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Bandarban Sandbox

Needs assessment and hypothesis development

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Notes

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Figures and tables

Abbreviations and acronyms

BBS	Bangladesh Bureau of Statistics
EdTech	Educational technology
ICT	Information and communications technology
MICS	Multiple Indicator Cluster Survey
MMC	Multimedia classroom
RQ	Research question
TOC	Theory of Change

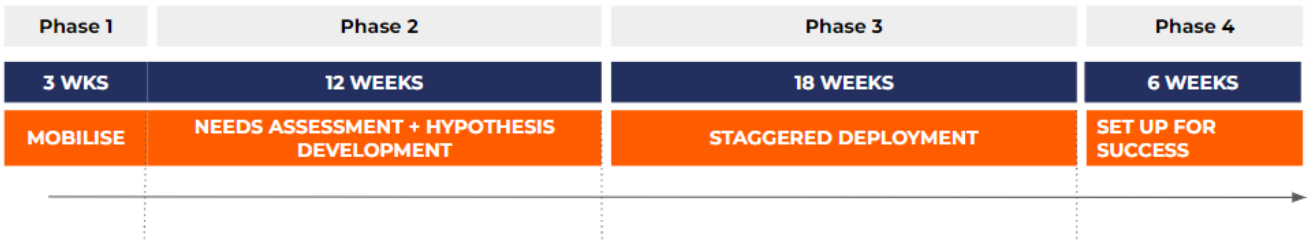
Executive summary

Covid-19-related school closures have seen a significant worldwide increase in the use of technology to support education service delivery — both in class and remotely. Bangladesh has been no exception to this trend, with the Government of Bangladesh and its development partners deploying a broad range of projects that have leveraged technology to support learning. However, while many educational technology (EdTech) programmes have been deployed, there is still much to be understood about which of these have been the most impactful, particularly for the most marginalised. In this context, the UNICEF Bangladesh Education Division[1] (henceforth UNICEF) has been working closely with the government and EdTech Hub to identify how EdTech can best be harnessed to support learning in Bangladesh. This work has included the development of three theories of change (one for learners (↑Clark-Wilson et al., 2021), one for teachers (↑Clark-Wilson et al., 2022) and one for parents (forthcoming) to identify how technology can be most effective.

Using these theories of change as a foundation, UNICEF partnered with EdTech Hub to seek a better understanding of how EdTech interventions can help to improve numeracy skills among the most marginalised learners in Bandarban, one of the most remote areas of Bangladesh. This partnership uses the sandbox approach — which provides a space for partners to test and grow ideas in conditions of uncertainty — to test how EdTech modalities that aim to improve numeracy outcomes for Grade 6 learners (early secondary) can be used most effectively by learners and educators. UNICEF and EdTech Hub are working in partnership with Agami Education Foundation[2] (henceforth Agami), who are the implementing agency for the sandbox.

The Bandarban Sandbox has been designed to include four phases, as shown in Figure 1.

Figure 1. *Four phases in the Bandarban Sandbox*



While the 'mobilise' phase aimed to get a sense of the people and the reality through formative research conducted by Agami, the 'needs assessment and hypothesis development' phase was intended to get a better idea of the

[1] Retrieved 1 August 2022 https://www.unicef.org/bangladesh/en/education
[2] Retrieved 1 August 2022 https://www.agami.org/

experiences of the people behind the data. This phase was crucial for designing and testing interventions as per user needs to ensure the best possible outcome through staggered deployment in the later phases.

This report outlines the process of and findings from the needs assessment and hypothesis development phase. These findings (as well as the data collection which informs them) are organised here around five research questions developed by EdTech Hub in partnership with Agami:

- RQ1: How is technology used now in schools, classrooms and the home, by teachers and Grade 6 students?
- RQ2: What teaching practices are deployed in schools for numeracy instruction for Grade 6 students?
- RQ3: What factors impact numeracy learning outcomes for students?
- RQ4: How do teachers feel about using technology in their classroom / for learning?
- RQ5: How do Grade 6 students feel about using technology for learning?

Data collection took place through two rounds of semi-structured interviews and classroom observations with teachers, headteachers, and students of 10 schools in different corners of urban and rural Bandarban. The Agami team took notes on interview responses and recorded the audio of some interviews. EdTech Hub worked with Agami to refine the research tools for data collection and to synthesise the data after the first round, to fully address the key research questions. However, due to language barriers and some technical gaps, the scope of data analysis and synthesis had some limitations.

The findings of the research were distributed in 13 themes, answering 5 research questions. The themes laid out the availability and utilisation of technology and a valid level of knowledge and interest in teachers and students towards using technology for education. While some findings shed light on the technical aspects of the context (i.e., schools being understaffed, internet connectivity, electricity, school closures during the Covid-19 pandemic, lack of teacher training, language barriers, etc.), some human factors also played a role in resisting acceptance of technology in education (i.e., pedagogical culture, resistance to change, etc.). Table 1 below, presents the themes by research question.

Table 1. *Themes under research questions*

Research Question	Themes
RQ1: How is technology used now in schools, classrooms and the home, by teachers and Grade 6 students?	1. Schools have some technology available (in the form of multimedia classrooms or ICT labs), but these are not generally used for teaching and learning. 2. Most teachers do not currently use technology in their classrooms, but some use it to consult resources to improve their teaching. Smartphones are the most widely used device for teachers. 3. Most students described using technology at home for entertainment purposes. No students described engaging with technology at school. 4. All schools visited relied on energy supply from the grid, but some have issues with reliability. Internet connectivity type and quality varied greatly.
RQ2: What teaching practices are deployed in schools for numeracy instruction for Grade 6 students?	5. Maths classes are often lecture-based and textbooks are the only resources utilised for teaching and learning in Grade 6.
RQ3: What factors impact numeracy learning outcomes for students?	6. Many schools are severely short-staffed. As a result, they often do not have a dedicated maths teacher and have large class sizes. 7. Some teachers have not received any pedagogical training. 8. Due to school closures as a result of the Covid-19 pandemic, students are behind in their numeracy education. 9. Students from minority ethnic backgrounds face difficulties related to language barriers.

RQ4: How do teachers feel about using technology in their classroom / for learning?	10. Teachers were mostly positive in utilising technology for student learning but identified specific challenges. While some teachers had concerns about exposing students to technology and technology interrupting their curriculum, others felt introducing technology to lessons would be beneficial. 11. Many teachers had not received ICT training. 12. Teachers expressed interest in MMCs and tablets over smartphones.
RQ5: How do Grade 6 students feel about using technology for learning?	13. Students expressed interest in utilising technology for learning.

The findings from this needs assessment phase have four implications for the implementation of the hypotheses listed above.

1. **Teacher training:** a focus on classroom integration of tEdTech tools will be important in teacher training (instead of just prioritising a teacher's ability to use EdTech), as teachers have little experience with this.
2. **Onboarding:** teachers, learners, and parents should be thoughtfully onboarded, as many expressed a lack of familiarity and (some) even discomfort with the idea of technology being used in education.
3. **Hardware / device equity:** MMCs have been highlighted as the technology package that is most likely to be implemented equitably, with some teachers raising issues about the distribution of tablets and / or smartphones. Distribution of these should be considered thoughtfully to avoid friction and further inequities within our target communities.
4. **Self-learning tech interventions / content:** there is some opportunity to use self-learning modules and content to address the dire teacher shortages faced by some schools. To do so effectively, content should be curated to ensure accessibility (for instance adapted to the primary language of learners with a lesser focus on proficiency in Bangla).

Building on the learning from this needs assessment phase, Agami and EdTech Hub have agreed to test this implementation plan. The findings helped to inform the development of three hypotheses in the upcoming staggered deployment phase. Through the staggered deployment phase, Agami will implement interventions in two further stages. During the first stage of

deployment, Agami will test different modalities in different clusters of schools (August–October 2022). Learnings from this first deployment will be used to determine the scope of a second deployment with another cluster of schools (October–mid-November 2022).

1. Research background

The Covid-19 pandemic has catalysed the need for technology-enhanced education globally. This is no different in Bangladesh, where the Education Section of the UNICEF Bangladesh Country Office (henceforth referred to as 'UNICEF Bangladesh') is seeking a better understanding of the role and potential of EdTech to improve numeracy skills among the most marginalised learners.

1.1. History of EdTech Hub and UNICEF engagement

In 2021, UNICEF Bangladesh partnered with EdTech Hub to develop a theory of change (TOC) (↑Clark-Wilson et al., 2021), which would identify how a technology-enhanced education system can help improve the learning outcomes of students in Bangladesh. This was undertaken in response to the lack of robust research and insights to determine which EdTech modalities can be most effective in supporting learning in Bangladesh, including in communities with low incomes, low digital literacy, and low learning outcomes, especially for girls and other marginalised groups.

Following this successful partnership, UNICEF Bangladesh and EdTech Hub extended the partnership to design, implement, and gather data on EdTech modalities through a sandbox in Bandarban. An EdTech Hub sandbox provides a testing environment for EdTech interventions to allow our partners to test how they might adapt all parts of an intervention in a system. This sandbox, in Bandarban, aims to identify the technology-enhanced approaches which most effectively support the acquisition of basic numeracy skills by learners in hard-to-reach areas.

1.2. Context of Bandarban

Bandarban is a remote, hilly, and multi-ethnic / multilingual district in southeastern Bangladesh. Beyond its diversity and topography, Bandarban also exhibits some of the lowest education outcomes in the country. Multiple Indicator Cluster Survey (MICS) data (↑Bangladesh Bureau of Statistics (BBS) & UNICEF Bangladesh, 2019) notes an upper secondary school net attendance rate of 31.7% and upper secondary completion of 22.9%. In Grades 2–3, just 6.2% of children have foundational numeracy skills and only 5.4% have foundational literacy skills. Bandarban also lags behind the national average female youth literacy rate by about 22% (67% compared to an 89% average). It is anticipated that the 18 months of school closures caused by the Covid-19 pandemic will have further widened this existing learning gap.

The district also experiences teacher and staff shortages (in part due to the remote nature of many schools) as well as gaps in infrastructure. Although some schools have access to power via solar energy, many face significant connectivity and electricity problems.

1.3. The sandbox model

A sandbox fast-tracks promising EdTech interventions by providing funding, tools, and access to evidence. A sandbox creates the space as a prototype of the whole education system, to test and adapt EdTech interventions, treating it as a lab to bring costs down and drive up impact. We, at EdTech Hub,[3] break up sandboxes into short sprints, learning and iterating as we go. Principles applied by us in our sandbox include:

1. A problem-centred approach with a clear focus
2. Systematic experimentation, through real-life implementation
3. Narrowing the distance between theory and practice
4. Treating the system as a unit of experimentation
5. Giving a mix of actors a seat at the table and holding space for their collaboration
6. Partnering and building on what's already out there

1.3.1. The '6 Ps' for scaling in an education system

Any technology exists within a broader system of factors that need to work together to have an impact at scale.

EdTech Hub uses the '6 Ps' to systematically experiment with the full breadth of factors that might unlock scale for a promising solution. We have modified the system into the 6Ps of 'people, provision, product, practices, policy and place', to allow us to consistently measure these areas in sandboxes across regions.

[3] Retrieved 1 August 2022 https://edtechhub.org/innovation/

Figure 2. *The 6 Ps*

PEOPLE: Who are the users and who is implementing it?

PRODUCT: What is the product/ service and how is it all being delivered?

PEDAGOGY: What is the required pedagogy?

POLICY: What is the government stance?

PLACE: Where will this intervention be used?

PROVISION: How is this intervention being funded and supported?

Although the sandbox will consider each of the 6 Ps throughout its implementation, different phases focus on different aspects of the system:

- The 'needs assessment and hypothesis development' phase focuses on the areas of **people** and **place**, to ensure context is understood before we deploy any technology.
- The 'staggered deployment phase' focuses on **product** and **pedagogy,** gathering data on the effectiveness of different EdTech modalities and learning content.
- The 'set up for success' phase focuses on **provision** and **policy**, to ensure that any validated EdTech intervention(s) can scale sustainably, primarily through the Government of Bangladesh.

1.3.2. Bandarban Sandbox

In collaboration with EdTech Hub and UNICEF Bangladesh, Agami is serving as an implementation partner in this effort. Agami has extensive experience providing support to secondary schools throughout Bangladesh, including through the provision of EdTech resources and teacher training and through their collaboration with Khan Academy Bangla[4] and Learning Equality.[5] This experience makes them an ideal partner for this work.

[4] Retrieved 1 August 2022 https://bn.khanacademy.org/
[5] Retrieved 1 August 2022 https://learningequality.org/

Based on their past experience in implementing EdTech interventions, Agami proposed two intervention models in Bandarban. The first model involves training teachers to conduct multimedia classes through Kolibri[6] using existing MMCs.

The second model involves conducting classes with tablets (procured and distributed by Agami), also via Kolibri, to disseminate content.

UNICEF Bangladesh, Agami, and EdTech Hub will collaborate to explore the effectiveness of these models. This work includes the following objectives:

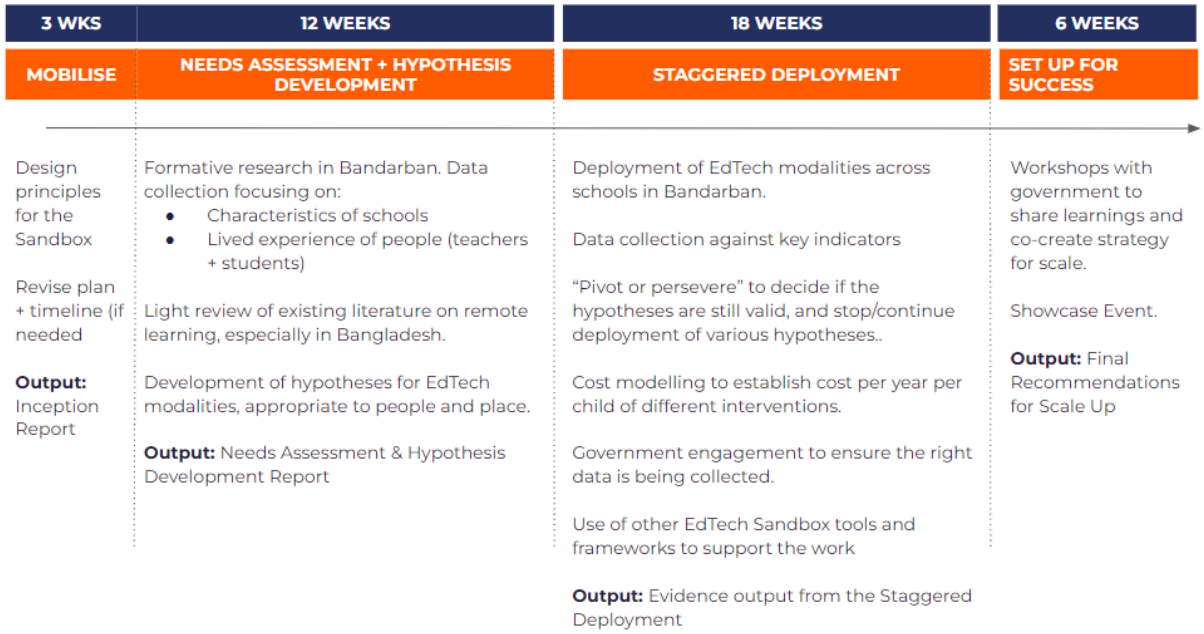
- Implement EdTech interventions that may enhance numeracy learning outcomes for children in Bandarban.
- Conduct nimble data collection (i.e., observations, focus group discussions and interviews, competency assessments) to assess the effectiveness of these interventions, understand user experiences, and identify challenges and opportunities to implement at scale.
- Provide recommendations for UNICEF Bangladesh and the Government of Bangladesh on a scalable intervention, which might enhance learning outcomes across Bangladesh or similar countries, especially in marginalised communities. These recommendations might form the basis for future research and / or implementation.

1.4. Introduction to the needs assessment and hypothesis development phase

Needs assessment and hypothesis development is the second of four phases in the sandbox. A summary of the four phases can be seen in Figure 3 below.

[6] Retrieved 22 August 2022 https://learningequality.org/kolibri/

Figure 3. *Summary of the four phases in the Bandarban Sandbox*



The aim of the needs assessment and hypothesis development phase was to gain a better understanding of the experiences of the people (learners and teachers) we seek to impact with the EdTech modalities tested through this sandbox. This will enable us to design and test interventions which are appropriate to the context and have the maximum chance of enhancing numeracy learning outcomes for Grade 6 learners in Bandarban.

2. Research overview

The research intended to find out the plausible EdTech interventions to improve numeracy outcomes for Grade 6 children in Bandarban, where the numeracy level was previously found to be significantly low. EdTech Hub and Agami collaboratively worked to choose appropriate research methodology and iterate on the data collection tools to get a better understanding of the people and place in question. The data analysis revealed valuable insights, while some limitations in the process left some room for improvement in the later phases.

2.1. Research objectives

The overarching research question for this study was:

Which EdTech interventions might improve numeracy outcomes for Grade 6 children in Bandarban?

The Agami team, with support from EdTech Hub, conducted formative research (including data collection with users in Bandarban) in order to gain a better understanding of the context and its education challenges. Ahead of this needs assessment research, Agami proposed two interventions related to different EdTech modalities to be developed and tested with Agami, UNICEF Bangladesh, and EdTech Hub. One intervention involves the use of MMCs and the other uses tablets. Based on insights from this needs assessment phase, these hypotheses were iterated upon and added to.

The following research questions guided data collection:

RQ1: How is technology used now in schools, classrooms, and the home, by teachers and Grade 6 students?

RQ2: What teaching practices are deployed in schools for numeracy instruction for Grade 6 students?

RQ3: What factors impact numeracy learning outcomes for students?

RQ4: How do teachers feel about using technology in their classroom / for learning?

RQ5: How do Grade 6 students feel about using technology for learning?

2.2. Methodology

Data collection took place in two rounds, both of which involved visits to Bandarban to collect primary data from teachers and students.

Within the schools, Agami aimed to:

- Interview the head teacher
- Interview 1–2 school teachers
- Interview 2 students
- Observe / capture a classroom
- Observe the school premises and ICT facilities

The first visit was undertaken from April 17–20, 2022. It was conducted by four representatives from Agami, one from EdTech Hub and one from UNICEF. During this round, the team visited six schools in three *upazilas* (administrative regions): Sadar, Ruma, and Rowangchari. The schools were Bandarban Government Girls High School, Bandarban Ideal School, Rowangchori Government High School, Kachoptoli Junior High School, Ruma Government High School, and Ruma High School

The second visit took place from May 28–29, 2022. Three representatives from Agami visited four schools in two upazilas: Thanchi and Alikadam. These schools were Boli Para Bazar High School, Thanchi Government High School, Alikadam Government High School, Alikadam Residential High School.

In addition to supporting Agami in the data collection and analysis of its formative research, EdTech Hub conducted a light-touch review of existing literature on tech-enabled education interventions in Bangladesh as a reference for the needs assessment and hypothesis development process. This review also focused on secondary school numeracy interventions (including outside of Bangladesh).

2.2.1. Data collection tools

Agami conducted semi-structured interviews with teachers (including head teachers) and students during two rounds of data collection. Following the first round of data collection, EdTech Hub worked with Agami to refine the research tools to ensure that the data collected more fully addressed key research questions. The refined interview protocols are better aligned with these key questions and to the findings of this assessment phase. The following protocols were used during the second data collection visit:

- Teacher Interview Protocol
- Head Teacher Interview Protocol
- Learner Interview Protocol

A checklist was used by Agami to capture key school details, including the number of learners per class and existing infrastructure. Lastly, EdTech Hub held a workshop with Agami to orient them on two design thinking tools (user personas and a 'Values, Loyalty, Loss' framework), which were used to capture additional insights into learners' and teachers' perspectives.

2.2.2. Sampling

In total, 10 schools were visited across the two trips. These schools were selected with input from the UNICEF Field Office in Chittagong and Bandarban Hill District Council. They were chosen to represent a range of urban and rural schools.

In total, Agami spoke with 44 participants, including 10 head teachers, 14 teachers, and 20 students. Breakdowns by school, group (head teacher, teacher, or student), gender and ethnic group can be found in the Annex.

2.2.3. Analysis

Agami collected data via observations and interviews with head teachers, teachers, and learners. They also recorded the audio of some interviews, depending on participant type (all interviews with students were recorded). The Agami team took notes on interview responses. Classroom observations and observations made concerning school infrastructure were also recorded in data collectors' notes.

Rather than directly transcribing the interviews recorded or compiling question-by-question notes on interview responses, Agami held a debrief session with data collectors and summarised data in the two trip reports (Trip Report 1 and Trip Report 2). The trip reports relied on observations made by Agami during school visits. Agami also synthesised some data in a spreadsheet, including data on school infrastructure and demographics. This spreadsheet and the two trip reports were shared with EdTech Hub.

EdTech Hub reviewed the outputs produced by Agami. In addition, EdTech Hub asked follow-up questions for more detail and clarification around key data points. EdTech Hub also held a debrief session with Agami data collectors to supplement findings.

2.2.4. Limitations

There were some limitations in the data collection process. For example, Agami staff noted that some students from local ethnic groups struggled to express themselves in Bangla since it is not their first language. In addition, interviews not being transcribed or coded posed challenges for data analysis

and synthesis. The inability to cross-check and code qualitative data by gender or age limits how precise the sandbox can be about nuanced viewpoints.

3. Research outcomes

This section includes an integrated summary of relevant findings that emerged from the needs assessment research and the rapid evidence review. The findings are organised by research questions and the related themes which answer the research questions. Boxes include tentative conclusions drawn from the data, which affected the hypotheses developed.

RQ1: How is technology used now in schools, classrooms, and the home by teachers and Grade 6 students?

Theme 1: *Schools have some technology available (in the form of multimedia classrooms or ICT labs), but these are not generally used for teaching and learning.*

All ten schools visited have a multimedia classroom (MMC). At a minimum, an MMC contains a projector and laptop. Other devices / technology, including additional laptops, desktop computers, monitors, mini PCs, and speakers, may also be available; the quantity and type of devices available in each vary significantly.
However, many schools have not yet received training on how to use MMCs. Of the ten schools visited, six reported that the MMC classrooms are not used and two reported that they have been used (although they did not comment on the frequency of use).
Nine of the ten also have ICT facilities (computer labs). Despite this, many go unused due to a lack of ICT training and staff shortages. Teachers also cited their lack of time to take learners to ICT facilities and guide them on how to use the resources. Most of the schools do not have a designated ICT teacher. In general, most of the Grade 6 classrooms do not currently utilise technology for teaching and learning. Some students said they did not know they had computers in the school, while others were aware of the MMCs at school, but had no access to them.

Theme 2: *Most teachers do not currently use technology in their classrooms, but some use it to consult resources to improve their teaching. Smartphones are the most widely used device for teachers.*

Of the teachers interviewed, only two cited specific examples of using technology in their classrooms. One noted that she had shown students videos on her smartphone to help them communicate better in Bangla. Another said he regularly develops digital content for his classes, however, his focus was on higher grades (not Grade 6).

In their day-to-day lives, teachers frequently use smartphones. A few teachers

also reported using laptops at home. It was uncommon for teachers to use their personal devices for teaching and learning purposes. Given this familiarity and experience with android smartphones, teachers expressed feeling more comfortable using android tablets as opposed to other devices. Teachers still noted that they would like support on how to use devices to access content for teaching and learning.

Theme 3: *Most students described using technology at home for entertainment purposes. No students described engaging with technology at school.*

Students have had limited opportunities to engage with technology for educational purposes at school. During student interviews, many said they had not used ICT in any of their classes.

Students frequently mentioned that they engage with technology, particularly smartphones and television, for entertainment purposes. They described watching cartoons, television shows, and movies. A few students also described watching maths classes on television and watching youtube videos (via smartphones) to help them solve mathematical problems. During Covid-19-related lockdowns, very few students took classes and completed assignments remotely.

Within households, televisions and smartphones were the most commonly available technologies. Data from the evidence review indicates that nationwide, 41% of households owned at least one smartphone and 47% owned a television (↑Islam et al., 2021). That said, students who have access to smartphones in their households are rarely able to use them for educational purposes. For school-age children in the poorest wealth quintile in Bangladesh, very few have access to television and radio, but a majority have access to a mobile phone in their household (92%) (↑UNICEF, 2020).

Access to higher-end technologies often varies from school to school. In Ruma High School, for example, learners only have access to feature phones. In another school, Rowangchori Government High School, teachers reported that students have little to no access or exposure to technology outside of their school as they come from more remote communities. Very few students across all of the ten schools visited have a computer at home and for those who do, it is not often accessible to them.

Theme 4: *All schools visited relied on energy supply from the grid, but some have issues with reliability. Internet connectivity type and quality varied greatly.*

Energy connectivity is not reliable in many of the schools visited. The reliability

of electricity in these schools is often impacted by weather. In addition, it was noted that one area is prone to load-shedding — the practice of temporarily reducing / cutting off the supply of electricity to an area to avoid overloading the power system. Load-shedding is common in these areas when it rains, to avoid accidents related to electrocution. Some of the schools have solar power as a backup during periods when the normal electricity supply is unavailable.

Three of the ten schools have no internet connectivity at all. Only two of the schools have a broadband internet connection. Five of the schools have access to mobile internet, though they have difficulties with connectivity and / or the bandwidth is very low. Only two schools described their internet connection speed as 'good'. All others were described as 'patchy' or 'poor'. The networks available are Robi and Teletalk.

Figure 4. *Key takeaways from RQ1*

MMCs are likely to be a major component of the EdTech modalities implemented through this sandbox in Bandarban: these are available in all 30 schools where Agami is planning its first deployment. However, our user research suggests these are severely under-utilised, so any EdTech intervention using MMCs would need a significant training and onboarding component.

Given teachers' limited experience incorporating technology into their classroom practice, teacher training should focus on this.

The schools experience irregular electricity supply and limited internet connectivity. The interventions should ensure that the chosen technology does not heavily depend on electricity or the internet (e.g. rechargeable tablets with built-in content).

RQ2: What teaching practices are deployed in schools for numeracy instruction for Grade 6 students?

Theme 5: *Maths classes are often lecture-based and textbooks are the only resources utilised for teaching and learning in Grade 6.*

Teachers follow traditional teaching and learning strategies. Maths classes are lecture-based and follow the same textbook curriculum with very little variation. Learners are given the same textbooks that teachers instruct with. Teachers use a blackboard or whiteboard to solve a few problems while students copy solutions in their notebooks. These lessons focus on following specific steps provided in maths problem-solving textbooks and memorising the steps to reach the solutions, rather than exploring different processes.

Grade 6 maths lessons are often 45 minutes long and take place five times a week. However, in schools with teacher shortages and large class sizes, lessons take place less often (e.g., three days a week).

Figure 5. *Key takeaways from RQ2*

EdTech interventions can complement the unidirectional manner of traditional maths classes. However, there may be some resistance from teachers who are new to alternative teaching methods. Methodical training and in-class examples can ease the pain of accepting this change in practice.

Introducing external instructional content on maths may help teachers explore alternative / better methods to teaching and explaining specific concepts to students.

RQ3: What factors impact numeracy learning outcomes for students?

Theme 6: *Many schools are severely short-staffed. As a result, they often do not have a dedicated maths teacher and have large class sizes.*

A lack of sufficient and subject-based teachers is a common problem in all schools where interviews were held. A teacher at one short-staffed school reported that a teacher shortage had been ongoing for several years, forcing schools to adopt coping strategies. For example, during most days at one school, students attend just 2–3 of their 6 timetabled lessons. At another severely short-staffed school, there are just 2 teachers for 380 students, leading to a reduced number of lessons per day and the number of days per week that students go to school. In this school, students from Grades 6, 7, and 9 attend school from Saturday–Monday while students from Grades 8 and 10 attend Tuesday–Thursday.

Most of the schools visited, particularly the non-government schools reported that they did not have a designated full-time maths teacher. In Grade 6, it was noted that often one teacher conducts Bangla, English, and maths classes. Often, they do not have the subject-based training needed to conduct these classes. Three of the ten schools do have a designated maths teacher, but often this teacher instructs higher grades (Grades 8–10).

Theme 7: *Some teachers have not received any pedagogical training.*

Teachers in at least four of the schools have not received formal pedagogical training, meaning they have had no formal training or certification (this is not a requirement in all schools). This was particularly common for newly appointed teachers. For example, according to one of the more experienced head

teachers:

> **"There are some new teachers in my school and for the last 2–3 years there has been no training for them. It is high time the training programmes should resume and my teachers can prepare them for creating a better learning environment in the classroom."**
>
> **– Anonymous Head Teacher, 2022**

Theme 8: *Due to school closures as a result of the Covid-19 pandemic, students are behind in their numeracy education.*

The negative impact of the Covid-19 pandemic on teaching and learning in the last two years has been significant. Given that schools were closed for a total of approximately 18 months, students have not received much numeracy education in their last two grade years. Students from underprivileged and more remote backgrounds in Bandarban are especially affected as many did not have access to online classes during the Covid-related closures. Although some schools made an attempt to conduct online classes, they found only a small number of students were able to participate. As a result, many students lack the maths skills needed when promoted to the next grade. For example, one Grade 6 teacher said that as a result of closures, some of her students lacked maths concepts that should have been covered in primary grades. She identified this as a key challenge in her classroom.

Theme 9: *Students from minority ethnic backgrounds face difficulties related to language barriers.*

Teachers in several schools reported that students in their classrooms have some difficulties with classroom instruction in Bangla, which is the language of instruction but not necessarily the learners' primary language. Many students have difficulty expressing themselves in Bangla. As a result, teachers will sometimes try to communicate in local languages to improve learners' comprehension of lessons where possible. One teacher said that in her experience, many students are able to mostly overcome this challenge by Grade 8, but Grade 6 and 7 students tend to struggle with Bangla as an instruction medium. Some students also noted these challenges during interviews.

Figure 6. *Key takeaways from RQ3*

> The lack of maths teachers is a persistent issue in most of the schools visited. This acts as a barrier for learners to receive meaningful education in class, especially for those who do not have an alternative way of learning.

EdTech interventions that students can interact with without the supervision of teachers may be able to minimise the learning gap and the existing workload of the teachers.

Teacher shortages may impact teachers' ability to participate meaningfully in teacher training and programme implementation. Training and intervention activities will need to account for limitations related to teachers' time and capacity.

A lack of adequate maths classes (due to teacher shortages, large class sizes, and maths classes taught by uncertified teachers) and Covid-related school closures have likely impacted learning outcomes. Pedagogical training and content will need to account for these varying skill levels.

Content should be accessible to learners who have difficulty comprehending and communicating in Bangla.

RQ4: How do teachers feel about using technology in their classroom / for learning?

Theme 10: *Teachers were mostly positive in utilising technology for student learning but identified specific challenges. While some teachers had concerns about exposing students to technology and technology interrupting their curriculum, others felt introducing technology to lessons would be beneficial.*

Some teachers believe that Grade 6 students are too young to be exposed to technology. For example, one head teacher said that although she thought adding technology to education was a definite benefit, students from Grade 6 should only have supervised access to devices. This attitude was common. Teachers reported feeling more comfortable providing ICT-aided lessons to students of Grade 9 or higher. Some teachers claimed technology in classrooms would distract students from lessons. Teachers also felt that learners' use of technology should be guided by teachers in the classroom and that learners should not have unsupervised and unlimited access to devices.

A number of teachers named specific challenges to using technology in the classroom, for example:

- One teacher reported that he feared using technology in the classroom would hamper his regular class activities. He felt that technology-based learning would be less efficient than traditional, lecture-based instruction and that the syllabus should be shortened if ICT was made mandatory.
- Another teacher who has had some experience using technology for

education felt that given the staff shortages in his school, leveraging technology in his classes may not be possible.

Agami generally observed that older teachers tended to be less open to adopting technology in the classroom than younger teachers. A majority of the teachers interviewed were younger as most older teachers tend to teach higher grades.

Others showed interest and enthusiasm for using technology in the classroom. For example, according to one maths teacher:

> **"I know a little bit about the usage of technology in education but I haven't extensively used it in my classes. I do want to adopt technology in my classes as I think it will complement my lessons and the students will really enjoy the classes if some digital content can be shown during the class."**
>
> **– Anonymous Teacher, 2022**

A majority of teachers agreed that using technology in the classroom would make it easier to present a lesson rather than using regular methods. They also felt that this would engage students more. Despite not having extensive experience with technology, teachers reported feeling that technology would in general add value to the classroom, but did not provide other specific examples of benefits.

Theme 11: *Many teachers had not received ICT training.*

In most schools visited, only about 1–2 teachers in the school had received some sort of ICT training. ICT training is delivered by the government and is often fairly simplistic. It typically focuses on teaching teachers how to use computers and how to create PowerPoints for their classes. In general, it was found that teachers in government schools had received ICT training more frequently than their counterparts in non-government schools. In many cases, teachers who had received ICT training received it 4–5 years ago. Additionally, many have been unable to leverage these skills, often due to staff shortages and, in one school, a lack of ICT facilities. Additionally, newer teachers were less likely to have received any ICT training (new ICT trainings were conducted as needed to onboard new teachers). Many teachers who had not received ICT-related training reported that technology would be very helpful and wanted teachers to be given access to training.

Theme 12: *Teachers expressed interest in MMCs and tablets over smartphones.*

Teachers reported feeling more comfortable utilising the MMCs as the MMCs could accommodate larger classes. They were concerned that using smartphones in a classroom would be less manageable. Due to their familiarity with smartphones, teachers also reported feeling more comfortable using Android tablets.

Figure 7. *Key takeaways from RQ4*

While some teachers felt that technology would add value to teaching and learning, many were unable to provide specific examples of how technology could be leveraged in their classrooms. This indicates that teacher training will need to go beyond the basics of how to use technology to how technology can be applied to their classroom practice to enhance learning.

Given that some teachers felt that technology could be disruptive, distracting, or inappropriate for Grade 6 learners, teacher onboarding is necessary to ensure buy-in to any tech-supported intervention. Given the concern about learners using technology unsupervised, onboarding may need to be extended to parents as well. This may also indicate that a low-tech solution will have more teacher and parent support.

Teachers voiced support for the use of MMCs and / or tablets. Provision of smartphones or tablets will need to account for issues of equity.

RQ5: How do Grade 6 students feel about using technology for learning?

Theme 13: *Students expressed interest in utilising technology for learning.*

Many students did not have knowledge of what ICT is and none of the students interviewed had ever used technology in the classroom for learning. Students with less exposure to technology generally had no understanding of how technology could be used in learning or in the classroom. Students who were more familiar with technology suggested that it would help them in their studies and increase their learning. To quote one student: “I have never seen a computer used for studying in school. But I would like it very much if the teacher would use a computer and projector to teach us with more fun and entertainment.”

Some students also indicated that they could not ask lots of questions in the classroom, as their teachers would get irritated. The students believed that this would not happen if they could learn maths from video content, since they could pause it at any time and think, or repeat it as many times as they wanted, without annoying anyone. Learners with varying levels of experience

with technology all expressed great interest in using technology in the classroom.

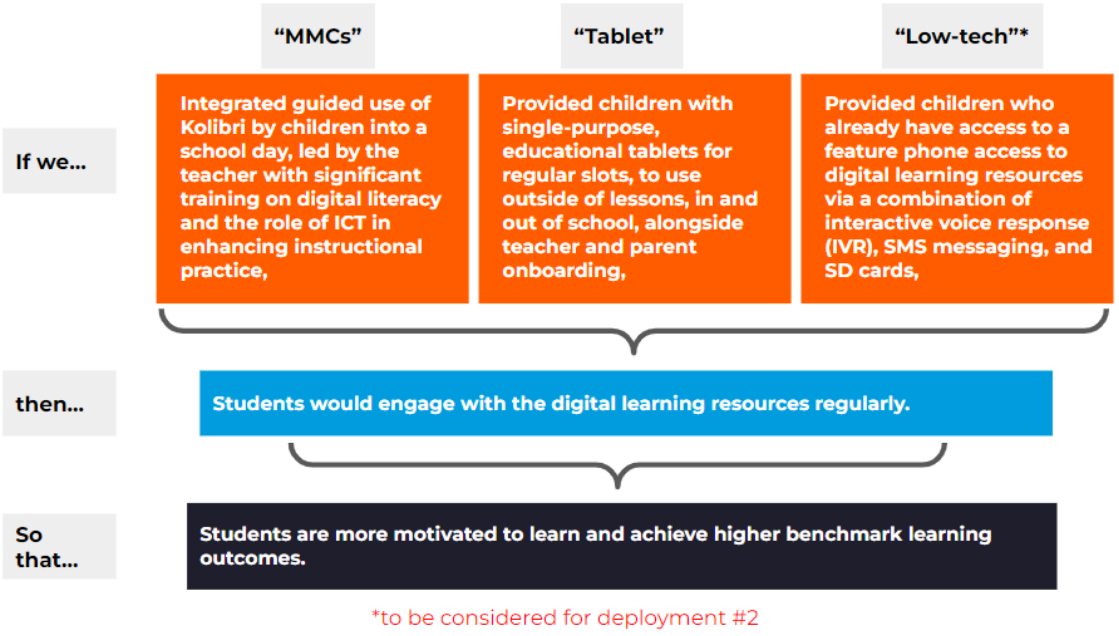
Figure 8. *Key takeaways from RQ5*

> Given learners' limited exposure to technology for learning, yet their enthusiasm to explore it, onboarding for learners is necessary.

3.1. What are the implications of these findings for Agami's hypotheses?

Based on the findings of the user research, Agami refined its intervention models (MMC and tablet models). The following three hypotheses emerged:

Figure 9. *Our hypotheses*



The findings from the needs assessment phase have the following implications for the implementation of these hypotheses:

- **Teacher training:** Responses from teachers indicate that they have little understanding or awareness of how technology can be incorporated into their classroom instruction. Given this, teacher training conducted by Agami will have a significant focus on how devices should be used in the classroom to enhance learning. Evidence on EdTech in Bangladesh also highlights the need for teacher training needs to go beyond training on ICT to supporting teachers with ICT to improve their pedagogy.

- **Onboarding**: Given the general lack of familiarity with the integration of technology in education and a unidirectional pedagogical culture that was found in our user research, all interventions will require varying levels of onboarding for teachers, parents, and learners to ensure buy-in. Given the different levels of enthusiasm in teachers and students regarding using technology for education, it is evident that teacher training will need to inspire qualitative change along with technical know-how. Onboarding sessions should ensure that stakeholders' perspectives are heard and addressed regarding challenges and concerns associated with EdTech use and that they feel supported in their engagement with this technology.
- **Hardware / device equity:** Given that MMCs are available in the schools where Agami is likely to implement them, MMCs are an appropriate vehicle to deliver the content available on the Kolibri platform. Teachers pointed to MMCs as a more equitable and accessible intervention for large classes. They expressed concern that distributing smartphones would be less manageable given the issue of large classes. Even though an equitable and impactful distribution of tablets seems to be a matter of concern, teachers expressed support for android tablets given their familiarity and level of comfort with using android smartphones. Issues like reliance on electricity and internet connectivity will also need to be considered.
- **Self-learning tech interventions / content:** Learners can interact with content without the supervision of teachers, thus minimising learning gaps and constraints related to teacher shortages. These interventions can also supplement the traditional, lecture-based teaching methods already employed in Bandarban schools by introducing or reaffirming specific concepts to students through alternative presentations and activities. The content utilised should also be accessible to, and impactful for, learners who have difficulty comprehending and communicating in Bangla.

  To ensure that the content introduced is useful and to ensure that learners and teachers are not overwhelmed, Agami will also ensure that the content made available will be covered in the existing curriculum for the year. Agami is also focused on ensuring that teachers understand that the content and tools provided should be used frequently.

3.2. Implementation next steps

Building on the learning from this needs assessment phase, Agami and EdTech Hub have developed the implementation plan outlined below.

Agami will implement interventions in two phases. During the first phase of deployment, Agami will be active in 20 schools. This sample will include diverse school types, including urban and rural schools and government and private ones. This phase will take place from August–October 2022.
Agami will train teachers in ten of the schools to conduct content dissemination through MMCs. Agami will test different modalities in the remaining ten schools. In five schools, Agami will train teachers to conduct multimedia classes and will also simultaneously distribute tablets that will be used in or out of classrooms. In the five remaining schools, Agami will only distribute tablets. In these five schools, Agami will also test tablet use in and out of the classroom. Figure 10 below provides a visual representation of this plan.

Figure 10. *First Deployment of MMCs and tablets*

		First Deployment of MMCs and Tablets			
10	MMCs	Ruma High School	Thanchi Girls High School	Ruma Govt. High School	Balaghata Ideal School
2	MMCs + Tablets in class	Alikadam Govt. High School	Tindu Junior High School	Matamuhuri Secondary School	Thanchi Govt. High School
3	MMCs + Tablets out of class	Chaykhong Model high School	Rajbila High School	Bandarban Govt.High School	Alikadam Residential High School
3	Tablets in classroom	Onnesha Collegiate School	Songha Mita Sheba Songho High School	Kachoptoli junior High School	Gunguru Para Junior School
2	Tablets out of classroom	Saint Francis Xavier Junior High School	Vangamura Junior School	Mro Residential High School*	Rowangchari Govt. High School
		MMCs only		Tablets + MMCs	Tablets only

Learnings from this first deployment will be used to determine the scope of a second deployment with an additional ten schools. It is possible a lower-tech modality will be included in this scope, to include smartphones. The second deployment will take place from October–mid-November 2022.

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Annex

Table 2. *Participants by school and group*

School	Number of head teachers	Number of teachers	Number of learners	Total
Bandarban Govt Girls High School	1	1	2	4
Bandarban Ideal School	1	2	2	5
Rowangchori Govt. High School	1	1	2	4
Kachoptoli Junior High School	1	1	2	4
Ruma Govt High School	1	2	2	5
Ruma High School	1	1	2	4
Boli Para Bazar High School	1	2	2	5
Thanchi Govt High School	1	1	2	4
Alikadam Govt High School	1	2	2	5

Alikadam Residential High School	1	1	2	4
Total	10	14	20	44

Table 3. *Participants by gender*

Participant Group	Male	Female	Total
Head Teachers	8	2	10
Teachers	11	3	14
Learners	8	12	20
Total	27	17	44

Table 4. *Participants by ethnic group*

Ethnic group	Teachers (incl. Head Teachers)	Learners	Total
Bengali	18	8	26
Chakma	1	2	2
Marma	0	7	7
Tanchingya	1		1
Borua	2	1	3
Bom	1	2	3
Tripura	1		1

Table 5. *Hypothesis 1: MMC-based model*

TECH + USER (INTERVENTION)	*If we ...*	Integrated regular mathematics classes focused on the guided use of Kolibri by children into a school day, led by the teacher with significant training on digital literacy and the role of ICT in enhancing instructional practice,
OUTCOME	*Then ...*	Students would engage with the digital learning resources regularly in school,
IMPACT	*So that ...*	Students are more motivated to learn and achieve higher benchmark learning outcomes.

Table 6. *Hypothesis 2: Tablet-based model*

TECH + USER (INTERVENTION)	*If we ...*	Provided children with single-purpose, educational tablets for regular slots, to use outside of lessons, in and out of school, alongside teacher and parent onboarding,
OUTCOME	*Then ...*	Students would engage with the digital learning resources regularly in and out of school,
IMPACT	*So that ...*	Students are more motivated to learn and achieve higher benchmark learning outcomes.

Table 7. *Hypothesis 3: Feature-phone-based model*

TECH + USER (INTERVENTION)	*If we ...*	Provided children who already have access to a feature phone access to digital learning resources via a combination of interactive voice response (IVR), SMS messaging, and SD cards,
OUTCOME	*Then ...*	Students would engage with the digital learning resources regularly,
IMPACT	*So that ...*	Students are more motivated to learn and achieve higher benchmark learning outcomes.