 TECHNICAL REPORT

3MPower Inception Report

Mobile Learning for the Empowerment of Marginalised Mathematics Educators, Bangladesh.

Date 31st March 2022

Authors

Tom Power, The Open University
Hafizur Rahman, Dhaka University
Agnes Kukulska-Hulme, The Open University
Nure Alam Siddique, Dhaka University
Claire Hedges, The Open University
Sarasawati Dawadi, The Open University
About this document

Licence
Creative Commons Attribution 4.0 International
https://creativecommons.org/licenses/by/4.0/
You—dear readers—are free to share (copy and redistribute the material in any medium or format) and adapt (remix, transform, and build upon the material) for any purpose, even commercially. You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

Notes
EdTech Hub is supported by UK aid and the World Bank; however, the views expressed in this document do not necessarily reflect the views of the UK Government or the World Bank.
SECTION 1: Introduction

Study abstract

3MPower will generate evidence on technology use for Teacher Professional Development (TPD) in low- and middle-income countries, with a particular focus on children’s foundation numeracy skills in schools serving marginalised, low-income, rural communities. 3MPower will study the use of numeracy TPD courses on Muktopaath - a government-led e-Learning platform used by over 400,000 teachers in Bangladesh - to answer the question How are primary numeracy teachers using mobile learning for teacher development in rural schools and in what ways does this change learning and teaching? 3MPower will generate evidence about the validity of every step linking teachers’ use of mobile learning to improved student learning outcomes, through at-scale mixed methods research. 3MPower includes four process evaluation studies and two quasi-experimental impact evaluation studies with 240 teachers and 3,600 learners. Qualitative methods include Participatory Ethnographic Evaluation Research (PEER) exploring rural teachers’ experiences of accessing CPD with technology and the practical application CPD to teaching and learning. Throughout the research, 3MPower will engage a broad range of national stakeholders including government policymakers, policy implementers, teacher educators, rural education officers, and rural teachers. Stakeholders will participate in an iterative series of knowledge exchange activities, beginning with co-design and continuing throughout, to make sense of the emerging evidence, refine the research approach, and identify implications and recommendations for policy and practice. 3MPower findings will address significant gaps in global evidence on the use of technology for teacher development in marginalised schools, the role of communities of practice, and the impacts at-scale on teaching quality and learning outcomes.
<table>
<thead>
<tr>
<th><strong>Key study information</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
</tr>
<tr>
<td><strong>PI</strong></td>
</tr>
<tr>
<td><strong>Technical Team</strong></td>
</tr>
<tr>
<td><strong>ROO</strong></td>
</tr>
<tr>
<td><strong>Focus Country</strong></td>
</tr>
<tr>
<td><strong>Focus Topic(s)</strong></td>
</tr>
<tr>
<td><strong>Research Partners</strong></td>
</tr>
<tr>
<td><strong>Implementing Partner(s)</strong></td>
</tr>
<tr>
<td><strong>Budget</strong></td>
</tr>
<tr>
<td><strong>Duration</strong></td>
</tr>
<tr>
<td><strong>Methodology</strong></td>
</tr>
</tbody>
</table>
SECTION 2: Research focus and questions

Research objective

The purpose of this research is to generate evidence on technology use for Teacher Professional Development (TPD) in low- and middle-income countries, with a particular focus on strengthening children’s foundation numeracy skills in schools serving marginalised, low-income, rural communities.

The research will produce actionable insights relating to the processes of teacher development with technology—including how TPD providers can improve the equity of access for teachers from marginalised rural communities, how they can better align their programme content with the needs of teachers and learners in such communities, and how they can help schools to work together to strengthen teaching practice and learning outcomes, making TPD programmes more cost-effective.

Throughout the study, the research will generate recommendations for TPD policy and practice in collaboration with government policymakers and practitioners who are ultimately responsible for implementing the recommendations.

Background to the study

3Mpower will study at-scale TPD courses provided via Muktopaath, a Bangla-language e-Learning platform. Since Muktopaath was launched in 2016, some 1.8 million people have used its courses - which are free or low-cost (~$4). Muktopaath has been used by 400,000+ teachers. 3Mpower will focus upon courses to improve the teaching and learning of foundation numeracy skills in primary schools (grades 1 to 8). Over 130,000 teachers have completed the most popular course on numeracy teaching - Anonde Gonit Shikhi (Let's learn Maths with fun). The Directorate of Primary Education (DPE) is creating a pool of 2,000 Master Trainers to train teachers in this approach and the online Anonde Gonit Shikhi course is seen as an introduction to this method.

The sustainable, at-scale implementation of Muktopaath is enabled by the following characteristics:

- No donor or government funding is required to equip teachers and schools with technology. Teachers themselves use their own mobile phones to access materials and pay for using data on their devices
- Uptake is promoted by national policy and teacher training agencies
- Institutional infrastructure for mLearning is already in place
- Access to Muktopaath courses for teachers is either free or very low cost (~$3)

Research questions

The overarching research question is

How are primary numeracy teachers using mobile learning for teacher development in rural schools and in what ways does this change learning and teaching?

Sub-questions seek to explore the validity of assumptions in the Theory of Change linking mobile learning for teacher development with improved numeracy outcomes in rural schools.
1a) Which factors affect the equity of teachers’ access to mLearning for TPD?

1b) Is the content and pedagogy of Anonde Ganit Shikhi to teachers’ needs, in terms of the skills required to help students acquire foundational numeracy?

1c) In what ways, if any, do communities of practice embrace mLearning and support improvements in teaching practice in schools?

1d) How cost-effective is using mLearning for TPD in Bangladesh?

...and **evaluate the outcomes** of the use of mobile learning for teacher development

2a) Does mLearning for TPD improve teaching practices?

2b) Does mLearning for TPD improve student learning outcomes?

---

**Why the research is needed**

3MPower will address the gap in research evidence on the experiences and outcomes of using EdTech for Teachers’ Continuous Professional Development (CPD) in schools serving low-income rural communities—with a focus upon the teaching and learning of foundation skills in numeracy. As such, our study is at the intersection of several domains: *Learning poverty, Teacher development, EdTech, and Education in rural schools serving marginalised communities.*

Worldwide, more than half of all children are not expected to be proficient in basic literacy and numeracy skills by the time they are old enough to complete primary education. Children from lower income families, communities, and countries are disproportionately affected (UNESCO, 2017). This is sometimes referred to as ‘learning poverty’ (UNESCO, 2017; World_Bank, 2019). In Bangladesh, less than one-in-five students achieve expected standards in maths by grade 5 and improving foundation skills is a national priority (MOPME, 2017).

Only half of primary teachers in Bangladesh are qualified (World Bank, 2017). Low learning outcomes have been linked to teacher shortages in general and to shortages of mathematics teachers in particular - shortages which are often most severe in rural areas (Halim, 2011; Luftuzzaman et al., 2006). Many rural primary teachers have weak subject knowledge in maths (Luftuzzaman et al., 2006) and in numeracy teaching the use of inquiry, problem solving, or application to real-life situations is rare (Islam, 2017).

There is a growing willingness to explore the potential of technology for teacher development (DFID, 2018) and this is a rapidly growing field of global research, yet there are significant gaps in evidence - particularly concerning use in marginalised rural schools and impacts on teaching quality and learning outcomes (Hennessy et al., 2021, 2022).

3MPower will address these evidence gaps by researching the use of mobile learning for teacher development, at scale, in rural schools serving marginalised communities—and evaluating the impacts of such use on teaching quality and learning outcomes in numeracy.

---

**How the research leads to change**

Conceptually and practically, there is a gulf between the idea of teachers looking at something on their mobile phones and their students’ learning outcomes improving. When mLearning for TPD is being deployed to improve student learning outcomes an implicit set of assumptions are established bridging between the input (mLearning for TPD) and the desired outcomes (improved student learning), as shown in the figure below.
3MPower studies will generate evidence about the validity of every link in this logical chain, identifying issues and experiences that limit or enable effectiveness at each step. Iterative and ongoing knowledge-exchange activities are integral to the research design, engaging stakeholders in collaborative evidence-generation, sense-making, and application.

In the first quarter of 2022, the research will be co-designed with contributions from government bodies (MOPME, DPE, A2I, NAPE), education officers, teachers, and non-governmental organisations. We will continue to work with these stakeholders throughout the research through a series of Evidence Cafés—it makes sense of the emerging evidence, refining the approach, and considering the implications for policy and practice.

Throughout 2022 we will carry out four studies into the processes which link the mobile CPD programme with changes in teaching and learning. This research (studies 1a,b,c,d) will generate evidence to help national stakeholders strengthen the design and delivery of mobile CPD programmes, for greater impact on teaching and learning.

The following year, we will carry out a large-scale quasi-experimental evaluation of the outcomes of the mobile CPD programme—on teaching (Study 2a) and learning (Study 2b), with 240 teachers and 3,600 learners. Learning outcome data will be disaggregated by gender. UNESCO’s guidance on impact evaluation and quasi-experimental methods (White & Sabarwal, 2014) notes that conclusions from quasi-experimental studies are at times viewed as less definitive than those from randomised control trials (RCTs). However, QE methods often offer more practical options for impact evaluation in real-world settings as they allow the use of pre-existing or self-selecting groups. This is essential for evaluation of Muktopaath, as teachers are self-selecting in their use of the programme. UNESCO also recommends that the limitations of a QE design are best addressed through qualitative methods in conjunction with the QE methods, to gain better insights into why a programme has worked—or not—and it is for this reason that 3MPower has included PEER research alongside the quasi-experimental design, to capture teachers’ own views about the nature and extent of changes in teaching and learning, and factors which have enabled or constrained such changes.

Through proactive collaboration with policymakers, implementers, and educators, this study will generate evidence and insights enabling stakeholders to:

- Improve the equity of access to CPD and mLearning for female and rural teachers
- Increase the relevance of CPD content to the need for strong foundations in numeracy

---

Evidence Cafes (Clough & Adams, 2020) are knowledge exchange events between academics and practitioners. Cafes are facilitated by ‘evidence-based champions’ from stakeholder organisations. 3MPower will use evidence cafes to interpret emerging evidence, refine research, and generate recommendations.
• Strengthen school-level support for numeracy CPD and putting pedagogy into practice
• Promote more effective teaching practices and improved learning outcomes in numeracy
• Make evidence-based decisions on the cost-effectiveness of CPD and mLearning

Implementing partners

3Mpower is led by the Open University UK in partnership with the Institute of Education and Research (IER) at Dhaka University, Bangladesh. Our Consortium brings almost 15 years of research collaboration in EdTech and Open Educational Resources to support TPD in Bangladesh. Through English in Action (EIA) (2008-2018) IER and the OU researched the effectiveness of a national-scale TPD EdTech project in Bangladesh which reached 54,000 teachers and over 7m learners (Power et al., 2017).

The Open University, established in 1969, is globally recognised for the quality of its research. In the UK REF2021, OU’s education research ranked 2nd in the Power ranking. The OU works with LMIC partners to research and co-develop at-scale TPD programmes using low-cost technologies to enhance teachers’ practice and students’ learning. EIA innovated through research to develop the ‘Trainer in the Pocket’, helping teachers study using their own mobile phones. It increased the proportion of primary and secondary students who can use basic English from 36% to 70%, and 40% to 80%, respectively. 3Mpower will be based at the OU’s Centre for the Study of Global Development (CSGD), directed by Prof. Kwame Akyeampong. 3Mpower will reside in CSGD Research Hub 5: Professional Learning and Technology.

The Institute of Education and Research, Dhaka University, is a multi-disciplinary research-led institution in the field of education, influencing policy and practice in Bangladesh. It has strong relationships with government in country, supporting the Ministry of Primary and Mass Education (MoPME), Directorate of Primary Education (DPE), National Curriculum and Textbook Board (NCTB) and others with research, development of curricula and textbooks, and the capacity building of their personnel.

The government’s key implementing agency for Muktopaath is Aspire to Innovate (a2i), the Prime Minister’s Office’s flagship programme for ‘Digital Bangladesh’. a2i has overall responsibility for the Muktopaath platform and led the development of the Anonde Ghonit Shikhi course in collaboration with Math Olympiad. a2i is a government program run by Bangladesh’s ICT division, with assistance from the Cabinet Division and the United Nations Development Programme (UNDP). The fundamental purpose of a2i is to provide all citizens of Bangladesh with easy, inexpensive, and dependable access to quality public services, through digital innovations.

3MPower is highly relevant for a2i’s future plans to further upscale the use of EdTech for TPD. Aspire to Innovate have committed to involvement in co-design, project meetings and activities and to using the research findings at practice/policy levels. 3MPower is also supported by the Permanent Secretary for the Ministry of Primary and Mass Education (MOPME) and by the Director General of the Directorate of Primary Education (DPE), being the senior figures for primary education policymaking and implementation, respectively.
SECTION 3: Literature review

Introduction

This willingness to explore the potential of EdTech for teacher development is reflected in the UK’s international education policy - *Get Children Learning* (DFID, 2018). Such policy developments are informed by a rapidly growing body of global research but there are significant gaps in global evidence (see the recent rigorous review from the EdTech Hub, Hennessy et al., 2021, 2022) concerning:

- the needs of marginalised communities,
- the role of communities of practice within or between schools
- the impact on teaching quality and student learning outcomes

3MPower’s research will address each of these gaps by examining the use of EdTech in TPD for foundation numeracy skills in Bangladesh.

Although numeracy and literacy are both essential enablers of lifelong learning, literacy is often privileged over numeracy. For example the World Bank has chosen to ‘...focus the Learning Poverty metric specifically on reading...as an easily understood metric of learning...and as a proxy for foundational learning in other subjects...’ (World_Bank, 2019, p. 9). 3MPower will focus on foundation numeracy skills as the more under-researched area, while recognising that foundation literacy and foundation numeracy skills are both essential and often very highly correlated (World_Bank, 2019).

Before the pandemic, 387 million young people—around half of all children worldwide—were not expected to develop solid foundations of basic literacy and numeracy by the time they were old enough to complete primary education. Children from lower income countries and households are disproportionately affected. Most children in low and middle-income countries won’t have strong foundation skills by the end of their primary education (UNESCO, 2017). The World Bank refers to this as *Learning Poverty*. Recent data from the World Bank and the UNESCO institute of statistics estimate that 58% of children in Bangladesh are in learning poverty (Azevedo et al., 2021).

In Bangladesh, the National Student Assessments (NSA) show that over 80% of all learners fail to achieve the expected levels in mathematics by grade 5 (MOPME, 2017). However the way the NSA data is analysed, using bands, obscures the visibility of foundation skills. There is an analysis gap in the NSA data regarding the acquisition of foundation numeracy skills and disaggregation of foundation skills for different groups of students such as those from lower-income households or communities, ethnic or linguistic minorities, and rural areas. A study of secondary-aged learners in rural areas found that over half of the children struggled with foundation numeracy tasks (Asadullah & Chaudhury, 2015) - a finding which both supports the World Bank/UNESCO statistic and gives some possible insights into the likely position of foundation skills within the NSA data.

While the last three sets of National Student Assessment (NSA) data indicate “...that there is gender equity in mathematics performance in Bangladesh” (MOPME, 2017, p. 24), Asadallah and Chaudhury (2015) found rural girls systematically scored below boys on basic numeracy skills - even though girls typically had more schooling (0.6 years) and were more likely to have completed primary education.

---

2 The Department for Primary Education (DPE) notes ‘...the legacy bands may not be an accurate framework for the evaluation of student achievement...’. (MOPME, 2017, p. 4)
It is well-established that teaching quality is the most important factor determining student learning outcomes (see Boissiere, 2004; Bold et al., 2017; Glewwe & Kremer, 2006; Rivkin et al., 2005). Improving teaching quality is therefore fundamental to addressing gaps in learners' foundation skills. Yet, despite massive investment in teacher education worldwide, many teachers remain poorly prepared to address learners' needs. For example, a study across seven countries in Sub-Saharan Africa found that although good teachers had significant, large, and positive effects on student achievement, good teaching practices were rare - many teachers had weak subject and pedagogic knowledge (Bold et al., 2017). In Bangladesh, Asadullah and Chaudhury found that low levels of basic numeracy skills among rural learners ‘...cannot be explained in terms of household and child characteristics...’ and were most likely ‘...attributed to the low quality of schools in rural areas’ (2015, p. 463).

UNESCO (2014, p. 30) argues that “all children must have teachers who are trained, motivated and enjoy teaching, who can identify and support weak learners, and who are backed by well-managed systems” but only half of all primary teachers in Bangladesh are qualified (World Bank, 2017). Worldwide, children from rural areas, low-income households, and ethnic minority groups are disproportionately affected by shortages of qualified teachers. For instance, Nawab and Bissaker (2021) argue that rural students in Pakistan underperform compared with their counterparts in urban areas mainly because of the lack of quality teachers. Similar in Bangladesh, although the government provides financial incentives to encourage qualified teachers into rural areas there are still fewer qualified teachers in rural areas - which may be compounded by more limited access to in-service training in rural areas (Begum et al., 2019).

Low learning outcomes have been linked to teacher shortages in general and shortages of mathematics teachers in particular (Halim, 2011; Luftuzzaman et al., 2006). Many rural primary teachers have weak subject knowledge in maths (Luftuzzaman et al., 2006) and the use of inquiry, problem solving, or real-life situations in numeracy teaching is rare (Islam, 2017). The government has launched large-scale in-service programmes to improve teaching quality. The 2020-2025 Education Sector Plan sets out plans for the development and expansion of ICT based programmes for teacher professional development as a priority target (MOPME, 2020).

Equity of access

Digital divide research (Soomro et al., 2020; Thunman & Persson, 2013; van Dijk, 2006) suggests four successive types of access...

- physical,
- motivational,
- skills,
- use

...with attention currently shifting from issues of physical access towards motivation, skills and usage. “In terms of physical access, the divide seems to be closing in the most developed countries; concerning digital skills and the use of applications the divide persists or widens” (van Dijk, 2006, p. 229).

It is well documented that teachers have differential physical access to digital technologies depending upon geographic location, socio-economic status, age and gender (See Shrestha et al., 2021; Soomro et al., 2020; USAID, 2020). Teachers’ access to and use of technology for professional development is affected by their personal characteristics. For instance, younger teachers may possess higher ICT skills and utilise technology more often in their daily lives than older teachers (Soomro et al., 2020; Thunman & Persson, 2013). However, the Global T4 Teachers Survey—of over 20,000 teachers from 165 countries—found older and more
experienced teachers used digital tools to deliver alternative learning during the pandemic much more regularly, and using more sophisticated approaches to teaching, than their younger peers. Their findings “truly dispel the myth of older teachers being reluctant to embrace new technologies” (2021, p. 11).

The gender digital divide has also been reported in low-and middle-income countries. According to USAID (2020), “more than 300 million more men than women access the mobile Internet in low- and middle-income countries, and smartphone ownership, a principal way of accessing the Internet, is 20 percent lower for women than men” (p.2). Furthermore, research shows that male and female teachers use technology in different ways. For instance, according to (Thunman & Persson, 2013), female teachers use VHS/DVD players more often than male teachers whereas male teachers tend to use more audio materials to convey information and facts than do their female counterparts. Burnip (2006) and Thunman & Persson (2013) found that schoolteachers’ access to technology depends on their school type (private/public), with teachers in public schools having lower levels of access to, and use of, technology compared to teachers in private or independent schools.

Research shows a digital divide between teachers in rural and urban schools in LMICs, with rural school teachers having less access to technology (see Pota et al., 2021; and Shrestha et al., 2021). However, even when teachers have access to technologies “they may be reluctant to use them for professional purposes” (Hennessy et al., 2022, p. 4). For instance, Quaicoe and Pata (2020) argue that although teachers are digitally proactive in other areas of life, they appear not to be using technology and digital resources for professional learning.

In LMICs, the professional development needs of rural teachers differ from their urban counterparts. For instance, in the context of Indonesia (Soebari & Aldridge, 2016) and Fiji (Mohan et al., 2017), teachers in rural schools face more challenges as they are disadvantaged by several conditions such as large class sizes, and inadequate resources and facilities. Rural schools may also face significant challenges in providing professional development for teachers, including limited availability of human and material resources and geographic isolation (Glover et al., 2016). The use of mobile learning or EdTech to facilitate TPD could, in principle, overcome some of the obstacles of isolation from professional development resources in rural schools. Or it may be that, in practice, other barriers to access arise which replicate physical isolation in the digital domain.

**EdTech and CPD**

There is a rapidly developing body of evidence on the use of EdTech for teacher development in LMICs (Hennessy et al., 2021, 2022). A meta-analysis of 77 randomised experimental trials in primary schools in LMICs found that the two school-based interventions with the largest effect sizes were the introduction of educational technology and school-based teacher development (McEwan, 2015). However, Hennessy et al (2021) emphasise that EdTech and TPD need to go hand-in-hand, as the introduction of EdTech increases rather than replaces the need for teacher development.

Effective TPD programmes in LMICs typically share a number of common characteristics (see Orr et al., 2013; Bruns & Luque, 2015; Westbrook et al., 2013):

- they focus on practical activity in the classroom
- they provide teachers with learning resources, which guide classroom activity
- they create opportunities for peer-learning between teachers
- professional development is facilitated over a significant period of time, often by school leaders or other teachers within schools
The use of EdTech for CPD does not replace the need for these aspects of TPD programme design but can be seen as an additional aspect which enhances the others. For example, the EIA programme in Bangladesh incorporated peer support and co-learning for teachers, ongoing support for the application to classroom practice, support from head teachers, alignment with the curriculum, and also introduced mobile technology as a ‘fifth element’ of support (Power, 2019a). EIA used mobile phones and memory cards to give teachers reliable, free, offline access to a library of ‘Mediated Authentic Videos’ of classroom practice for ‘anytime, anywhere’ learning’ (Woodward et al., 2019). The Mediated Authentic Videos helped teachers focus on classroom activity, they provided practical guidance to support preparation and teaching, and they provided prompts and exemplar discussions to promote reflection and peer-learning between teachers.

The use of videos for teachers to observe and critically reflect on teaching practice is now a common area of research, as is the use of preloaded devices to provide teachers with teaching and learning materials, and the use of social media - especially WhatsApp and Facebook - to support collaboration and foster remote communities of practice. However, there are several gaps in the international evidence—very little of the research considers the needs of marginalised learners or vulnerable communities; the role of Communities of Practice in schools is unexplored; and there’s a lacuna of research evaluating the impact of TPD on teaching practice and learning outcomes (Hennessy et al., 2021).

Communities of practice

“Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly.”
(Wenger-Trayner & Wenger-Trayner, 2015, p. 1)

A community of practice (COP) is not the same as a community of interest. There are three features that are essential. These are the domain, the community and the practice. A shared domain of interest defines the identification of a community of practice. Members participate in collaborative activities and debates, assist one another, and share information in order to pursue their interest in their domain. Practitioners in a community of practice establish a shared portfolio of resources, such as experiences, stories, tools, and approaches to recurring problems—in short, a shared practice. A community of practice is made up of these three aspects in combination (Wenger-Trayner & Wenger-Trayner, 2015).

Work on communities of practice began in the fields of business, knowledge management, and organisational learning (Wenger et al., 2002) but has increasingly been used as a way of thinking about professional learning in educational settings (See for example Banks & Gouda, 2006; Cuddapah & Clayton, 2011; Niesz, 2010; Patton & Parker, 2017; Takahashi, 2011). Hennessy et al (2022) found many studies of the use of technology to foster remote communities of practice among teachers in LMICs - both through teacher-led sharing of practice via social media and through the adoption of social media within formal TPD programmes. However, Hennessey et al (2021) also noted an evidence gap on the role of COPs in schools.

It is not sufficient to think only about how EdTech can support the development of remote COPs for professional development. It is equally important to think about how in-school COPs can support the use of EdTech for professional development - particularly given the importance of teacher co-learning, application to classroom practice, and the role of school leaders in effective professional development. So 3MPower will examine the role of remote communities of practice enabled by EdTech and also the role of in-school communities of practice in supporting praxis - learning from the practical application of new ideas and approaches to teaching promoted by the EdTech CPD programmes.
Cost-effectiveness

Walls et al (2020) have set out a common framework for capturing, analysing, and using cost information in education programming. The fundamental objective is to facilitate adoption of robust cost measurement practices and for the results to improve effectiveness of global investments in education development among funders and national governments. Alongside this, FCDO 4Es analysis approach is shaped by Economy, Efficiency and Effectiveness. Later a fourth E–Equity– has been added, conveying the message that development is only of value if it is also fair (DFID, 2019).

The relationship between cost-effectiveness and equity has been explored in the context of the Girls Education Challenge through multi-dimensional programmes that frequently focus on direct support for learners (e.g. bursaries) with TPD as a supplementary component, such as Camfed’s programme in Tanzania.

“One of the key messages … is that, whilst it may cost more to reach the most marginalised, … the impact per dollar spent on Camfed’s programme in Tanzania provides even more value for money than when only learning gains are considered. … Finally, by addressing the needs of the most marginalised, programmes such as Camfed’s can be seen to address the needs of all: inclusive education systems will function for everyone if they function for the most marginalised” (Sabates et al., 2018).

The use of mLearning for TPD is highly scalable yet low cost as even in lower-income countries most teachers own smartphones and can be seen to have the potential to reach the most marginalised.

Turning to Bangladesh, a study of at-scale mobile learning for English language teachers found significant shifts in teaching practice and learning outcomes (Power et al., 2017). Hedges et al (2019) found this mobile learning intervention for TPD yielded substantially bigger gains in learning outcomes for a marginally higher cost of training, giving better value for money. Yet while this is an area of active concern and investment, mLearning for TPD remains under-researched (Haßler, 2020).

An exception is a study by Islam et al (2022), which explored cost-effectiveness of an intervention using mobile phones to deliver a set of audio lessons to primary school students using Interactive Voice Response in Bangladesh, with a focus on the relationship between fixed and variable costs and scaleability.

Evaluating impacts on teaching practice and learning outcomes

In their review of evidence from TPD programmes using EdTech, Hennesssey et al. (2021) identified the absence of evaluation evidence robustly demonstrating the impact of TPD programmes on teaching practice and student learning outcomes. Only 9% of studies mentioned changes in classroom practice—and most of those relied on self reporting—while just 8% mentioned learning outcomes... Student learning was rarely mentioned in any region other than SSA [Sub-Saharan Africa] (Hennessy et al., 2021, pp. 44–45).

A recent review of EdTech initiatives in Bangladesh by the EdTech Hub (Zubairi et al., 2021) points to technology-based teacher professional development initiatives having had a positive effect on teaching and learning, partly attributed to enabling teachers to engage in professional development outside of school hours. However, most of the studies reviewed had small sample sizes and teacher’s voices weren’t fully present within the evaluations.

Previous research carried out in Bangladesh, by the Open University and the Institute of Education and Research at Dhaka University, provides an exception. The research team from the English in Action project (EIA) carried out several, at-scale systematic studies of changes
in classroom practice and student learning outcomes. EIA's at-scale TPD programme used mobile learning to enable school-based teacher development for English Language teachers in primary and secondary schools (Power, 2019b; Power et al., 2012). The final impact evaluation was designed as a quasi-experimental study (Power et al., 2017). Schools were randomly assigned as 'control' (not taking part in the TPD programme) or 'treatment' (taking part in the TPD programme). Then the research team conducted timed observations of 163 individual teachers’ lessons and carried out diagnostic assessments of proficiency in spoken English for 1,802 individual students, at the beginning and end of the study. This approach enabled comparison of the changes over this time, between the control and treatment schools (known as a difference-in-differences analysis). Although nationwide security disruptions in early 2015 meant teachers only had two-to-three months to put the programme into practice by the post-test, the study still showed marked changes in teaching practice—such as decreases in teacher talk, and increases in student-student talk—and statistically significant changes in learning outcomes for some learners.

The design of the 3MPower quasi-experimental study will be adapted from the previous study for EIA, with timed observations of teaching practice (RQ 2a) and standardised assessments of learning outcomes in numeracy (RQ 2b).
SECTION 4: Methodology

Summary of approach

In the first quarter of 2022, the research will be co-designed with contributions from national education stakeholders, including policymakers (MOPME, a2i), policy-implementers (DPE, NAPE), and rural teachers. We will continue to work with these stakeholders throughout the research, through a series of knowledge-exchange (KE) events, to understand and contextualise the findings, to iteratively refine the research approach, and to develop recommendations for policy and practice in TPD.

We will explore whether, how, and under what circumstances teachers’ use of technology for professional development impacts upon their student’s learning outcomes. There are a series of logical assumptions, not always explicit, which link an intervention to an intended outcome—in this case linking the use of technology for teacher development to improved student learning outcomes. The key strategy for establishing causality is to examine the evidence for causal relationships at each step in this logical chain (Rogers, 2014). 3MPower will examine each step linking mobile CPD for teachers to student learning outcomes (below).

Throughout 2022 we will carry out four studies into the processes which link the mobile CPD programme to changes in teaching and learning. These process studies (1a,b,c,d in diagram above) will generate evidence to help DPE, A2I, NAPE, and other stakeholders strengthen the design and delivery of mobile CPD programmes, for greater impact on teaching and learning.

The following year, we will carry out a large-scale evaluation of outcomes from the mobile CPD programme—on teaching (Study 2a) and learning (2b)—through a quasi-experimental study involving 240 teachers and 3,600 learners.
**Planned approach to sampling**

We will use purposive sampling to select teachers in Government Primary Schools serving learners from lower-income rural households, including communities with high proportions of ethnic and linguistic minorities, such as in the Chittagong Hill Tracts and the flood plains of the Hoar River. We will also ensure that the proportion of female teachers in the study is at least representative of or greater than the proportion of female teachers within the target schools (~65%), so that the studies are attuned to gender issues relating to technology use, marginalisation, and teacher development. An initial sampling frame will be shared with stakeholders and refined at the co-design workshop. The planned sample for each study is summarised in the table below.

<table>
<thead>
<tr>
<th>Study</th>
<th>Research Focus</th>
<th>Method</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>equity of access</td>
<td>PEER approach</td>
<td>100 teachers</td>
</tr>
<tr>
<td>1b</td>
<td>pedagogy of mLearning TPD</td>
<td>Desk review &amp; survey</td>
<td>250 teachers</td>
</tr>
<tr>
<td>1c</td>
<td>communities of practice</td>
<td>PEER approach</td>
<td>100 teachers</td>
</tr>
<tr>
<td>1d</td>
<td>cost-effectiveness</td>
<td>Comparative</td>
<td>~</td>
</tr>
<tr>
<td>2a</td>
<td>teaching practices</td>
<td>Timed Observation</td>
<td>240 lessons</td>
</tr>
<tr>
<td>2b</td>
<td>student learning outcomes</td>
<td>Standardised Assessment</td>
<td>3,600 students</td>
</tr>
</tbody>
</table>

**PEER researchers** will self-select (volunteer) for the study, based upon their interest in the research area. We anticipate that government and other stakeholders may prefer peer-researchers to be selected from ‘model schools’ and ‘best teachers’ within each Upazila, in association with local Upazila Education Officers. Draft criteria and processes for recruiting peer-researchers will be finalised through stakeholder engagement during co-design. The processes by which PEER researchers will recruit other teachers to participate in the study will be developed in collaboration with the PEER researchers themselves, during their induction workshop in May 2022.

For the **quasi-experimental evaluation studies** in 2023, treatment teachers will be chosen from among those actively engaged in the target TPD programme that year. Control teachers will be drawn from those who have not yet taken part in the programme. We will ensure comparability of control and treatment samples with regard to gender, school location (urban/per-urban/rural), and socio-economic status of the local administrative area (upazila) using either Coarsened Exact Matching or Stratified Random Sampling to ensure comparability of control and treatment groups.

A final sample size of 210 teachers is assumed. With 80% power at 5% significance (two-tailed), this is sufficient to detect effect sizes of 0.39. With a one-tailed test, much smaller effect sizes will be detectable. To allow for attrition, the sample has been increased to 240 teachers initially. A sample of 15 students will be taken from each teacher’s class, giving a total sample of 3,600 students (with attrition, this should give a minimum sample of 2,400 students in total at post-test). The student sample will allow detection of effect sizes (Pearson’s r)\(^3\) down to \(r = 0.06\), with 80% power at 5% significance (two-tailed).

\(^3\) See (Cohen, 1988)
Planned approach to data collection

PEER research studies: Equity of Access (1a) and Communities of Practice (1c)
Participatory Ethnographic Evaluation Research (PEER) approaches will be used to gain insights into teachers’ experiences of accessing CPD with technology, and of applying principles and practices from CPD to teaching and learning within their schools. PEER research may allow gathering of authentic data much more quickly than via traditional ethnographic approaches, with greater cultural sensitivity and contextual nuance (Elmusharaf, Byrne, & O'Donovan, 2017; Elmusharaf, Byrne, Manandhar, et al., 2017).

For each of the two studies, 20 peer researchers—themselves numeracy teachers in rural primary schools—will be recruited and attend initial workshops to introduce them to the PEER method, identify important issues, and co-design the approach for data gathering. Each peer-researcher will gather data from at least 5 other teachers—sampling at least 100 teachers in total for each study—over approx. 4-8 weeks. Peer researchers will also participate individually and collectively in data analysis and evidence cafés. There will be two cycles of peer research during 2022—the first to identify important issues and experiences, the second to explore these in-depth.

Study of TPD Pedagogy (1b)
In the first half of phase two, we will examine the Anonde Gonit Shikhi programme design with the people who developed the course, to understand their approach to mLearning CPD for teachers and to foundation skills in numeracy. We will also conduct a desk review of the programme content. In the second half of Phase 2, we will conduct a survey of at least 250 teachers, to explore how well teachers feel the programme met their needs in relation to teaching foundation numeracy skills. Survey data will be gathered remotely, if appropriate.

Impact Evaluation (2a and 2b)
The evaluation will examine teaching practices and learning outcomes, comparing teachers who are taking part in the mLearning CPD programme (treatment) with those who have not yet taken part (control). There will be two rounds of fieldwork, one close to the start of the school year (pre-test) and another near the end (post-test). The studies will compare the changes over this time, to see what difference the CPD programme made on learning outcomes between the start and end of the study (difference-in-differences).

Study of Teaching Practices (2a)
For the study of teaching practices (2a) teaching practices in foundation numeracy, fieldworkers will conduct a timed observation of numeracy teaching by 120 teachers taking part in the mLearning CPD programme and 120 teachers who have not yet taken part, recording teacher and student activities at regular intervals during the lesson. The observation instrument will be field tested and calibrated towards the end of 2022, ready for use in 2023.

Study of Learning Outcomes (2b)
Potential instruments for learning assessment will be considered in collaboration with national stakeholders, including the Early Grade Mathematics Assessment (EGMA) and numeracy tasks from Pratham’s widely used Annual Status of Education Report (ASER) protocol. Agreed instruments will be field tested and calibrated towards the end of 2022, ready for use in 2023.

Fieldworkers will then gather assessment data on foundation numeracy skills from fifteen students from each teacher—giving a total sample of 3,600 students.
Planned approach to data analysis

PEER research studies: Equity of Access (1a) and Communities of Practice (1c)

In order to fully involve the 20 PEER researchers from each study in data analysis, it will not be possible to use qualitative coding software such as QSR Nvivo. Instead, we will use a collaborative and iterative approach to thematic analysis (Braun & Clarke, 2021), drawing upon practices established in previous work with practitioners without prior research experience (Power et al., 2021, pp. 24–25). To make the process as transparent and rigorous as possible, insights from the data will be discussed through multiple iterations, between pairs of researchers (a peer-teacher and supporting early-career researcher) and the wider team, adapting the stages suggested by (Richards & Hemphill, 2018), below.

Study of TPD Pedagogy (1b)

In the first half of phase two, we will discuss the Anonde Gonit Shikhi programme approach with the people who designed the course, to understand their approach to mLearning CPD for teachers and to foundation skills in numeracy. We will then conduct a desk review of the programme content. Working with stakeholders, we will agree themes based upon the characteristics of effective Teacher CPD programmes (identified in reviews of work from low- and middle-income countries, as summarised in Moon, 2018; Power, 2019a), then conduct a thematic analysis of the course content to identify the ways in which such characteristics are embodied in, or omitted from, the programme design. We will conduct the analysis in collaboration with programme designers.

Following the analysis of TPD pedagogy in programme design, we will develop a closed-question user-survey for teachers—exploring how well they felt different aspects of the design met their needs, including whether the TPD program was suitable in terms of ease of access, teachers’ digital literacy etc—which will be analysed through descriptive statistics.

Evaluating the impact of technology use for CPD on Teaching Practice (2a) and Learning Outcomes (2b)

As noted in the previous section, these studies will examine teaching practices (2a) and learning outcomes (2b) for foundation numeracy skills, comparing teachers who are taking part in the mLearning CPD programme (treatment) with those who have not yet taken part (control). There will be two rounds of fieldwork, one close to the start of the school year (pre-test) and another near the end (post-test).

The analytical approach will compare the changes in outcome over time, between the treatment and control groups. This is known as a ‘difference-in-differences’ method and is recognised by UNICEF’s Office of Research, Innocenti, as a good approach to calculate estimates of quantitative impacts (White & Sabarwal, 2014). Differences-in-difference analyses depend upon the control and treatment groups being as alike as possible, so careful
steps need to be taken to ensure during sample design (White & Sabarwal, 2014). We will identify the most appropriate method for this with stakeholders during 2022 (see sampling).

**Planned approach to cost-effectiveness analysis**

**STUDY 1 D: Cost-Effectiveness**

The Research Question will be examined using the Building Evidence in Education Cost Measurement Guidance Note (Walls et al., 2020). In Phase 2, we will capture costs and reach data for the Anonde Gonit Shikhi programme through desk research and interviews with the programme design and finance teams. We will consider costs incurred by implementing agencies, by schools and by teachers. Costs will include those for the required technology, data use, TPD materials, teacher support and assessment. Pre-existing Government cost data will be collected from DPE and A2I. This will be supplemented by use of a costing tool, such as an adaptation of the Brookings Institute tool, in interviewing key informants to collect any missing information (e.g., staff time). Upazila / school costs will be collected via Study 1C. Teacher costs will be collected via Study 1A. Reach data will be collected through an interrogation of the Muktopaath Dashboard in liaison with A2I. Cost-efficiency analysis will then calculate unit costs per participating teacher and learner for the programme. Quantitative survey data from study 1b) will be used to compare the deployment of the programme funds with what teachers actually use and value. Further, an equity lens will analyse if/how programme resources are being used to compensate for existing barriers to TPD for marginalised groups of teachers.

In Phase 3, when the results (i.e. student learning outcomes) data is generated by the quasi-experimental study, a cost-effectiveness analysis will occur. The key indicator will be the unit cost per learner with an improved numeracy learning outcome, defined as a learner moving out of the non-learner category (a non-learner being defined as scoring less than 10% on the pre-test numeracy learning assessment). The unit cost per teacher with changed practice will also be calculated. The analysis will cover impact, scale, sustainability and affordability, unpacking the features of the target programme and context that drive costs and results.

**Potential risks and challenges related to the methodology and how these will be managed**

Most schools in Bangladesh have been closed due to COVID-19 since March 2020 until the government reopened all schools in October 2021. Further school closures are not anticipated but if schools do have to close again we will adapt the research studies to the new context, for example:

- study 1a) will examine the ways in which mobile learning allows for continuity of professional learning and also exploring the challenges and limitations of this;
- study 1b) will evaluate the relevance of the mLearning pedagogy in meeting teachers’ need to support remote learning by students;
- study 1c) will explore how teachers, school leaders, and education officers are finding ways to support each others’ professional development and childrens’ learning
- Study 2a) will quantify teachers’ readiness to support remote learning in numeracy, the proportion of learners reached, and the extent of teachers’ engagement in teaching numeracy remotely.
- Study 2b) will adapt the methodology of remote-evaluation of foundation numeracy skills by telephone-based assessment used successfully in an RCT by Pratham in Botswana (Angrist et al., 2020).
## SECTION 5: Engagement and uptake

### Anticipated outputs of the study

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Output</th>
<th>Research &amp; KE activity (Activity ID)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2 2022/03</td>
<td>Inception Report</td>
<td>Co-design workshop &amp; documentation of full research design (1.05, 1.07, 1.08)</td>
</tr>
<tr>
<td>Q3 2022/06</td>
<td>Workshop report - Equity of Access (study 1a)</td>
<td>PEER researcher induction workshop (2.03)</td>
</tr>
<tr>
<td>Q3 2022/06</td>
<td>Workshop report - Community of Practice (study 1c)</td>
<td>PEER researcher induction workshop (4.03)</td>
</tr>
<tr>
<td>Q4 2022/09</td>
<td>Report on target programme design &amp; content (study 1b)</td>
<td>Desk review of target programme design, available evaluation data, and content (3.02, 3.03)</td>
</tr>
<tr>
<td>Q4 2022/09</td>
<td>Report on Evidence Cafe 1</td>
<td>First cycle of PEER research for: Study 1a (2.04, 2.05) and Study 1c (4.04, 4.05). Desk review of target programme design and content, study 1b (3.04, 3.03)</td>
</tr>
<tr>
<td>Q5 2022/12</td>
<td>Report on Evidence Cafe 2</td>
<td>Second cycle of PEER research for: Study 1a (2.06, 2.07) Study 1c (4.06, 4.07) Survey of teachers’ experience of target programme, study 1b (3.04, 3.05)</td>
</tr>
<tr>
<td>Q5 2022/12</td>
<td>Documentation of full design for QE study (2a, 2b)</td>
<td>Analytical framework (7.01) Field testing/instruments (7.02) Sample design (7.03)</td>
</tr>
<tr>
<td>Q6 2023/03</td>
<td>Phase II completion report (Cross-study analysis - what have we learned?)</td>
<td>Studies 1a-d knowledge exchange (6.01, 6.02, 6.03)</td>
</tr>
<tr>
<td>Q7 2023/06</td>
<td>Fieldwork competition report —pretest</td>
<td>Study 2a&amp;b, recruitment, induction &amp; pretest fieldwork (7.04, 7.05, 7.06, 7.07)</td>
</tr>
<tr>
<td>Q8 2023/09</td>
<td>4 policy briefs, 2 journal articles, 2 webinars, and 2 conferences</td>
<td>Studies 1a-d Knowledge Exchange - Global KE products (6.04)</td>
</tr>
<tr>
<td>Q9 2023/12</td>
<td>Fieldwork competition report —post-test</td>
<td>Study 2a&amp;b Post-test fieldwork (7.12, 7.13)</td>
</tr>
<tr>
<td>Q10 2024/03</td>
<td>Quasi-experimental study report</td>
<td>Completion of study 2a&amp;b (7)</td>
</tr>
<tr>
<td>Q11 2024/06</td>
<td>Project Completion Report</td>
<td>Completion of all studies and KE events</td>
</tr>
<tr>
<td></td>
<td>4 policy briefs, 4 journal articles, 2 webinars/conferences</td>
<td>Studies 2a, 2b Knowledge Exchange - Global KE products (8.02)</td>
</tr>
</tbody>
</table>
Pathways to uptake and dissemination plan

The research outputs listed above fall into four broad categories, each with distinct audiences and purposes. The **research reports** are primarily for the EdTech hub but also contribute to the important body of grey literature used by EdTech and teacher-education researchers and practitioners. The research reports demonstrate the robustness and rigour of the research method, provide comprehensive analysis of the data, and identify key findings. **Policy briefs** are intended for policymakers and other education decision-makers—they provide clear evidence summaries, identify key issues and provide actionable recommendations, developed with and for education policy and practitioners through evidence cafés (below). **Journal articles** are written primarily for the global academic research community, and provide an in-depth critical examination of particular aspects of the evidence from the research reports or synthesise findings from multiple reports. **Webinars and conferences** provide opportunities to share emerging evidence or full findings with various research, practitioner, or policymaker communities - to encourage engagement, development of ideas or evidence, and uptake.

Through these various research outputs and pathways to uptake we hope that, in Bangladesh and around the world:

- Those designing and delivering programmes using EdTech for TPD will have a better understanding of:
  - How to improve the equity of access for rural teachers, female teachers, and teachers from marginalised communities
  - How communities of practice, within or between schools, can help teachers learn by putting new ideas into practice in the classroom
- The EdTech research community will have access to rigorous data which addresses current gaps in research-evidence around the use of EdTech for TPD in marginalised communities and the impact of such use on teaching and learning.
- Policymakers will have a better understanding of where best to invest in the use of technology for TPD

**Stakeholder mapping and engagement**

We have identified a broad range of stakeholders within Bangladesh, including government policymakers (Ministry of Primary & Mass Education, Aspire 2 Innovate), policy implementers (Directorate of Primary Education), teacher educators (National Academy of Primary Education) and rural education officers and teachers. We will work with key representatives from these organisations, from inception to project completion, to make sense of the emerging evidence, refine the research approach, and identify implications and recommendations for policy and practice.

The processes of equitable knowledge-exchange will begin with co-design during inception and continue with Evidence Cafés during phases two and three. Rural teachers will also be engaged as PEER-researchers and will contribute to evidence cafés throughout the study, so that teachers' voices are heard and their perspectives are valued.
SECTION 6: Ethics and risk management

Research ethics

OU-led research is supported by a robust governance framework to ensure high ethical standards. The OU Pro-Vice-Chancellor Research, Enterprise and Scholarship (PVC-RES) oversees research conduct and investigates allegations of malpractice. OU researchers adhere to: 1) Ethics Principles for Research with Human Participants; 2) OU Code of Practice for Research, 3) The principles in the 'The Concordat to Support Research Integrity' (2019). These and OU’s Annual Statement on Research Integrity are available here.

3Mpower submitted a full ethics application to the OU Human Research Ethics Committee and has received a favourable opinion. HREC commented that they saw the iterative and collaborative approach to research and the way of working with the committee as exemplary practice. The application to HREC included detailed proposals for methods of data collection, analysis and protection; how participants will be recruited; which ethics or legal guidelines will be followed; how harm to participants will be avoided; and how robustly the project will be managed. We will also follow the BERA guidelines for educational research in the UK.

The consortium partners will work together with a broad range of stakeholders to ensure that the ethical approach is fit for purpose and culturally and contextually relevant. The Institute of Education and Research at Dhaka University is in the process of developing formal ethics frameworks for educational research and the experiences of 3MPower will feed into that process through knowledge exchange.

Informed consent will be secured from all participants - adults and children. A Project Information Sheet in line with OU guidelines on informed consent will be shared in a language participants can understand. It will contain suitable, age-appropriate information about the research aim, data collection and use, the expected conduct of the research team, and contact details if alleged misconduct arises or if participants would like to withdraw from the study. Local field officers will provide explanations on this to participants in their mother tongue. Ethical procedures will be culturally and contextually sensitive. In some communities, many parents and children will not be fully literate. We will thus offer alternative channels to express consent, e.g. signature, verbal approval, or via use of a visual consent form.

Data management. All data collected will remain confidential. Schools and participants will be assigned anonymised unique identification numbers used throughout data analysis and reporting. All research tools, data collection instruments, and analytical methods will be developed with IER to ensure cultural appropriateness.

Inclusion & representation. Sampling and consultation with communities prior to research will ensure a diverse range of participants (i.e. gender, ethnicity, disability). We will amplify the voices of rural women teachers, and conduct women-only focus groups if appropriate. Rural teachers will be trained as PEER researchers and their stories will be foregrounded as part of research dissemination.

We will also follow the OU policy and code of conduct for safeguarding children, young people, and vulnerable adults overseas, which is aligned to the Foreign, Commonwealth and Development Office’s enhanced safeguarding standards. All research staff will adhere to the policy and code of conduct, and safeguarding clauses are included in the OU’s sub-contract with IER.
## Risk management

<table>
<thead>
<tr>
<th>Risk</th>
<th>Impact Assessment</th>
<th>Impact</th>
<th>LH</th>
<th>Risk exposure score (I x L)</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 COVID-19 Travel restrictions remain in place</td>
<td>UK researchers unable to travel to Bangladesh to deliver project design and dissemination events - resulting in little to no face-to-face contact with in-country research teams.</td>
<td>3</td>
<td>4</td>
<td>12 Medium</td>
<td>The team is designed with a country research lead who will act as the 'feet on the ground'. Field research is already designed to be led by experienced in-country researchers and delivered by an in-country team. We will facilitate remote events and communication via Zoom/Teams, leveraging OU’s 50 years expertise in effective distance learning and strong existing relationships with the Bangladesh team. Travel budget can be repurposed to provide additional in-country resources for engagement activity. Capacity assessment and virtual capacity building events will be held to ensure the whole team can implement research protocols, methods and instruments effectively.</td>
</tr>
<tr>
<td>2 Schools in Bangladesh remain closed due to the impacts of COVID-19</td>
<td>Researchers are unable to study impacts of EdTech on teaching and learning in schools.</td>
<td>4</td>
<td>3</td>
<td>12 Medium</td>
<td>If schools continue to be closed and alternative (non-classroom based) teaching and learning remains widespread during Phases 2 and 3, we would introduce an additional research question to examine the ways in which the programme implementation had adapted to the pandemic – with particular attention to the practices of professional development, teaching and learning, and the role of mobile technology within these. Phase 2 and 3 studies would be adapted as described in section 2 of the proposal. Data collection, research workshops, and knowledge exchange events will either be carried out face-to-face with COVID risk-mitigations in place or will switch to remote methods as appropriate.</td>
</tr>
<tr>
<td>3 Risk of COVID-19 transmission during research activity</td>
<td>Risk of illness, hospitalisation, death. Risk of project delays.</td>
<td>4</td>
<td>2</td>
<td>8 Medium</td>
<td>Ensure strict Covid protocols are enforced by the research team to reduce the risk of transmission, including 2-metre distancing, wearing face masks, regular hand washing and use of hand sanitiser, avoiding large indoor gatherings until it is possible. Where appropriate, research will be undertaken remotely via telephone or mobile methods and project meetings and dissemination events will be virtual.</td>
</tr>
<tr>
<td>4 Overseas travel of academics</td>
<td>Possibility of health, safety and security issues leading to injury or loss of life.</td>
<td>4</td>
<td>2</td>
<td>8 Medium</td>
<td>Staff will travel in pairs to avoid lone working. Each will receive a bespoke security briefing pre-travel. OU staff travelling will receive automatic security alerts from Anvil Employee Travel Monitoring System (ETMS) based on location. Travel insurance will cover emergency repatriation for security or medical reasons.</td>
</tr>
<tr>
<td></td>
<td>Lack of commitment to 3Mpower from key government stakeholders, with regard to research implementation and uptake</td>
<td>Difficulty getting permissions, data, and inputs to design and implementation from key figures. Slows progress and reduces research uptake for impact on policy and practice.</td>
<td>4</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>6</td>
<td>Muktopaath may be withdrawn before our research ends</td>
<td>Unable to deliver research as planned in the proposal.</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Complexity of project activities and funder requirements</td>
<td>Potential for cost and time overruns leading to reputational damage with funder and with government partners.</td>
<td>4</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>Misuse of Project funds</td>
<td>Significant impact on cost effectiveness of project. Reputational damage. Legal action.</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>Safeguarding risks such as Sexual Exploitation and Abuse and Sexual Harassment (SEAH)</td>
<td>Research will involve contact with children and vulnerable adults. Potential of harm to participants, or that participants may disclose information of a sensitive nature.</td>
<td>5</td>
<td>2</td>
<td>10</td>
</tr>
</tbody>
</table>
SECTION 7: Work plan

Team roles and responsibilities

PI, Tom Power helped the Government of Bangladesh design their national approach to the use of EdTech in the primary education sector for PEDP-4. Tom also led a multinational research team, in collaboration with IER, on the £3m Research component of English in Action (Bangladesh)—rated A++ by FCDO.

Study 1a Lead, Prof. Agnes Kukulska-Hulme brings 30+ years’ expertise as PI and Co-I in research on mLearning globally (including in Bangladesh) and is widely published in peer-reviewed journals including the British Journal of Educational Technology. Agnes will work with an ECR, Dr Saraswati Dawadito design and deliver study 1a.

Study 1b Lead, Prof. Nure Alam Siddique has extensive experience in designing, conducting and researching teachers’ professional development programs.

Study 1c Lead and Country Research Lead, Prof. S.M. Hafizur Rahman has numerous publications on the impact of professional learning communities on teachers’ practice. He has led research programmes for funders such as the Government of Bangladesh and JICA.

Study 1d lead and Research Manager, Claire Hedges has over 15 years’ experience of managing successful at-scale teacher development programmes, including Teacher Education in Sub-Saharan Africa (TESSA) and English in Action (Bangladesh). For EIA, Claire has also led analysis of cost-effectiveness in teacher development and published in this field.

Role of research partners

The PI has overall responsibility to deliver 3MPower and report to EdTech Hub. He will ensure that the work plan is implemented effectively and achieves the expected results. The PI will head the Research Leadership Team, supported by an Advisory Committee, a dedicated Research Management Team, and Country Research Team.

A clear structure for management of personnel is in place. A total of 6 persons will directly report to the PI (Study 1a, 1c, and 1d leads, the Study 1b/Country Research Lead, the UK-based ECR, and the Quantitative Researcher). The Country Research Lead will manage the remaining Country Research Team including the Bangladesh-based ECR. He will also be responsible for management and training of the Field Researchers (10 in Phase 2; 20 in Phase 3) who will conduct the fieldwork. The Research Manager is responsible for the management and coordination of inputs from administration, financial, legal, and communication staff from the faculty’s Research Support Team.
<table>
<thead>
<tr>
<th>Task (ID)</th>
<th>Activity (ID)</th>
<th>21</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Q 01</td>
<td>Q 02</td>
<td>Q 03</td>
<td>Q 04</td>
</tr>
<tr>
<td>Start up (1)</td>
<td>Contracting, advisory committee, ethics, &amp; person specifications (.1, .2, .3, .4, .6)</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Co-design &amp; report (.5, .7, .8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEER Research</td>
<td>Study 1a - Equity of Access (2) &amp; lc Community of Practice (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recruitment &amp; Induction (.1, .3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>First research cycle (.4, .5)</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Second research cycle (.6, .7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 1b - TPD pedagogy (5)</td>
<td>Desk review design &amp; content (.2, .3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Teacher survey (.4, .5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 1d - Cost Effectiveness (5)</td>
<td>Initial analysis &amp; capture (.1, .2)</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Analysis of equity &amp; use (.3)</td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outcomes &amp; cost-effectiveness (.5, .6)</td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>RQ1 Knowledge Exchange (6)</td>
<td>Evidence Cafes (.1, .2)</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Global KE events &amp; products (.3, .4)</td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Studies 2a&amp;b - Quasi Experimental (7)</td>
<td>Recruitment &amp; testing (.1, .2, .3, .4, .5)</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre-test (.6, .7, .8)</td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Qualitative studies (.9, .10, .11)</td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-test &amp; report (.12, .13, .14, .15)</td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>RQ2 Knowledge Exchange (8)</td>
<td>Evidence Cafes (.1)</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Global KE events &amp; products (.2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completion (9)</td>
<td>Consolidation of learnings &amp; project completion report (.1, .2, .3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION 8: Budget

As per proposal, see separate document.

SECTION 9: Logistics

Partnership and stakeholder management

The Sub-Contract with the Institute of Education and Research (IER), Dhaka University, has clear milestones explicitly linked to the Head Contract Milestones and Milestone Dates, including successful completion by IER of workshops and training for researchers, successful completion of fieldworks, successful completion of evidence cafés, submission of relevant contributions to reports and knowledge products.

Quarterly Progress Meetings will take place between the Principal Investigator, Bangladesh Country Research Lead, Research Manager and the Director of IER to review progress against these Sub-Contract milestones, budget implications, key risks and key opportunities.

Monthly meetings will take place with the Principal Investigator, Bangladesh Country Research Lead and Research Manager with other team members, as appropriate, to undertake a formal review of progress against the work plan, review of expenditure against budget, to consider any required remedial actions and flag any issues for reaching next milestones and to identify key learnings, including operational and organisational learnings.

In other weeks, shorter team meetings will take place with these team members to review progress and discuss opportunities and challenges, as they arise. These may be extended depending upon need and the frequency will be reviewed after the first 6 months.

All meetings are minuted with actions.

Data storage and protection

Data will be saved in anonymous coded files (so participants' personal details will not be stored alongside their data). Research associates at Dhaka University and The Open University will be appointed as data managers. When field data has been passed on to the data managers and the Principal Investigator, the fieldworkers will delete any local copies they may have had on their devices. This data and relevant documents will then be stored in a secure password-protected space on OU Teams folders, managed by The Open University, only accessible by designated members of the project research team.

Raw data will be saved until one year after the end of the project. It is anticipated that raw data will be destroyed / deleted by June 2025 at the latest.

During the project lifetime, good practices for open research will be explored to maximise the potential use of project approaches, tools and data by the wider research community.
Travel

19 international flights (17 UK-Bangladesh returns and 2 Bangladesh-UK returns) are planned. All those travelling will have read the EdTech Hub Duty of Care and Safeguarding Policy and will have read, signed and adhere to The Open University International Travel and Assignment Approval, Business Travel Risk Assessment Checklist, Business Travel Risk Assessment and Specific Assignment Risk Assessment processes.

The project research team and field researchers will travel to Upazilas, selected for this research, adhering to The Open University and Institute of Education and Research, Dhaka University policies and procedures for safe travel.

The peer researchers will be selected from the Upazila, in which they live and teach, thereby minimising travel requirements.

Asset management

70 Android tablets will be purchased at a budget cost of £50 each for data collection for use by the peer and field researchers. In addition, 3 laptops will be purchased at a budget cost of £425 each for new Bangladesh project staff. It is planned to purchase these in Bangladesh.

The tablets will be issued to individual researchers for specific fieldwork activities under a signed agreement of use and will be returned at the end of that set of fieldwork activities. The laptop will be issued to the Bangladesh project staff under a signed agreement of use for the project lifetime.

An asset register, with unique identifiers for each asset, will be kept for all the above, showing the user and tracking location.
Appendixes

Appendix 1 References


UNESCO. (2014). *Teaching and learning: Achieving quality for all* (pp. 1–51).


Appendix 2: List of Stakeholders participating in Co-design

**Honorary Guests**

1. The Permanent Secretary, the Ministry of Primary & Mass Education (MoPME)
2. The Vice Chancellor, Dhaka University
3. The Director of the Institute of Education & Research (IER), Dhaka University
4. The Director General, the Department for Primary Education (DPE)
5. The Director of Monitoring, the Department for Primary Education (DPE)
6. The Director General, the National Association for Primary Education (NAPE)

**Participants (Excluding IER and OU colleagues)**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Participant Role or Title</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Policymakers and Government Technical Advisers (Policy makers)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a2i</td>
<td>eLearning Consultant</td>
<td>Mehedi Hasan</td>
</tr>
<tr>
<td></td>
<td>Innovation Expert</td>
<td>Anina Mahmud</td>
</tr>
<tr>
<td></td>
<td>Policy Specialist</td>
<td>Afzal Sarwar</td>
</tr>
<tr>
<td>National Association of Primary Education</td>
<td>Assistant Specialist</td>
<td>Mazhurul Khan</td>
</tr>
<tr>
<td>National Curriculum &amp; Textbook Board</td>
<td>Research Officer</td>
<td>Md. Mazharul Rahman</td>
</tr>
<tr>
<td>BRAC</td>
<td>Senior Sector Specialist</td>
<td>Md. Shafiqul Tipu</td>
</tr>
<tr>
<td>Bangladesh Open University</td>
<td>Professor</td>
<td>Mohsin Uddin</td>
</tr>
<tr>
<td><strong>Education Officials (Policy implementers)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directorate of Primary Education</td>
<td>Deputy Director</td>
<td>Rasheda Begum</td>
</tr>
<tr>
<td></td>
<td>Education Officers</td>
<td>Md. Nobir Uddin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Roksana Haider</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Md. Dulal Mia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Md. Shariful Islam</td>
</tr>
<tr>
<td></td>
<td>General Instructor</td>
<td>Md. Khan</td>
</tr>
<tr>
<td></td>
<td>Assistant Instructor</td>
<td>Nilufar Yeasmin</td>
</tr>
<tr>
<td></td>
<td>DPEO</td>
<td>Ahindra Mondal</td>
</tr>
<tr>
<td></td>
<td>UEO</td>
<td>Jahanara Khanom</td>
</tr>
<tr>
<td></td>
<td>AUEO</td>
<td>Md. Shah Roshid</td>
</tr>
<tr>
<td><strong>Teachers and School Leaders (Educators)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Narayanganj</td>
<td>Assistant Teacher</td>
<td>Md. Mahbub Sarkar</td>
</tr>
<tr>
<td>Dhaka</td>
<td>Assistant Teacher</td>
<td>Aparajita Chowdhury</td>
</tr>
<tr>
<td>Manikgonj</td>
<td>Head Teacher</td>
<td>Sujit Sarkar</td>
</tr>
<tr>
<td>Lalbag</td>
<td>Head Teacher</td>
<td>Hasna Hena</td>
</tr>
</tbody>
</table>
## Appendix 3: Co-Design Workshop Programme

### Aims and Objectives

1) To share insights and experiences of the challenge of foundation numeracy skills, in rural schools.

2) To share insights and experiences of how Anonde Gonit Shiki and Muktopaath are intended to help teachers address the challenges of foundation numeracy skills, in rural schools.

3a) To introduce stakeholders to the research design and to secure permissions for the project overall.

3b) To refine the research design together.

4) To secure buy-in for the ongoing knowledge exchange programme and identify participants for the first evidence café.

### Day-1

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 – 9.30</td>
<td>Registration</td>
</tr>
<tr>
<td>9:30 – 10.30</td>
<td>Welcoming Addresses &amp; Introduction</td>
</tr>
<tr>
<td>10.30 – 11.00</td>
<td>Tea</td>
</tr>
<tr>
<td>11.00 – 1.00</td>
<td>Session-1: The challenge of foundation skills in numeracy</td>
</tr>
<tr>
<td>1.00 – 2.00</td>
<td>Lunch</td>
</tr>
<tr>
<td>2.00 – 3.30</td>
<td>Session-2: The opportunities for mobile learning and teacher professional development in Bangladesh</td>
</tr>
<tr>
<td>3.30 – 4.00</td>
<td>Tea</td>
</tr>
<tr>
<td>4.00 – 5.00</td>
<td>Discussion</td>
</tr>
<tr>
<td>5.00</td>
<td>Close</td>
</tr>
</tbody>
</table>

### Day-2

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00 – 9.30</td>
<td>Session-3: Technology for professional development (study 1a) and Community of practice studies (study 1c) - The PEER research approach</td>
</tr>
<tr>
<td>11.00 – 11.30</td>
<td>Tea Break</td>
</tr>
<tr>
<td>11.30 – 1.00</td>
<td>Session 4: CPD pedagogy (study 1b) and cost-effectiveness studies (study 1d)</td>
</tr>
<tr>
<td>1.00 – 2.00</td>
<td>Lunch</td>
</tr>
<tr>
<td>2.00 – 3.30</td>
<td>Session 5: Knowledge exchange and ways of working</td>
</tr>
<tr>
<td>3.30 – 4.00</td>
<td>Tea Break</td>
</tr>
<tr>
<td>4.00 – 5.00</td>
<td>Closing Remarks</td>
</tr>
</tbody>
</table>