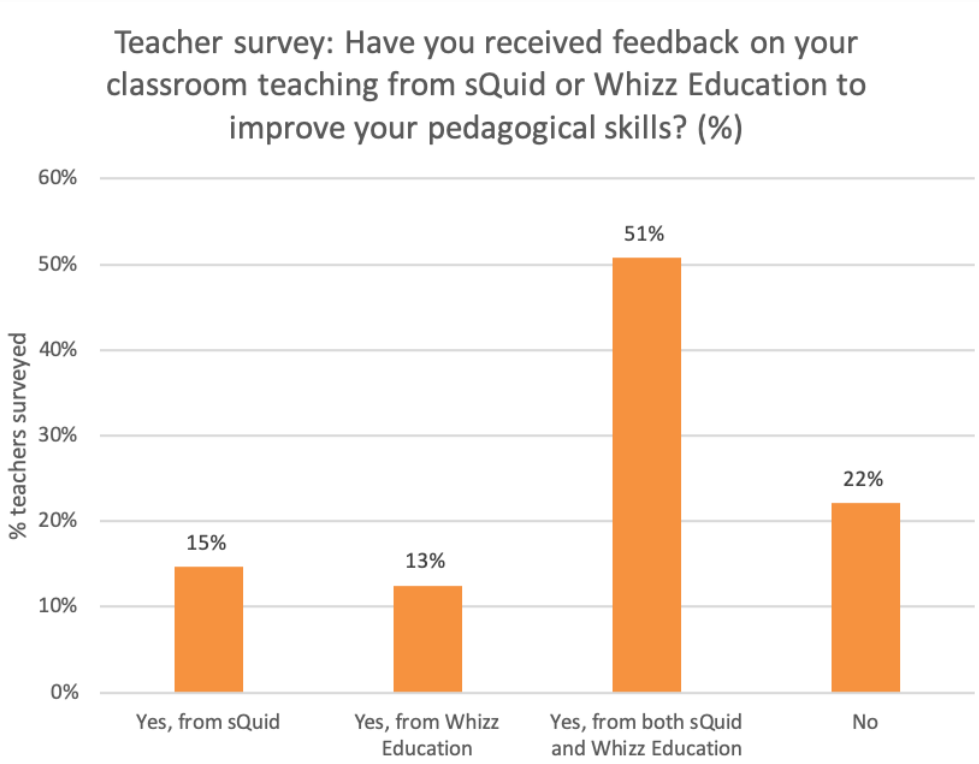
Appendix M: Teacher training and support

This appendix outlines findings related to teacher training and support provided by the project drawn from the digital teacher survey, interviews with iMlango consortium partners and interviews with teachers.

Note that findings regarding support from school leaders and administrations are presented in the body of the report in research theme 3: school management practices and use of data to inform decision-making.

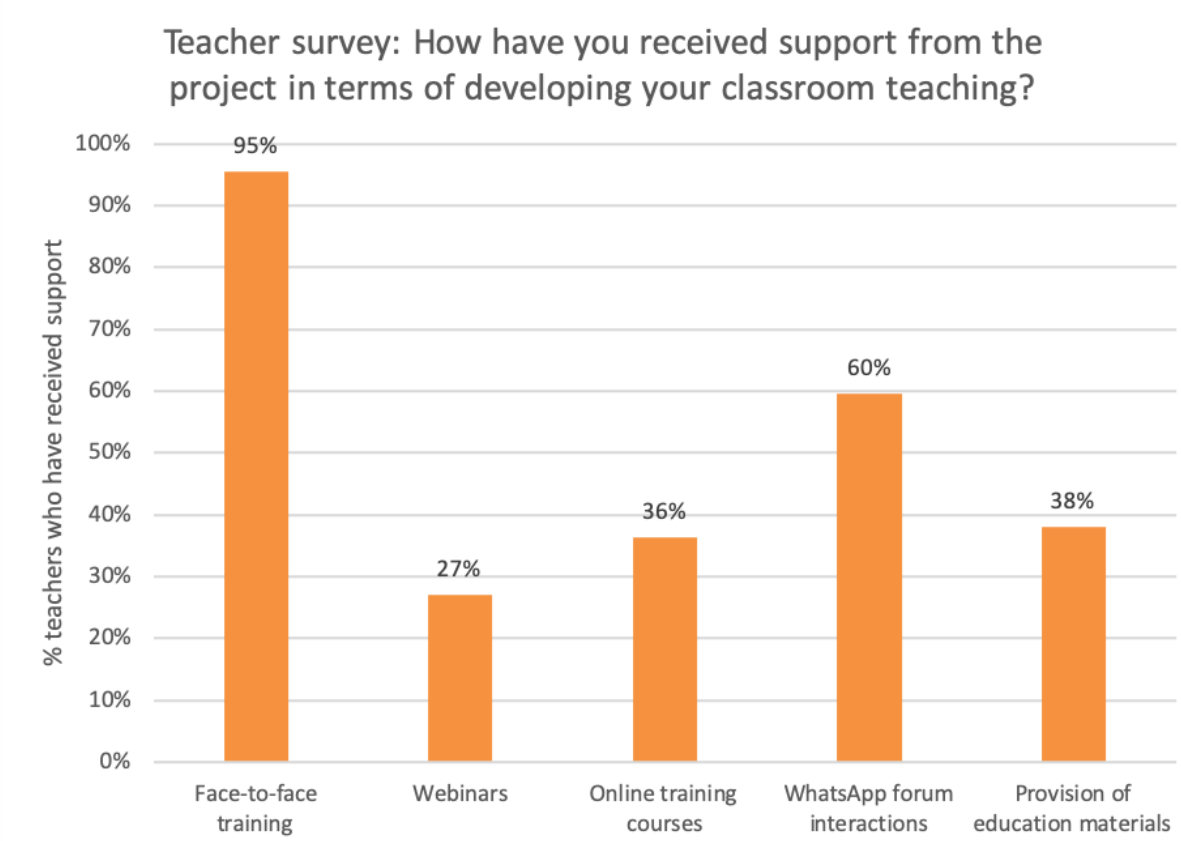
Teacher training

The majority of teachers who participated in the digital teacher survey have received feedback from iMlango on their classroom teaching to improve their pedagogical skills. Of all teachers surveyed, 77.9% have received feedback and 22.1% have never received feedback on their classroom practice. This suggests that there is a need for training to have wider coverage across all iMlango teachers. Half of teachers surveyed have received feedback from both sQuid and Whizz Education.



A higher percentage of male teachers have received feedback than female teachers: 82.9% compared to 73.5%. The county with the highest percentage of teachers who have received feedback is Uasin Gishu (85.0%) and followed by Makueni (81.1%). The county with the lowest percentage of teachers who have received feedback is Kilifi (73.8%). Of those who have received feedback, all consider the feedback and support helpful in improving their classroom teaching.

Among teachers who have received support to develop their classroom teaching, the most common method of receiving training is face-to-face training, followed by WhatsApp forum interactions.



Only 27% of teachers have received training via a webinar and 36% have participated in an online training course. Face-to-face training was the most common method of receiving training in all counties. The county with the highest percentage of teachers who have participated in a webinar is Kajiado, with 45.2% of teachers compared to 16.3% in Makueni. Again, Kajiado had the highest percentage of teachers who have participated in an online training course, 48.4% compared to 29.4% in Uasin Gishu, the lowest percentage across the counties. This suggests that there is scope for iMlango to expand the provision of online training methods and to ensure the same training resources are available across counties.

Overall, teachers appear to find the support provided by iMlango to be helpful. Of teachers in the digital teacher survey, 13.3% consider the support "fairly helpful" and 86.7% "very helpful". Similarly, in interviews with teachers most teachers who spoke about training in the interviews had positive opinions towards the training received:

> *'It has been useful - I would not know how to teach them using the projector and the computers. It enabled me to use the resources and improve my teaching with these additional resources.'* (Teacher, low usage school, Makueni County)

Several teachers also requested further training, and identified particular gaps in their knowledge where they feel that they would benefit from further support. For example, one teacher from a low usage school in Uasin Gishu who had mentioned earlier that she struggled to make use of the student learning data, said that she would benefit from training on how to make effective use of this data. Other teachers suggested that training needed to be more regular and expanded to include more teachers:

'I have been trained by the iMlango project and it helps in a way but I want to extend it to all of the teachers - shouldn't be narrowed down to specific teachers. ICT teachers don't implement the whole project - all teachers do. All staff training would give better results. Also need more computers. Training should be reviewed consistently - not just done once. Training only happened once over 5 years. They can really improve on that.' (Teacher, high usage school, Kajiado County)

The teacher from a high usage school in Uasin Gishu that had completed a training of trainers and had visited six other schools in his area to conduct training also advocated for further training. He said that some schools may not have received any further training since the beginning of the project and that they would benefit from a refresher course, particularly because changes have been made to the portal since the beginning of the project. iMlango partners note that this is being planned with Avanti and Camara for when schools resume. iMlango partners note that this is being planned with Avanti and Camara for when schools resume.

Interviews with iMlango consortium partners underscored the importance of teacher training. Field officers and other consortium partners were all adamant of the importance of teacher training within the project, which was strengthened following a review of monitoring data within the project. When asked what the project could improve on, Field Officers noted that there should be more training for teachers *'so teachers can continue to learn and support other teachers'* (iMlango Field Officer). One reported that: *'Teacher training was the key ingredient of success for iMlango - this was the pathway for teachers to understand what we're there for and what we've brought to them.'* (iMlango Field Officer)

WhatsApp forums

Results from the digital teacher survey indicate that the iMlango WhatsApp forums are widely used. Of teachers surveyed, 80.7% use the WhatsApp forum to share activities and strategies with other teachers, although 19.3% are not participating. A higher percentage of male teachers use the WhatsApp forum than female teachers: 85.4% compared to 78.1%. The county with the highest percentage of teachers using the WhatsApp forums is Uasin Gishu (85.0%) and the lowest is Makueni (73.6%).

Teachers report that they find the WhatsApp forum helpful for their confidence in searching for and using digital resources during lessons. Of all teachers surveyed, 99% of teachers who use the WhatsApp forum consider it "fairly helpful" (15.9%) or "very helpful" (83.2%). Only one teacher who uses the WhatsApp forum considers it "fairly unhelpful" and one teacher considers it "very unhelpful".

Interviews with teachers also highlighted the use of the WhatsApp forums. One of the teachers who was interviewed from a medium usage school in Makueni said the following: *'Yes it [the WhatsApp forum] is very helpful, people post learning content, teaching methods, problems that they need assistance with and we solve the problems together. It is very helpful. And in that group we share challenges'.*

Feedback from the project

Interviews with iMlango consortium partners underscore the importance of the support provided by the project. Support is provided to schools and teachers through field officers conducting school visits, lesson observations and training sessions. Through lesson observations, field officers are able to monitor teacher usage of ICT and quality of the lessons delivered using ICT. Field officers described the importance of lesson observations:

'Conducting the lesson observations as a support service - we are looking at the

teachers and how they can improve, and getting feedback to them. They sometimes sit back and interact and we share feedback, and they go through the LO tool with us and they recognise how they can apply things in their normal lessons as well. So they feel empowered not just for ICT lessons but outside as well. They apply the feedback to their normal lessons as well as the ICT lessons, so there is trickle down to their normal lessons.' (iMlango Field Officer)

Field officers also run training sessions to equip teachers with pedagogical skills, for example, training in gender responsive pedagogical approaches.

Interviews with teachers emphasised how important providing ongoing support from iMlango is to allow teachers to make continuous progress. Two teachers specifically mentioned the ongoing support that they had received from iMlango Field Officers, and were very positive about the quality of this support:

'The monitors [Field Officers] are super, they keep checking on us and something they feel is not going right they come to school, train us again, and discuss challenges. If there's a problem they are always quick to come.' (Teacher from a medium usage school in Kajiado)

Appendix N: iMlango-T school case studies

Appendix N1: Case study of a high performing school in Kilifi County

Overview

This case study presents findings from one of the highest performing iMlango schools in terms of overall portal usage. The aim of the case study is to provide insight into a high performing school's engagement with the iMlango interventions, factors that contribute to success and challenges they faced. Interviews were undertaken with one Board of Management member, one teacher (who is also one of the iMlango school champions), and the former head teacher of the school.

Portal data findings

The following table provides an overview of the school's usage for student maths, literacy, and the teacher portal. These are in average minutes per week.

Student maths usage (average minutes per week)	Student literacy usage (average minutes per week)	Teacher portal usage (average minutes per week)	Total average score	Overall rank for usage
66.92	20.47	22.26	36.55	2/134

The next table provides more detailed findings taken from the quantitative data collection. This includes Maths-Whizz portal, sQuid's iMlango portal data (both students and teachers), and the average EGRA scores.

Data type	Data source	Description	Total averages across all

			schools
Student numeracy progress[29]	Maths-Whizz portal	Average usage per week: 95.55	17.41
		Average progress rate: 1.67	0.57
Student literacy progress	sQuid's iMlango student portal	Average total # of logins in active teaching months: 50.07	47.89
		Average total time logged onto the portal during active teaching months: 179.05	108.35
	EGRA	Average score from Jan 2020: 67.6	68.42
Teacher portal usage	sQuid's iMlango teacher portal[30]	Average total # of logins during active teaching months: 84.2	53.1
		Average total # of minutes spent logged onto the portal during active teaching months: 456.1	146.1
		Number and length of logins during non-active teaching months: one teacher logged in 4 times for a total of 4 minutes	Total average for all schools was 4 logins for 14 minutes

Relevant background information

The school had previous experience with ICT interventions. Prior to the iMlango project, another ICT project called 'Computers for Schools Kenya' ran by Action Aid took place within the school. This project provided computers to the school. These computers were not connected to the internet, however, and were primarily used to teach children skills in Microsoft Office. An ICT teacher had also been in place at the school for a number of years. A number of the teaching staff therefore had prior experience with ICT, though many of the teachers who were at the school during this previous project had already moved on by the time iMlango started. Some teachers at the school had also received training on ICT by the Kenyan government prior to the start of the iMlango project.

The teacher that was interviewed from this school was an iMlango school champion. This teacher had obtained a post-secondary certificate in computer operations, and had previous experience working in the ICT lab of a secondary school. The head teacher at the school was also ICT literate, and 'led by example' by using the iMlango resources himself whenever

[29] Note that there were no EGMA/SeGMA tests done in this school.
[30] There were 10 entries (i.e. 10 teacher ID cards used to log onto the portal), with 5 female and 5 male teachers.

he had to teach a class.

This pre-existing culture of ICT use at the school may have helped to support the successful implementation of the project at this school.

Factors contributing to successful implementation

The following factors have been identified through qualitative interviews with school representatives as contributing to the successful implementation of project activities at this school:

High level of buy-in from school leadership, staff and community

This is the foundational factor for success in this school, from which many of the subsequent factors for success emanate. The head teacher's enthusiasm and support for the project, which manifested itself in a number of practical ways, was pivotal to the success of the project at this school. The dedication and effort of the iMlango school champions at this school, and their commitment to supporting and training other teachers, is another key element that has promoted teacher engagement with the project resources.

More generally, the school seems to have strong governance and administrative structures, which have assisted with the smooth running of the project. The school also maintains good links with parents in the community. There are regular parents' meetings, parents take part in one of the school's income generating activities, and parents are regularly informed about the project activities. There is strong support for the project amongst parents. The established practices of communication and engagement with parents arguably provide a good foundation for the successful fundraising for project expenses amongst parents of students at the school.

Successful income-generating practices

Related to the high level of buy-in from school leadership and community are the successes the school has had in raising funds to ensure the effective implementation of project activities. The head teacher and the school's Board of Management developed an income generating activity within the school, planting and selling trees, which some of the parents were also involved in. Some of the proceeds from this activity were put towards paying for costs associated with the iMlango project. The head teacher also set up another income-generating activity involving students from the school to grow and sell cassava. This activity was very successful, and helped raise money to fund computer repairs.

This school faced the same issues of power outages and high electricity bills that were consistent across all schools. However, unlike some other schools, this school was able to successfully raise the funds through parent contributions to pay the high electricity costs. Challenges with project implementation are discussed during parents' meetings, and if there is an issue that requires extra funds, for example electricity costs, parents fundraise to provide the money required. This is demonstrative of a willingness and ability amongst parents to contribute money towards the project activities.

Setting targets that are higher than the expected targets for student usage

The school created targets for pupil portal usage that were higher than the targets set by the project. The target set at the school for classes who have assessments is 100 minutes per week, and the timetables for lab usage these more ambitious targets built in. This is reflected in the very high usage statistics for this school. In addition, the head teacher at the school permitted usage of the lab outside of school hours, including during breaks and

lunchtime, and in the evenings for the borders..

Clearly defined timetables for usage and monitoring

High levels of organisation were evident at the school with regards to the timetables for usage of project resources, and these timetables were well-adhered to. In addition, a teacher or student champion was assigned for each of the lab sessions to ensure that there was someone available to assist students with any issues that may arise. The school champion would then receive feedback from the person monitoring the lab session so that he could follow up on any problems that arose.

Providing extra incentives for good performance

The head teacher provides small incentives to the students who perform well on the Maths Whizz portal. When students receive a certificate from Maths Whizz, the head teacher supplements this with a small cash reward of 100 to 200 shillings, which provides further motivation to students to perform well. The head teacher also provides a small bonus to the teachers who are most engaged with the project.

The weekly reports showing the progress of the school compared to other schools in the county, and the competitive spirit fostered by the reward structure of Maths Whizz (i.e. receiving trophies and certificates for the best performance), also motivate the staff and leadership at the school to strive for excellence.

Regular, meaningful engagement with portal data

At this school, one of the school champions is responsible for monitoring the data generated by the project. He does so on a regular basis. The head teacher also has a high level of knowledge of the project data, and has created channels to address issues that are highlighted through examination of the project data. For example, the head teacher has set up a weekly briefing between himself, the school champion in charge of project data monitoring, and the other teachers at the school. During this briefing the school champion provides an overview and discusses any issues that are evidenced through the project data - for example, teachers forgetting to register attendance using the digital system - and encourages teachers to address these issues. The school champion also has oversight of the student portal and learning data, and other teachers also make use of the learning data. The school champion examines the data on a weekly basis, identifies students who are having issues, and follows up with them or assigns another student to help them.

Proactive harnessing of iMlango support

The teacher had reached out to iMlango in the past for support with low levels of cooperation from other teachers. iMlango responded by visiting the school to provide assistance or training as required.

Ongoing, in-school training by school champions

Alongside the support and training from iMlango staff, the school champions also provide ongoing support and training to other teachers at the school. School champions use effective training methods, progressing from demonstration to supervised practice, which has improved the skills and confidence of other teachers over time. This is exemplified by the fact that school champions are called for less frequently to assist with technical problems than they were at the beginning of the project.

Challenges to successful implementation

Alongside the challenges raised above relating to power outages and electricity costs, there were a number of other challenges identified as limiting factors to successful implementation at this school. The issue of having too few computers relative to the number of students was identified as one of the key challenges at this school.

In addition, there are a minority of teachers at the school who are yet to embrace the project activities. These teachers are mainly older and nearing retirement. Continued efforts are being made to encourage participation amongst these teachers, but it is an ongoing challenge.

Despite the clear successes in implementation at the school, the ability of the school to self-finance the iMlango activities after project closure is considered a major challenge for the future. In addition, the loss of a head teacher who is extremely invested in and supportive of the project activities could also have implications on the continued successes of this school.

Appendix N2: Case study of a low performing school in Makueni County

Overview

This case study presents findings from one of the lowest performing iMlango schools in terms of overall portal usage. The aim of the case study is to provide insight into a low performing school's engagement with the iMlango interventions, challenges they faced, and the main barriers to successful implementation at the school. Interviews were undertaken with one PTA member, two teachers (one literacy teacher and one numeracy teacher), and the deputy head teacher of the school.

Portal data findings

The following table provides an overview of the school's usage for student maths, literacy, and the teacher portal. These are in average minutes per week.

Student maths usage (average minutes per week)	Student literacy usage (average minutes per week)	Teacher portal usage including: maths, literacy, life skills & CLA content (average minutes per week)	Total average score	Overall rank for usage
0.21	11.28	4.13	5.21	128/134

The next table provides more detailed findings taken from the quantitative data collection. This includes Maths-Whizz portal, sQuid's iMlango portal data (both students and teachers).

Data type	Data source	Description	Total averages across all schools
Student numeracy	Maths-Whizz portal	Average usage per week: 10.93	17.41

progress[31]		Average progress rate: 1.01	0.57
Student literacy progress[32]	sQuid's iMlango student portal	Average total # of logins in active teaching months: 57.39	47.89
		Average total time logged onto the portal during active teaching months: 135.54	108.35
Teacher portal usage	sQuid's iMlango teacher portal[33]	Average total # of logins during active teaching months: 76.25	53.1
		Average total # of minutes spent logged onto the portal during active teaching months: 207.25	146.1
		Number and length of logins during non-active teaching months: no teachers logged on during non-active months	Total average for all schools was 4 logins for 14 minutes

Relevant background information

The deputy head teacher is in his third year of service at the school. The iMlango project had already started when he arrived at the school. The deputy head teacher had taken ICT courses during his teacher training. The literacy teacher had no prior experience with ICTs, and the numeracy teacher had exposure to ICTs through her university studies, but had not previously used ICT for teaching.

The government has also provided the school with ten tablets.

Factors contributing to successful implementation

Overall, the school representatives interviewed expressed positive opinions and enthusiasm about the project, and there is evidence at the school of some impact on learning and attendance as a result of the project activities. In addition, there is some evidence that the school is making use of the student data on learning and attendance, although teachers themselves are not regularly accessing this data via the portal.

There is also evidence that the school makes use of the student champions, who help to set up the project resources and provide support to those students who require it. There is awareness of the need for effective planning and preparation to enable successful lab and whole-class lessons, and there is self-reported evidence that teachers are planning in advance of their whole-class lessons.

[31] Note that there were no EGMA/SeGMA tests done in this school.
[32] Note that there were no EGRA tests done in this school.
[33] There were 4 entries (i.e. 4 teacher ID cards used to log onto the portal), and all were female teachers.

Challenges to successful implementation

Poverty

Poverty in the local community is a barrier to successful implementation at the school. This is linked to two issues: fluctuating student attendance, and issues with raising funds to support the project activities:

Fluctuating student attendance

Student attendance fluctuates at the school. High levels of poverty in the community means that parents struggle to pay school fees, which impacts the attendance levels at the school. Students who are not in school cannot access the iMlango resources, which has an impact on usage rates. However, there is some indication from one of the school teachers that attendance has improved at the school as a result of the iMlango activities.

Difficulty raising funds for project activities

There is a disconnect between the views of the head teacher and other school representatives regarding the capacity of parents to contribute to the successful implementation and continuation of project activities. Whilst the head teacher indicated that he was optimistic about the capacity and willingness of parents to support the iMlango activities after project closure, the PTA representative said that parents cannot afford to contribute the required funds to support the additional electricity costs, which she linked to high rates of poverty in the local community. She expressed that the school would not be able to continue the project activities post-closure.

It is also worth noting that the PTA was only set up at the start of iMlango, which is indicative that this form of community engagement with the school is relatively new. The PTA primarily assists the project by engaging with the community to ensure that the students attend school and by encouraging the teachers to use the iMlango resources. Project dialogue and engagement with a school's PTA is intended to align the project with the school's unique needs, facilitating stronger buy-in and use of the interventions.

There is also no evidence of other income generating activities in place at the school. Indeed, the lack of a reliable source of water was seen as the most pressing issue at the school and a barrier to the implementation of income generating activities. For example, the head teacher wants to start a school business growing vegetables, but cannot do this in the absence of a reliable water source.

Low levels of confidence in using project resources

The numeracy teacher said that she had received initial training from the project, but had not received further training and was not able to attend the refresher training because only the head of maths was allowed to attend. She feels unable to problem solve when students have issues with the computers and believes she requires more training. The literacy teacher said similarly that teachers' knowledge of how to set up the computers is poor, and this wastes time during the lab sessions.

Low levels of engagement with project data amongst teachers

Linked to the above is the low levels of engagement with project data described by the teachers. There is evidence that the data on learning is infrequently accessed by some teachers at the school. This is reflected in the very low levels of teacher usage according to the portal data. This is also possibly linked to low levels of knowledge and understanding of how to harness this data. Indeed, the numeracy teacher found it difficult and confusing to

navigate the system in order to access the learning profiles, and rarely did so.

However, the deputy head teacher demonstrated knowledge and use of the student data on learning and attendance, suggesting that it is used at the school to monitor individual student performance. According to the deputy head teacher, this data is shared with teachers through numeracy and literacy subject panels.

Ongoing resistance to use of resources by teachers

There is evidence of negative opinions around the project activities amongst some teachers at the school. Teachers feel like it is an added burden to access the resources. Although attempts are being made to improve the attitudes of teachers, it is an ongoing challenge at the school.

Lack of local technical expertise

The school does not have staff or community members with the skills to solve technical problems when they arise. As a result, they must rely on and wait for the project technicians to come and fix technical issues. For example, the school had a problem with the internet server, and in the time it took for a project technician to come and fix the issue, the school lost valuable access to resources. School representatives requested further training on maintenance and repair to address this barrier to successful implementation.

Insufficient time management in terms of access to resources

High numbers of students per class make it difficult for students to reach the recommended usage time at the school. This is a barrier to successful implementation that many schools, both high and low usage, identified. However, unlike in other schools, there is no evidence that these issues have been mitigated at the school through effective timetabling. Indeed, there is indication that time remains poorly managed in terms of access to the project resources.

Other practical barriers

Alongside the problems with the server, regular power outages were recognised as another major issue at the school which hampers successful implementation of iMlango activities.

Having limited resources was seen as a practical barrier to successful implementation at the school, in particular the fact that there is only one classroom with a projector board, which is also the classroom for grade one.

Construction has been taking place in the school, and the noise from the construction has disrupted lessons.

Appendix O: Extended distance-based methodology

Overview

The iMlango Transitions midpoint research study began in March 2020, just as COVID-19 resulted in widespread global closures of schools and prevented non-essential travel. The scope of the study was thus adapted in conversation with iMlango project partners and the FM. This resulted in the design and implementation of a remote methodology and associated data collection and analysis tools and templates. Key strengths, challenges and areas of opportunity and learning were captured throughout the research process as well as retrospectively, and are presented in this appendix.

Capturing methodological learning

A structure was developed during the inception phase of the study for monitoring and assessing the relevance and effectiveness of the distance-based methodology. Successes, challenges and key areas of opportunity were systematically collected and analysed internally and in conversation with Avanti in order to: (i) make adaptations to the data collection processes where needed, and (ii) mobilise key learning for the sector to develop enhanced distance-based methodologies and remote qualitative data collection in particular. This was done formatively throughout the implementation of the methodology, particularly during 'refinement' stages of the tools (e.g. after initial analysis of Workstream 1 in iMlango). In addition, a summative analysis was conducted following the completion of the data collection and analysis.

Methodological learning is presented in two main sections that follow: key areas of success, and key challenges. Five broad themes are presented and discussed within these sections that consider both the design and implementation of the methodology.

Key areas of success

Successes in the design and implementation of the methodology are presented in five broad themes below: (i) understanding of best current practice, (ii) agility and responsiveness, (iii) the use of participatory approaches, (iv) sequenced data collection and analysis, and (v) high response numbers.

Success 1: Understanding of best current practice

During the design of the methodology, the research team engaged with and utilised current best practices for remote data collection through a review of relevant academic and grey literature and attendance at relevant webinars (hosted by e.g. NVivo, GEC, etc.). Drawing on this learning and participating in the ongoing global dialogue regarding distance-based research practices strengthened the design and implementation of the methodology.

Success 2: Agility and responsiveness

Adaptations to the project scope and data collection were made early on in the COVID-19 response. While a sum of additional expenses was attached to the main budget in case travel restrictions were lifted, the research team operated under an assumption that the full length of the data collection process would have to be conducted using remote methods. Through embracing change and reframing the study accordingly, the project avoided the need for adaptations once data collection had begun. In addition, the early pivot to remote methods allowed for a sequenced approach to be utilised (i.e. success 4).

Success 3: The use of participatory approaches

Participatory approaches were used to design and implement the methodology, which resulted in more relevant tools and higher rates of responses from beneficiaries. This included the development of the analysis frameworks for the quantitative data, the digital teacher survey, and the KII templates in conversation with project partners and Field Officers. The research team further leveraged the connections between the Field Officers and school staff to mobilise the survey, encourage participation, and contact specific school staff members to participate in the key informant interview. The role of the Field Officers was considered critical for the high response rates.

Success 4: Sequenced data collection and analysis

A phased and iterative approach to data collection and analysis was utilised, whereby data

collected and analysed in one phase of the process was used to inform and refine the data collection tools for the next phase(s). This approach resulted in more streamlined processes and relevant tools, and enabled the team to elicit a greater depth of response from respondents to build a clearer picture of how schools engage with the iMlango project interventions through using each phase of data collection to build upon the previous one(s). The research team recommends that any sequenced approach ensure that enough time is allocated to each phase to ensure that relevant and meaningful insights have been elicited and can inform the next phase of data collection. For studies such as this one, however, with a shorter time frame, it was critical to map out areas that could overlap if needed. This is what happened with the current study, and having this plan already in place meant that this was done in the most logical way.

Success 5: High response numbers

As a result of COVID-19, multiple challenges and barriers emerged that were considered likely to negatively impact the response rate for both the digital teacher survey as well as the phone interviews with school key informants. However, there was a significant positive difference between what was anticipated and the result. It is likely that this positive response rate is a combination of the following:

- Leveraging the connections between the Field Officers and school members to mobilise the survey and encourage participation in the interviews, as discussed in Success 3.
- Having a short period of time (i.e. one week) in which to complete the digital teacher survey may have also resulted in more responses sooner than expected. This allowed the research team to stay to schedule for the analysis and that in turn informed the template design for the school-level KIIs.
- The use of financial reimbursements for mobile data needed to complete the digital teacher surveys. The ethical implications of this are considered more fully in our ethics framework (Appendix E).
- Having a script prepared for both Field Officers and the research team to contact the key informant and arrange a time for the interview. This required significant flexibility on behalf of the research team.
- The connectivity was better than anticipated for phone interviews with school key informants, with only a few exceptions. This required further flexibility in the timing of the interview so that the respondent could find a suitable location for ideal connectivity.
- Using the preferred method of communication by the respondent for the KIIs. Respondents were asked how they wanted to undertake the interviews. Most were available by WhatsApp, which made scheduling the interviews much easier through sending WhatsApp messages ahead of time.
- The teachers may have had more time available because of their absence from the schools.

It is considered that for the project-level KIIs, the research team was able to conduct as many interviews as intended and indeed reflected that nothing was lost because of the remote nature of the data collection. The interviews elicited a substantial amount of rich data. The research team found the use of video functionality particularly helpful for building rapport and creating an open environment for dialogue.

Key challenges

Challenges in the design and implementation of the methodology are presented in five broad themes below: (i) lack of theoretical and operational understanding, (ii) absence of

students' voices, (iii) understanding the context, (iv) eliciting in-depth insights from school key informants, and (v) the validity of the data.

Challenge 1: The lack of theoretical and operational understanding of research during a pandemic

There is a considerable lack of knowledge, understanding and practice of how to conduct research effectively and meaningfully in the context of a global pandemic. This includes the design of effective and relevant tools and instruments that elicit the required insights while also ensuring that the process is enriching for the participants. The research team was able to draw on current research and sharing of learning within the sector through a review of literature and attendance at various relevant interactive webinars on the subject. However, since the learning was shifting while the data was being collected for this study it was challenging to balance continued research into good sector practices and the implementation of the study's methodology. A highly flexible approach and a systematic way of capturing successes and challenges of the methodology itself was therefore necessary. The sequenced approach to the data collection and analysis also helped incorporate further research and learning produced as a result of the global conversations taking place.

Challenge 2: Inequitable distribution of voices in the collected data

For a study regarding girls' education, the research team acknowledges the limitation in not presenting the voice of girls themselves. The pivot to remote data collection resulted in the removal of data collection from students, predominantly due to logistical challenges caused by school closures, and importantly, ethical issues that arise with remote data collection of student insights.

With the absence of student voices, the collection of qualitative data at the teacher level included adapted versions of research questions related to student experiences, although most research questions regarding students were removed rather than having them answered by someone else in their stead. However, even with the adapted questions, multiple biases were introduced (e.g. teachers selected by Field Officers; teachers providing what they may have perceived would be desirable answers). The research team mitigated this through emphasising confidentiality and anonymity and building a judgement-free space, however this was challenging over the phone in such a short timeframe.

Further research needs to be undertaken to better understand how to conduct remote research with young people in low-resource contexts and the associated ethical implications and considerations.

Challenge 3: Gaining a rich understanding of the context

Gaining a rich contextual understanding was a significant challenge during the design of the methodology and the tools. The research team reflects that the tools likely did not provide the immersion that face-to-face data collection might have. This might be in part because traditional forms of data collection were utilised but with added technology. In future distance-based methodologies, the research team recommends using a wider range of data collection methods that draw on the learning from research studies conducted during COVID-19 to help gain further contextual understanding. In addition, given the challenges in gaining a sufficiently rich understanding of the local context by a research team from the UK when conducting remote data collection, it is recommended that future distance-based research studies be conducted by or in close partnership with local research teams with extensive in-country research experience and expertise.

Challenge 4: Eliciting in-depth insights from school key informants

Building rapport during the distance-based interviews with school key informants, particularly at the beginning of the call but also throughout, was an integral component of the conceptual framework behind the interview tool. There were several respondents who responded positively to this and offered a significant level of detail and depth to their responses, and the distance-based methods did not appear to create significant barriers for communication. For other respondents who were more reserved, however, it is possible that the phone as a communication platform exacerbated this and presented a further barrier to providing detailed responses. The extent to which the depth of insights offered by respondents is affected or exacerbated by a phone interview versus the level of detail that would have been possible in a face-to-face interview with these individuals remains unclear. The research team notes that in the case of respondents who gave shorter answers, the probes as well as secondary (i.e. not priority) questions in the interview templates were helpful. The team would recommend employing a similar feature in future distance-based interview templates.

In addition, at times during the interviews, the research team felt that the respondent perceived the team member to be affiliated with the project despite the interviewer asserting the externality of the research team. This may have been reinforced by the fact that sampling was mediated by project partners (i.e. Field Officers), and the research team was unable to explain the situation face-to-face where it might have been easier to differentiate the research team from the project team.

Challenge 5: Validity of data

Data validity and reliability challenges arose with the different data sources. Because the research team was unable to travel to Kenya to collect data from students, it was critical to leverage the student numeracy and literacy data partners already had available. As acknowledged by the project partners during early communication regarding this data, however, it was not designed to be used for a research study of this nature. It was therefore limited for the purposes of this study and is presented alongside a range of caveats in the body of the report. In addition, this meant that the research team was unable to assess the validity of this data.

In addition, the digital teacher survey was administered online and there were financial reimbursements available for participants to cover their costs of mobile data usage to complete the survey. This method of survey administration meant that the quality of responses were mixed and the research team had to trust that only one response was submitted for each teacher. During the design of this instrument, the research team developed a process to check for the quality and validity of the data through having survey information whereby school names could be matched and duplicate entries could be easily removed.

Lastly, the sampling strategy for the school-level KIIs aimed to create an unbiased approach to school selection. However, since the Field Officers were able to select the teachers, head teachers, and PTA/BoM representatives from those schools, there is of course an inherent bias with the sample.

Project Management Response

Findings

Research theme 1: Pupil learning

Numeracy learning improvements:

According to Maths-Whizz progress rate data, using the portal for the recommended time per week results in a higher than expected progress rate. The findings also support the observations by Maths-Whizz that an exposure time of 18 minutes per week can lead to a higher progress rate than the 0.58 iMlango progress rate. Students that spend an average of 18 to 29 minutes on the platform achieve a progress rate of 0.78.

The learning assessment data suggests that portal usage may influence the rate of improvement in numeracy. Learning assessment results shows that students that spent between 30 to 90 minutes on the portal scored 3.11 marks higher than students that spent 0 to 29 minutes per week on average on the portal. However, the findings from the assessment data are mixed and are subject to limitations.

Project response: iMlango agrees with this finding. The correlation between Maths-Whizz usage and Maths-Whizz progress rates is good to see, and in line with what we have observed over a number of years within iMlango. We would have liked more emphasis on the correlation with the learner assessments, though the caveats around how this data was collected are fair. It would have been instructive to look at numeracy learning progress within usage bands in more detail. The banding used in the Midline report is very broad, so there is little meaningful sense of the degree of learning within for example; the 15-29-minute range.

A regression analysis would almost certainly put colour on the overall findings by demonstrating higher learning gains for those in the larger usage brackets.

Literacy learning improvements:

Usage of literacy portal data over time and EGRA results indicate that there is a positive correlation between more time spent on the platform and learning outcomes in literacy, although the trend is not completely linear. The findings related to portal usage and changes in learning outcomes are mixed, showing a decrease in results for some students with higher usage of the platform. As such, while there is some evidence of literacy learning improvements, this is not yet fully clear.

Project response: We agree with the finding that there is a positive correlation between time spent on the platform and learning outcomes in literacy. However, due to the pandemic we missed out on substantial data that would have given us clearer picture of the learning outcomes. This is because we had not completed collecting EGRA results from all the schools covering end of march being the end of term.

Reach and access of individualised learning content:

For Maths-Whizz, the average number of minutes spent on the portal per week is 17 per student. This is lower than the recommended 30 to 90 minutes of usage per week. Analysis of usage over time across the four periods shows that usage decreased across the periods, from June 2019 to February 2020.

Top three factors enabling students to receive the recommended 30 minutes of Maths-Whizz are:

- School administration supports the intervention - 64.2%
- Teachers follow the timetable for the ICT lab - 62.6%
- The ICT lab is open throughout the day - 51.4%

Barriers to pupil portal usage are:

- Having a limited number of computers
- Breakdown of devices

- Poor attendance
- Digital literacy of students
- Differences in usage between maths and literacy content suggest barriers exist (whether engagement or otherwise) to either maths or literacy content
- Power and connectivity issues hindering ICT lab sessions and whole-class lessons using the projector
- Limited number of computers provided to schools

For sQuid's iMlango portal, on average each student registered 48 logins, and spent a total of 108 minutes on the platform, or slightly less than two hours. This is an average of 15 minutes per month with active teaching weeks, with an average number of 2.3 minutes per login.
School-level KIIs suggest that there may be uneven usage of the portal across grades in some schools, and this is varied by school based on perceived priorities.

Project response: iMlango agrees completely with the findings. The barriers mentioned are a true reflection of the hurdles we experience in relation to the portal usage.
We acknowledge that there are challenges in completing OTRS tickets within the 72-hour target and that only 42% of tickets have been closed within this target 72-hour window. There are various reasons why machines have been unable to be fixed/ replaced and tickets closed within this window including electricity, transportation and access (some schools are harder to reach during rainy season) as well as time required to get replacement equipment to school after the initial visit. However, there continues to be a problem with schools not reporting broken equipment in a timely manner and it appears that at times equipment can be sitting not working in a school for some time before tickets are raised. We have provided a simplified troubleshooting document to each school to help address some issues.

Exposure time and improvements in learning:
Students who spend the recommended time per week on the Maths-Whizz portal have a higher average progress rate than students who spend less than 30 minutes per week.
In school-level KIIs, most teachers across usage bands said that those students who achieve the recommended usage time perform better and have improved more than those students who do not. Note that this does not imply causality. It is not necessarily the case that the learners that are performing well or even those who are improving fastest are doing so because they are getting the recommended time per week of lab learning. The main factors limiting student access to individualised learning are unreliable electricity and internet connectivity, and the limited number of devices within schools.

Project Response: We agree with the finding that students who spend the recommended time per week on the Maths-Whizz portal have a higher average progress rate than students who spend less than 30 minutes per week. The finding support what we have observed in the past within iMlango. The factors mentioned to be limiting student access to individualised learning (unreliable electricity and internet connectivity, and the limited number of devices within schools) are equally true.

Gender and social inclusion:
Teachers did not report a clear trend of students receiving or not receiving the recommended 30 minutes of Maths-Whizz based on gender and social inclusion.
Maths-Whizz portal data suggests that male students have slightly higher portal usage time than female students (18% of male students used the platform for the recommended amount of time compared to 14% of female students).

sQuid's iMlango portal data suggests that female and male students use the portal for similar lengths of time (106 total minutes for females and 111 minutes for males). In the survey, of teachers who use the

school ICT lab, 30.2% report that there is no difference between students achieving the recommended time on the portal. However, 31.8% report that girls are the least likely to achieve the recommended 30 minutes. A further 24.6% of teachers surveyed report that boys are the least likely to receive the recommended 30 minutes and 11.2% of teachers report that children with disabilities are the least likely. In school-level KIIs, responses were somewhat mixed across participants regarding gender differences in lab usage. Several teachers said that girls and boys use the lab resources equally, while several other teachers said that boys use the labs more than girls.

Project Response: We agree with the finding that male students have slightly higher portal usage time than female students. This is because in the marginalized communities', girls are overburdened with domestic chores. This is a norm that the intervention has tried to change by distributing gender mainstreaming and CPS messages through community support networks that include teachers, head teachers, BoMs and parents WhatsApp groups.

Additional non-numeracy and non-literacy benefits for learners cited by iMlango stakeholders include:

- Improved digital literacy
- Increased enthusiasm for learning
- Improved attendance
- Improved pupil confidence

Project response: The finding is in agreement with observations we've made previously within iMlango. We are pleased with the additional non-numeracy and non-literacy benefits for learners as a result of the intervention.

Research theme 2: Teacher practices

Teaching approaches and practices:

School ICT labs, where available, and whole-class lesson resources are used by teachers on a regular basis and are becoming embedded in teacher approaches to improving pupil learning. However, teachers perceive that projected resources are less impactful on pupil learning than ICT lab resources.
In addition, teachers are not using sQuid's iMlango portal consistently, as evidenced by low time per login and the percentage of teachers only logging in one or two active teaching months.
There is additional scope to increase teachers' use of some available approaches, such as the Children's Encyclopaedia and Gender Responsive Pedagogy.

Project response: iMlango agrees with the findings in totality. Perception by teachers that that projected resources are less impactful on pupil learning than ICT lab resources is something the project has observed in the past. We have held discussions with school communities to avail an extra room fully equipped to be used as a whole class, this haven't been successful. We have also noticed that some teachers often use student accounts and this has majorly contributed to the finding that teachers are not using sQuid's iMlango portal consistently as observed with regard to teacher login time. We agree that there is additional scope to increase teachers' ability to apply GRP and to use the Children's Encyclopaedia. We have adapted the T& L content on iMlango portal to be accessible through the mobile app. Through the app, teachers and learners have access to Children encyclopaedia – Q-files and GESI messaging.

School ICT lab sessions:

Two broad themes emerged as enablers for achieving a well-executed ICT lab session:

- Preparing for the session and having support systems in place, such as student champions
- Supportive senior management.

Four themes emerged as barriers to lab use and to achieving a well-executed session in the ICT lab:

- Availability of the lab
- Hardware (low number of working and available computers)
- Unreliable electricity and internet connectivity
- Technical skills of teachers (i.e. the necessary digital and technical skills to adequately supervise and support students).

Whole-class lessons:

Four themes emerged as enablers for achieving a well-executed whole-class lesson:

- Preparing for the lesson
- Teacher confidence in the use of the equipment and resources
- Teacher familiarity with the available content and how it aligns with the curriculum
- Employment of classroom management techniques

Two themes emerged as barriers:

- Availability of projectors
- Unreliable electricity and internet connectivity

Teacher confidence and influential factors for using projected content:

Five factors emerged as influencing a teacher's decision to use projected content:

- Availability of the projector
- Teacher confidence in using the projector
- Use of a timetable teachers used projected content when they were timetabled to do so.
- Power supply and internet connectivity
- Digital literacy and prior experience using ICT in the classroom

The majority of teachers understand what digital resources and content is available to use with the projector and how to use it.

Project response: The observations on barriers and enablers are true and we are observing this in our interventions. The role of school leadership in both ICT lab and whole-class teaching through ICT cannot be understated and the report has captured this well.
We are pleased that student champions are recognised as an enabling factor behind good ICT lab practices. The project did a lot of work around empowering students as active participants and this work began to see results, pre-COVID. Student champions as an enabling factor also chimes with our internal iMlango research findings:
https://www.whizzeducation.com/our-work/research-thought-leadership/why-do-some-schools-adopt-edtech/
For whole-class teaching, we know that the availability of a room with all the necessary infrastructure (Wi-Fi, Electricity) is a critical barrier.
We are pleased to note that teacher capacity building process has led to mentioned enablers to achieve whole class sessions however more work needs to be done to build teachers confidence to use ICT tools deliver learning.
To improve and strengthen best practices by teachers the project is continuing to strengthen the use of focal teachers in supporting the other teachers in equipment setup and capacity building for their peers from time to time. We also have education advisors' regular visits to capacity build teachers on the pedagogical skills.
The project appreciates the fact that teacher technical capacity is limited and even with the little training that was offered at the onset of the project, teacher attrition has compromised that. We are pushing for teacher engagement with CLA (Camara Learning Academy) to help mitigate the void and provide the necessary digital and technical skills to teachers to adequately support the students. Engagement of this platform is already ongoing in the schools with teachers currently actively taking up

the courses. We intend to continue on boarding teachers to the platform as the project continues and also after project exit as part of the sustainability plan.

Research Theme 3: School management practises and the use of data to inform decision marking

School management practices:
Support from school administration for the project was identified as a key ingredient of success for project implementation through partner and school-level KIIs, and the digital teacher survey.

The use of data to inform decision-making at the project level:
Project-level KIIs indicate that the ability for iMlango to adapt its interventions and activities due to the availability of meaningful, real-time continuous data in tandem with rich contextual knowledge gained from engagement in local communities has the potential to transform the education sector.

The use of data to inform decision-making at the school level:
Knowledge and use of school data by school administrators was present across most schools, but was most clearly observed in high and medium usage schools.
School-level KIIs indicated that the use of data to monitor and follow-up on attendance and portal usage of individual students was common amongst head teachers.
There was little evidence that project data was being used for longer-term school planning and decision-making at the school management level.

The use of data to inform decision-making at the classroom level:
The digital teacher survey indicated that the majority of teachers found class-level data reports produced by the project helpful for their lesson planning, and only a small minority reported that they do not use the reports at all.

Project response: It is true that support from school administration for the project is key for success.
We agree with the findings on use of data to inform decision making at project level, school level and classroom level. The project team has been sharing data with the schools and this is continuously becoming useful in decision making at the project level, school level and classroom level.
Adaptations to the project have been built in through the intentional use of continuous data and knowledge of the context with project managers specifically tasked with coordinating and circulating the data and contextual insight within teams to inform changes.
The project team continues to encourage school management to use project data for longer-term school planning and decision-making.

Research theme 4: Project sustainability and scalability

Sustainability:

It will not be possible for iMlango to be sustained to the current level in the project schools without significant new funding, or the decision from partners to re-work their operating models and provide some services at reduced cost.

Similarly, it is not realistic to think that the majority of schools will continue to make significant use of the iMlango offering if all the current support is removed.

There are likely to be several instances of positive deviance - where schools continue to engage more than anticipated regardless of the support. However, these will be the exception rather than the norm and therefore overall decisions and projections should not be made on the basis of their existence. There have been some notable efforts made to promote school-level income generation - but it is unlikely that a school-based revenue generating model will be effective as the primary means through which the project is sustained.

The nature of operating in very low-income, rural and marginalised environments - the kind of environment where satellite-based interventions have most distinct comparative advantage - is that it is rarely possible or desirable to have a cost-recovery strategy based largely on community contributions.

Project response: We agree that it will not be possible for iMlango to be sustained to the current level in project schools without significant new funding.

We will empower 2 numeracy "champions" in each school through the Classroom Instruction course by the end of Q15. These individuals will then ensure the effective deployment of offline maths content in their schools beyond the project lifespan. We will also leave behind a comprehensive handbook to support them with this. This will ensure sustainability of outcomes.

The girl's club's mentors have been trained and empowered in preparation for resumption of Girls' Clubs. They are better equipped to identify girls' vulnerabilities and the required support, especially during and after the pandemic; and stronger engagement with key government support structures and referral pathways. Further the MBW episodes have been installed in some of the schools in offline mode with the remaining schools set to be covered when access is granted.

Communities have been sensitized about gender inclusivity and positive response has been recorded over time. These discussions will continue in January/February 2021 in order to embed the successes achieved.

For schools that have fully embraced the project, we shall carry on the intervention beyond GEC funding.

We plan to recover the ICT equipment from the schools where the project will NOT be continuing in order to avoid irresponsible disposal of E-waste when they breakdown.

In the interim, we shall draw the list of these schools and agree on the services to continue.

Project Value for Money:

Consortium partners are optimistic about the future value proposition of iMlango, explaining how much had been learned through the previous years about the best way to implement the project effectively.

The overall value of the learning from iMlango depends on what is now done with it to shape future project design and decision making across the sector.

One particularly important part of a positive future will be iMlango's success in linking effectively with other complementary initiatives - such as the Kenya DLP - which can enable some of the benefits to be achieved without requiring the full cost-outlay.

In order to achieve this, it will be necessary to have more transparency regarding costs, and more detailed cost models. Specifically, within this, it may be worth considering whether there is appetite for approaching governments and other donors with a proposal based on payment-by-results linked to pre-agreed impact on learning outcomes.

Project response: It is accurate that consortium partners are optimistic about the future value proposition of iMlango.

The consortium is working to determining the unique value proposition of iMlango. If necessary, reduce the project to a minimum viable product which can deliver on that proposition - removing the elements which do not contribute directly to achieving this.
The project intends to carry out VfM analysis which will be conducted at EL.
The project team will also consider working with other partners who are involved in complementary initiatives which will help achieve some of the benefits at a lower cost. We shall also be seeking DFID support in providing reference for the project as we engage other potential donors for the project post GEC.

Project scalability:
The future of the project is likely to involve specific parts being used in certain contexts, not a comprehensive national-level rollout of the whole iMlango offering.
As a result, a central determining factor in future success will be how effectively the project can identify the educational impact that can be achieved through implementing specific parts, draw on the learning from iMlango to maximise the efficiency of this, and re-package the offering for new contexts.

Project response: It is true as confirmed by the findings that the future of the project is likely to involve specific parts being used in certain contexts, not a comprehensive national-level rollout of the whole iMlango offering.
We intend to use learnings from iMlango to inform which areas to focus on for schools that we shall continue supporting post GEC.

Recommendations for the project

Majority of schools are not yet equipped to self-fund project costs. The consortium should provide high quality training in the coming months to help most of them embark on income generating activities. iMlango should further communicate what form of commitment it can make to sustain activities in the participating schools.

Project response: The consortium acknowledges the fact that majority of the schools are not yet equipped to self-fund project costs.
Action Point: *The consortium had discussions with the communities as well as school administrations on the possibilities of initiating income generating activities to support project sustainability. While this is an understandably difficult task to execute given the economic status of these communities, some schools have indeed started some income generating projects like dairy farming, borehole water vending, construction and leasing of business stalls along the school fence. It remains to be seen whether these schools will invest the income generated from these activities into sustaining the project given the many competing priorities they are faced with.*
We will communicate the project closure to the county/national governments by formally writing to them through the respective departments of education. Besides communicating project closure to the community, we also aim to discuss GESI sustainability strategies, GRP and Gender Responsive Learning Environment as well Safeguarding sustainability with teachers and the communities. These meetings are scheduled beginning January 2021.

The cost of sustaining current activities beyond project completion will be high. It is therefore necessary to decide what elements of the project have most significant positive and cost-effective impact, and prioritise these as part of a minimum viable product.

Project response: It is true that the cost of sustaining current activities beyond project completion will be high.
Action Point: *Consortium will carry out VfM analysis which will be conducted at EL to help decide elements of the projects which have most significant positive and cost-effective impact.*

The end of the current stage of the project provides the opportunity to reduce investment in schools that have not demonstrated buy-in, and potentially increase investment in schools that have demonstrated sustained uptake. iMlango should decide the criteria for determining whether or not a school has shown sufficient buy-in to continue their participation in the programme. It will be useful to build on the midpoint to assess the factors that have led to success in certain schools, and use this as the criteria for deciding any new schools that join a future expansion of iMlango.

Project response: The consortium agrees with the recommendation to reduce investment in schools that have not demonstrated buy-in and increase investment in schools that have demonstrated sustained uptake.
Action Point: *We shall carry on the intervention beyond GEC funding for schools that have fully embraced the project. (The selection of continuing schools will be based on the level of engagement of the school to the project)*
We plan to recover the ICT equipment from the schools where the project will NOT be continuing.

The project should consider the benefits of investing in and promoting the new mobile application, to see if it is possible to embed this aspect of iMlango as a provider of choice in Kenya for home-based mobile learning during school shut-down through high-quality curriculum-based education content, potentially utilising the micropayments cost model.

Project response: The consortium takes note on the benefits of investing in and promoting the new mobile application to see if it is possible to embed this aspect of iMlango as a provider of choice in Kenya for home-based mobile learning.
Action Point: *Informed by lessons learnt from iMlango App uptake in addition to other known factors (Low smartphone penetration in the rural communities, low infrastructure development in the rural communities i.e. 3G/4G mobile network, electricity, inability of the beneficiaries to afford mobile data for online learning) the consortium will be reluctant in investing in a mobile application.*

Any new schools introduced to the project should be selected from the rural and marginalised locations where satellite is likely to have a long-term comparative advantage over other forms of internet provision. This is likely to make iMlango a more distinct and compelling offering for the DLP.

Project response: The consortium welcomes the recommendation that any new schools introduced to the project should be selected from the rural and marginalised locations where satellite is likely to have a long-term comparative advantage over other forms of internet provision.

Due to Kenyan Government strategic focus on technology in education and the new increased availability of tablets in schools, iMlango should prioritise engaging with the DLP to explore potential collaboration.

Project response: The consortium has taken note of Kenyan Government strategic focus on technology in education.
Action Point: *Project team will have a discussion with DLP to explore potential partnership.*

Recommendations for the endline

Because of the value in the learning from iMlango it is recommended that the project decide how the 'lessons learned' can be disseminated most effectively. It may be possible for the Endline Evaluation to incorporate a significant focus on capturing and sharing the key lessons from iMlango in order to inform good practices across the broader sector.

Project response: The recommendation that the project decides on how 'lessons learned' can be disseminated most effectively is welcomed.
Action Point: *Project team will ensure Endline Evaluation incorporates a significant focus on capturing and sharing the key lessons from iMlango.*
We also plan to hold lessons learnt sessions as a consortium in Q16 alongside school's administration and the communities. We shall prepare a lessons learnt document that will be communicated to project as well as education stakeholders. Further, the Maths-Whizz reassessment activity (if approved) will produce three key outcomes to be shared and communicated with stakeholders as part of the project's key learnings. (A bespoke educational "Insight Report" for each school, a comprehensive project-wide COVID Learning Loss report and an Internal Efficacy Study which will show us the extent to which students' Maths Ages have increased since the start of iMlango)

The scope of the midpoint review did not cover a detailed examination of attendance or analyse available attendance data. It is therefore recommended at endline to explore this issue in further detail, and if possible to analyse change in attendance rates over time for iMlango schools. It is also recommended to cross-check attendance rates with portal usage data.

Project response: The project takes note of the fact that midpoint review did not cover a detailed examination of attendance or analysis of available attendance data.
Action Point: *Project team will see to it that analysis of change in attendance rates over time is explored in Endline Evaluation.*

It is likely that the Endline may be influenced by the ongoing context of COVID-19, both for iMlango and the GEC more widely. It is recommended that at endline the project build on the methodological innovations used in the midpoint review to undertake effective remote data collection if this is needed.

Project response: The project is cognisant of the fact that the endline may be influenced by COVID-19 pandemic.
Action point: *Project team will ensure effective, efficient and reliable remote data collection for Endline Evaluation in case the prevailing conditions persists. This will ensure the data collected is accurate, reliable and valid.*

Recommendations for the GEC and the wider sector

iMlango was established as a somewhat experimental project within the Strategic Partnerships window of the GEC. It is recommended that the Fund Manager systematically capture the lessons from iMlango – both in relation to edtech and in relation to the consortium - so that these can be used to shape future portfolio designs and implementation.

Project response: The recommendation that the Fund Manager systematically capture the lessons from iMlango – both in relation to edtech and in relation to the consortium is a key direction.

Action Point: *We have documented learnings and conducted some initial analyses of edtech enabling factors. We also have a comprehensive set of usage and learning analytics which our field interventions can be time-stamped against. This can generate rich findings about what works within a project of this scope and nature. Whizz Education will work with the external evaluator to make use of this data.*

There has been a data and reporting challenge throughout iMlango because of the divergence between the on-going project monitoring data that is available through the portal and the fixed points of the GEC evaluation process. As access to real-time learning data becomes more normal for large-scale education programmes, it will be necessary for standardised evaluation frameworks to adapt accordingly. It is recommended that the Fund Manager explores the potential to reduce the learning cycles within projects and facilitate more rapid iteration in approach through incorporating real-time data into external evaluations. It may be helpful for the Fund Manager to engage with Whizz Education to understand how real-time data could be built effectively into evaluation frameworks in the future.

Project response: We are in agreement with the recommendation that the Fund Manager should explores the potential to reduce the learning cycles within projects and facilitate more rapid iteration in approach through incorporating real-time data into external evaluations.

Action Point: *Whizz Education will engage the Fund Manager to understand how real-time data could be built effectively into evaluation frameworks in the future, conduct Maths-Whizz reassessments with primary school students once schools reopen as well as give teachers a powerful set of data to inform how to effectively pitch their teaching after a lengthy period of school closure. The reassessment analytics can an also feed into the iMlango Endline Evaluation. This will help assess post COVID-19 learning loss and also inform MoE resourcing priorities in future.*