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WORKING PAPER

A Theory of Change for Teachers towards a Technology-Enhanced Education System in Bangladesh

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Notes

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Acronyms and abbreviations

BRAC	Bangladesh Rural Advancement Committee
CSO	Civil society organisation
NGO	Non-governmental organisation
TOC	Theory of change
TPACK	Technology, Pedagogy, and Content Knowledge
TPD	Teacher Professional Development
UNICEF	United Nations Children's Fund

Executive summary

In November 2020, UNICEF requested support from EdTech Hub to help the Government of Bangladesh improve the reach, effectiveness, and inclusiveness of the programme of activities proposed in the government's *Covid-19 Response and Recovery Plan: Education Sector* (↑Ministry of Primary and Mass Education, 2020). At that time, this plan led to a wide and diverse range of programmes initiated by the government and other stakeholders. As a result, EdTech Hub worked with the government and other stakeholders to rapidly create a theory of change (TOC) for a technology-enhanced education system (↑Clark-Wilson et al., 2021). While acknowledging that parents, caregivers, teachers, and school and community leaders are also key stakeholders, the first TOC focused on learners as, ultimately, the desired impacts of a technology-enhanced education system are directed towards learners' educational outcomes.

One recommendation of the first working paper was that a TOC that focused on teachers as key agents in the development of a technology-enhanced education system for the country should also be developed.

The process to develop this second TOC, which focuses on the impacts of teacher professional development (TPD), comprised a desktop review, interviews, and two stakeholder consultation workshops. The resulting teacher-centred TOC draws on existing theory and practice as well as stakeholders' assumptions of how technology-enhanced TPD might achieve its goals — and what conditions need to be in place to achieve this. This working paper documents and explains the teacher-centred TOC.

In line with EdTech Hub's core focus on primary and secondary education, this initial support is focused on all teachers of learners in Classes 1–12.

EdTech Hub was also asked to propose strategies for the *use* of the teacher-centred TOC, beyond this initial exercise. The recommendations are as follows.

1. **Create a single, cohesive strategy for a technology-enhanced education system in Bangladesh** that incorporates and aligns the work of government and other stakeholder organisations.

2. **Familiarise government departments and stakeholders with the teacher-centred TOC and support the creation of programme-specific versions** through further stakeholder workshops that might enable more systematic monitoring and evaluation of programme outcomes over time.
3. **Develop a parent-centred TOC** that addresses the key role played by parents and caregivers within the development of a technology-enhanced education system in Bangladesh.
4. **Discuss with the government and key digital providers how to ensure that relevant data is made available to teams** to enhance the quality of monitoring and evaluation activities that are aligned with the TOC.
5. **Develop a research programme to investigate how the teacher professional development modalities and activities combine** holistically to support teacher development over time.
6. **Identify gaps in data that represent valid 'outputs' for TPD activities** to provide better evidence that short- and medium-term outcomes have been achieved.
7. **Identify gaps in TPD provision** to inform the design of new programmes for teachers that aim to impact the most disenfranchised learners.
8. **Explore whether a TOC for national or district level administration teams working in education** focused on their professional learning needs might support the development of a technology-enhanced education system in Bangladesh.

1. Introduction

1.1 Context of support

In November 2020, UNICEF requested support from EdTech Hub to help the Government of Bangladesh improve the reach, effectiveness, and inclusiveness of the programme of activities proposed in the government's *Covid-19 Response and Recovery Plan: Education Sector* (↑Ministry of Primary and Mass Education, 2020). At that time, the plan resulted in a wide and diverse range of programmes initiated by the government and other stakeholders. As a result, EdTech Hub worked with the government and other stakeholders to rapidly create a theory of change (TOC) for a technology-enhanced education system (↑Clark-Wilson et al., 2021). While acknowledging that parents, caregivers, teachers, school, and community leaders are also key stakeholders, this first TOC focused on learners as, ultimately, the desired impacts of a technology-enhanced education system are directed towards learners' educational outcomes. One recommendation was that a TOC should also be developed that focused on teachers as key agents in the development of a technology-enhanced education system for the country.

The teacher-centred TOC considers teachers' experiences within '*no technology*' **and** '*technology-enhanced*' teacher professional development (TPD) activities within both pre-service and in-service settings. We adopt the same definition of TPD as ↑Hennessy et al. (2021), to "encompass broad focus on formal programmes and informal peer learning of both pre-service and in-service teachers at school level" (p. 9).

We also use the ↑Hennessy et al. (2021) interpretation of technology use within the TPD as follows:

- technology use in TPD;
- teacher learning about / with technology that supports teaching, planning, and assessment practices;
- teacher learning about / with technology that supports student learning.

The rapid deployment of a range of remote education services for learners in Classes 1–12 that followed the onset of the Covid-19 pandemic in Spring 2020,

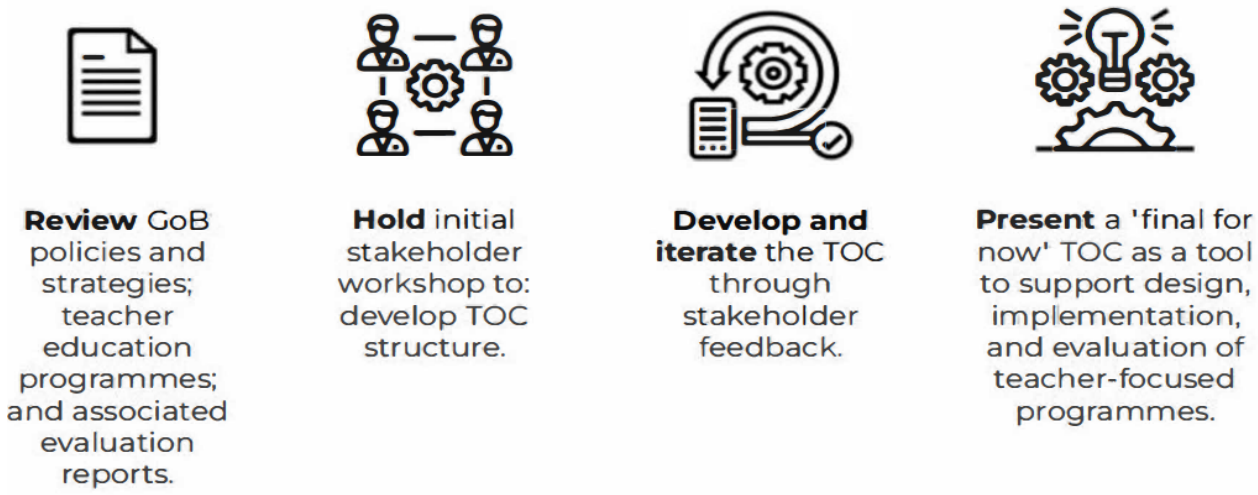
outlined a range of different programmes and initiatives. This included a number of initiatives that were aimed directly at teachers, to support them to continue to plan, teach, and assess their learners. However, there was limited opportunity to consider the professional development needs of teachers, nor to design TPD to directly address these needs. In common with the initiatives directed towards learners' learning (↑Kaye et al., 2020), few programmes and initiatives had the time and resources to document their theories of change, nor any associated monitoring and evaluation systems. This makes gaining insights into the success (or otherwise) of TPD initiatives a challenge.

Given the critical role that teachers play in ensuring a digitally-enhanced education system for learners in Classes 1–12 in Bangladesh, EdTech Hub was asked to provide support to government and development partners to develop a teacher-centred TOC. We worked between October 2021 and March 2022 to:

1. **Identify the implicit TOC behind existing teacher-focused professional development opportunities in Bangladesh towards a technology-enhanced education system**. This draws on existing theory and practice as well as stakeholders' assumptions of how professional development programmes achieve their outcomes, and what conditions need to be in place to achieve this. It builds on knowledge of international good practices regarding the elements, methodologies, and approaches from around the world.
2. **Assess the implicit TOC for coherence, logic, and inclusiveness.** This seeks to verify assumptions against existing evidence to check plausibility. It also involves assessing the assumptions and evidence on the pathways of change.
3. **Propose strategies for the use of the TOC**. This includes suggestions for using the TOC as a tool to assess existing structures and requirements for professional development approaches.

This document is the product of this support. It outlines the resulting TOC and the accompanying narrative. Annexes 2 and 3 provide descriptions of the processes that led to the development of this TOC, which are summarised in Figure 1.

Figure 1. *The theory of change development process*



1.2. A teacher-centred TOC to inform a technology-enhanced education system in Bangladesh

A TOC is an established methodology for supporting the evaluation of programmes (or interventions). The 'theory' is the description of how a programme is expected to bring about the desired changes (or impacts).

The Bangladesh Government's *Covid-19 Response and Recovery Plan* was primarily concerned with mitigating the impacts of school disruptions on learners' education. This plan necessarily addressed teachers, parents, and community groups. In common with the learner-focused programmes and initiatives, it is equally important to explain in detail how different TPD modalities and activities influence teachers' learning and development over time. Within a technology-enhanced education system, it is anticipated that in-service and pre-service teachers will engage in new and technology-enhanced learning modalities within both directed (formal courses and programmes) and self-directed (ad hoc) contexts.

By deconstructing the different TPD activities, it is possible to discern the evidence (in the form of metrics, measures, and data) that can inform both the

design and the impact of different programmes or initiatives. It also enables the impacts to be considered in an individual and cumulative way as teachers experience multiple TPD activities throughout their professional lives.

Therefore, this TOC is teacher-centred and it sits alongside the TOC for learners. The creation of separate TOCs to support the monitoring and evaluation of programmes targeting parents and community groups is also necessary to enable a comprehensive understanding of the wider impacts of a technology-enhanced education system in Bangladesh.

This TOC is a living tool to enable stakeholders to continually learn about and improve the various programmes that are implemented as part of an overall strategy. An effective TOC supports continuous evaluation throughout the lifespan of the programme or initiative while offering multiple stakeholders greater learning opportunities, better documentation processes, and a shared understanding of the efficacy of the programmes (Annex 5 outlines some approaches for this.)

The Government of Bangladesh acknowledges the challenges that the pandemic context has presented for education.

> **"The lives of teachers are also disrupted due to the pandemic and school closures. Prolonged absence and disengagement from teaching and on-going professional training will affect the quality of teaching and motivation. Coping with the changing nature of remote learning activities and lack of professional development opportunities for school teachers in using the online teaching-learning platform is an added challenge, both during and after the shutdown period."**
>
> **Ministry of Primary and Mass Education**
>
> **(May 2020, p. 5)**

1.3. Content of teacher professional development (TPD)

All TPD initiatives are designed with some content learning objectives for the teachers involved.

The TOC does not address the content of the TPD, which might focus on different (or combined) aspects of content, pedagogy, and technology knowledge and practice. Future programmes will need to address important themes such as:

- **Assessment**: Identified in-country priorities to develop teachers' and school leaders' competencies for both formative and summative evaluation to ensure high-quality progress tracking of learners' educational outcomes.
- **Cross-cutting issues**: Identified in-country priorities to ensure that teachers and school leaders are well prepared for emergency contexts, teaching learners with disabilities and special educational needs, addressing gender inequities etc.
- **Blended education**: As blended education becomes a bigger national priority, the TOC for teachers, in parallel with the TOC for learners provides a tool to support the design, implementation, and evaluation of different models for blended education, which can be aimed at teachers (learning *about* and *through* blended education) and learners (learning *through* blended education).

1.4. Structure of this document

The teacher-centred TOC for a technology-enhanced education system in Bangladesh is introduced in Section 2 along with the narrative that explains its format and hypothesised causal pathways.

Section 3 outlines the recommendations arising from the process of developing and evidencing the TOC.

Further details about literature reviewed, stakeholders consulted, the design and structure of both the initial stakeholder workshop and the subsequent stakeholder validation process can be found in the annexes.

2. The theory of change

A theory of change (TOC) is an overarching framework for understanding, systematically testing, and refining the assumed connections — the 'theory' — that underpins a programme and its anticipated impacts.

The complete teacher-centred TOC is shown in Figure 2 below. This figure is too small to be read in this document but can be viewed online here.

The TOC should be read from the bottom upwards. It includes the following components:

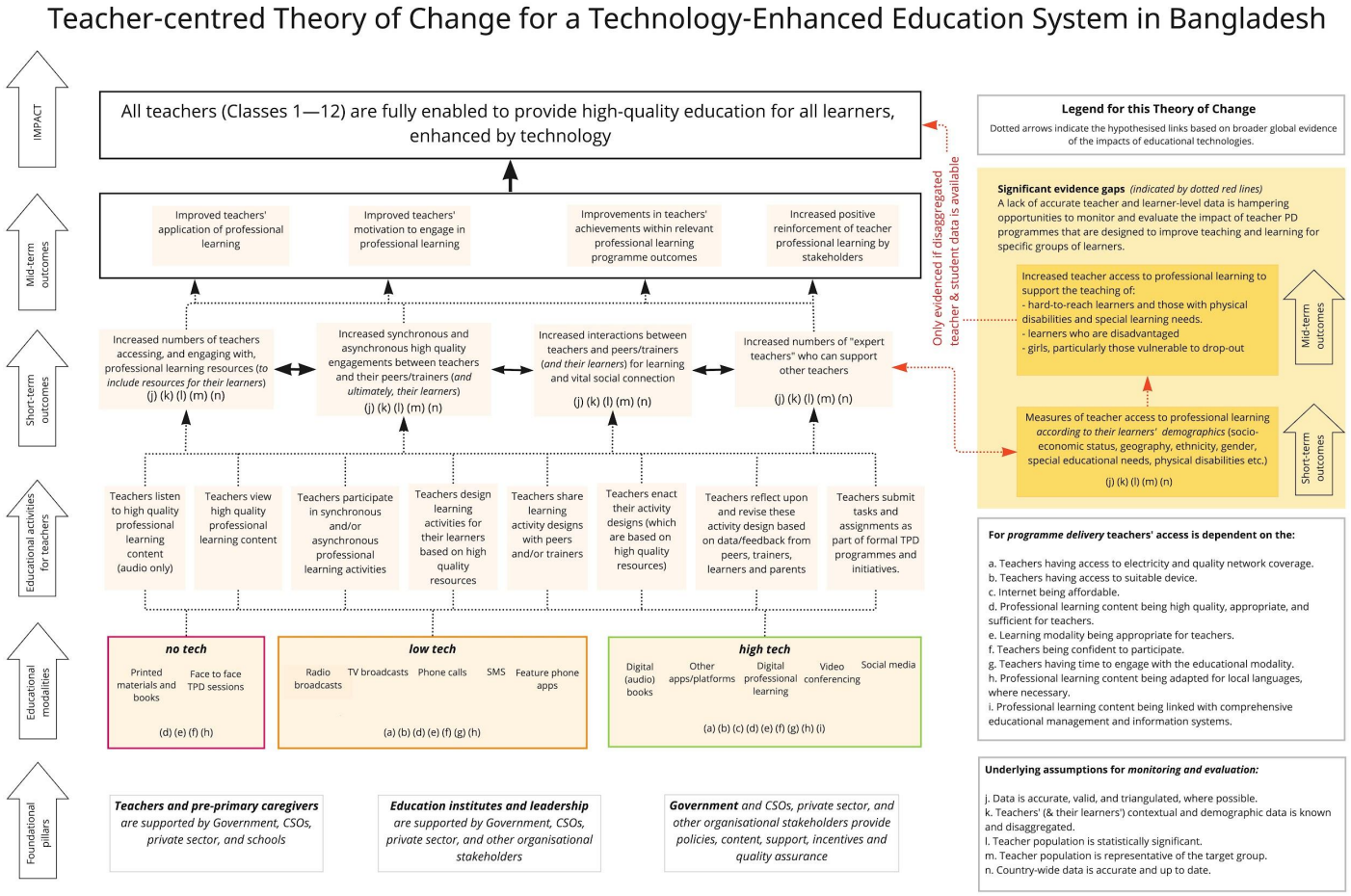
- Foundational pillars.
- Educational modalities.
- Educational activities for teachers.
- Short-term outcomes.
- Mid-term outcomes.
- The impact goal.

In addition, the TOC has dotted arrows that show the *potential* causal pathways between the educational modalities, activities, outcomes, and impact. As evidence becomes available for particular programmes and initiatives, it will be possible to form solid lines that indicate *actual* causal pathways.

To the right of the TOC diagram are: the legend, a yellow block of text that details the significant evidence gaps, the prerequisites for programme delivery, and the main underlying assumptions that relate to monitoring and evaluation.

The teacher-centred TOC is explained in detail in the narrative that follows.

Figure 2. *The theory of change for a technology-enhanced education system in Bangladesh. (Go here for an enlarged version of Figure 2).*



2.1. Foundational pillars

Figure 3. *Foundational pillars*

The TOC is built on three foundational pillars. These are:

1. Teachers and pre-primary caregivers
2. Education institutes and leadership
3. Government and civil society organisations (CSOs), private sector, and other organisational stakeholders

Government and CSOs, private sector, and other organisational stakeholders

This includes the policy frameworks, communications strategy, resources, TPD incentives, support, and associated quality assurance processes.

The government of Bangladesh conducted a series of futures thinking workshops with both public and private sector stakeholders to envision the futures of education in Bangladesh in 2041 (↑a2i, 2019). That exercise, in addition to the

rapid experiments undertaken by both public and private sectors during the pandemic, created momentum for the creation of the National Blended Education Masterplan (2022–2031), which, at the time of writing, is in the process of getting government approval. In addition, the Government of Bangladesh is also launching its new national curriculum and piloting of this curriculum is being conducted in about 100 schools. These waves of reform are indicative of further development of a technology-enhanced education system in Bangladesh.

Government and CSOs, the private sector, and other organisational stakeholders support this pillar by providing:

- Appropriate policies and digital learning infrastructures and environments such as the Teachers Portal.
- Inclusive TPD resources (considering diverse student needs, digital safety, and child protection) for TPD programmes and initiatives.
- Incentives for pre- and in-service teachers to engage in TPD such as qualifications, recognition of advanced teaching skills, and pay and promotion structures.
- Local support for all school leaders, teachers, caregivers and parents.
- Oversight of quality assurance, to include support for monitoring and evaluation.

Education institutes and leadership

With support from the government, non-governmental organisations (NGOs) and other stakeholders, these institutes and their leaders enact the policies and use the associated resources to provide access to TPD opportunities for all teachers.

Education institutes and leadership are supported by the government, CSOs, the private sector, and other organisational stakeholders to have:

- Guidelines and an organisational culture that align with effective use of technologies.
- Sufficient human support and infrastructure.
- Sufficient technology resources, and equitable access to them, for teachers.
- An adequate physical setup and digital infrastructure for technologies.

Teachers and pre-primary caregivers

Teachers and pre-primary caregivers form a critical pillar through which systemic educational change comes about, hence the need for pre-service and in-service teacher professional development opportunities that foreground technology use, and involve teachers in the ongoing development of curriculum and assessment approaches.

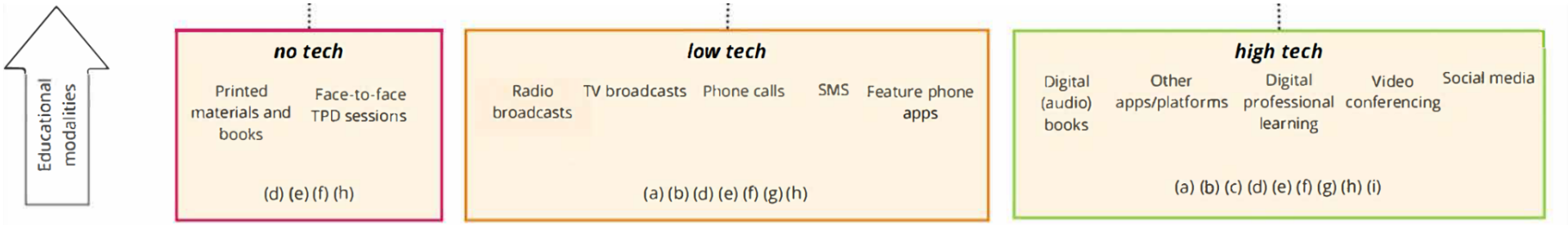
Teachers and caregivers are supported by the government, CSOs, the private sector, and schools to have:

- Access to suitable devices with affordable internet access.
- Sufficient skills and proficiency with technology for inclusive learning, especially for disabled learners.
- Awareness and ability to access, utilise, adapt, and create local, national, and international learning resources.
- Attitudes and beliefs aligned with educational technology pedagogy.
- Motivation and recognition for high-quality technology-enhanced planning, teaching, and assessment.

2.2. Educational modalities

The Educational modalities included on the TOC align with the 12 modalities outlined in the UNICEF *Guidance on Distance Learning Modalities* (↑UNICEF, 2020).

Figure 4. *Educational modalities*



For Bangladesh, these are grouped (and colour-coded) according to three categories: No tech (red), low tech (orange) and high tech (green), as proposed in the Blended Education For All (BEFA) website by a2i (↑a2i, 2022).

Printed materials / books (used by all modalities)
Face-to-face TPD sessions
Radio broadcasts
TV broadcasts
Phone calls.
SMS (short message service)
Feature Phone Apps

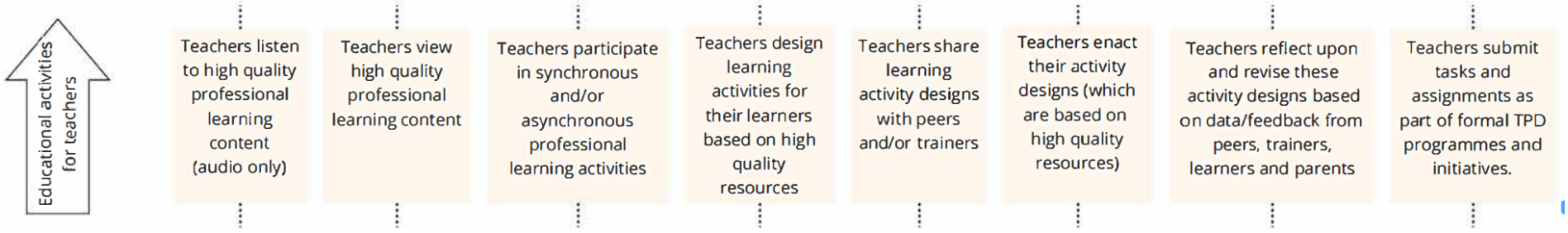
Digital (audio) books
Other apps / platforms
Digital classrooms
Video conferencing
Social media

By grouping the modalities in this way it is hoped to offer TPD programme designers an increased awareness of the possible educational modalities that might be used both within TPD programmes *and* in blended learning opportunities for students. Also, it should be noted that face-to-face professional development sessions and school lessons will increasingly involve the use of digital devices, which might range from computers and tablet devices to digital devices for learners such as coding and robotic kits.

On the TOC, each modality includes letter codes that refer to their specific underlying assumptions and dependencies. These letter codes are explained in Section 2.7.

2.3. Educational activities for teachers

Figure 5. *Educational activities for teachers*



This is the most critical component of the TOC as it is only by considering what teachers actually *do* when they are engaging in professional development that we can begin to appreciate how these activities contribute to teachers ' achievements of the relevant outcome measures, which in time lead to improved outcomes for learners.

This section of the TOC is deliberately detailed to highlight 'typical' activities within high-quality professional development programmes and initiatives. Within well-structured programmes that take place over months and years, teachers will be engaging in several of these activities at different points in time, which may involve 'plan-teach-reflect-revise' loops.

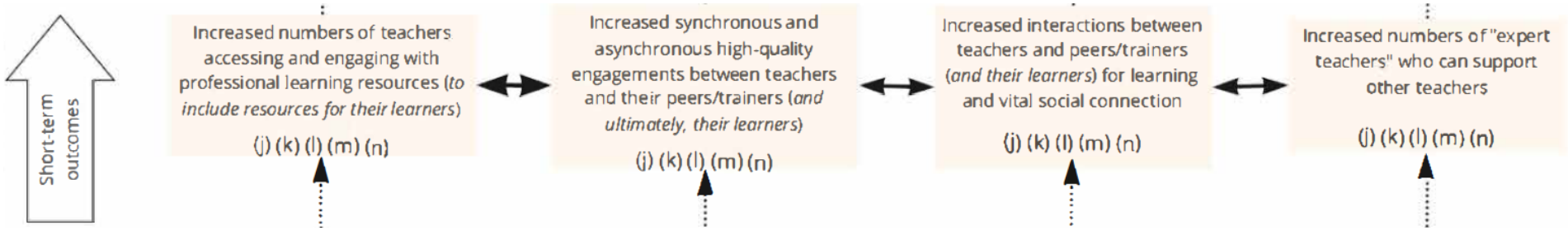
- Teachers listen to high-quality professional learning content (audio only).
- Teachers view high-quality professional learning content.
- Teachers participate in synchronous and / or asynchronous professional learning activities.
- Teachers design learning activities for their learners based on high-quality resources.
- Teachers share learning designs with peers and/or trainers.
- Teachers enact their activity designs, which are based on high-quality resources.
- Teachers reflect upon, and revise, their activity designs based on data/feedback from peers, trainers, their learners and parents.
- Teachers submit tasks and assignments as part of formal TPD course activities. For example, in initial teacher education programmes these would be the formal assessments. In less formalised programmes, this might be a baseline assessment of their technology, pedagogic and content knowledge, or a lesson design for which they might receive feedback from peers or trainers.

A traditional face-to-face professional development session can be conceived as a synchronous ('live') session that is typically held in the school or at the venue of a formal professional development programme or course. Asynchronous professional development for teachers would normally take place away from the classroom, either at home or at a venue that provided access to low- or high-tech professional learning content.

2.4. Short-term outcomes

The short-term outcomes might be evidenced over days, weeks, and months.

Figure 6. *Short-term outcomes*



They are:

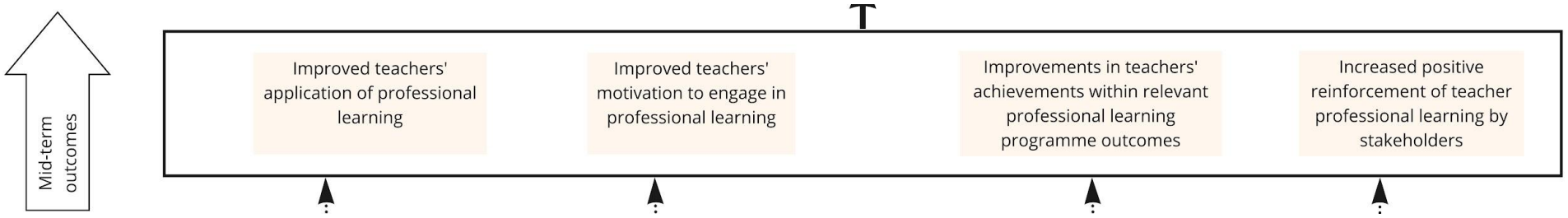
- Increased numbers of teachers accessing and engaging with professional learning resources.
- Increased synchronous and asynchronous high-quality engagements between teachers and their peers/trainers.
- Increased interactions between teachers and peers/trainers for learning and vital social connection.
- Increased numbers of 'expert teachers' who can support other teachers.

These four outcomes capture the key elements of high-quality TPD within effective education systems, with or without educational technologies. Each is vital to develop a teaching workforce that provides a learning environment in which all children learn and thrive within and beyond classrooms. The addition of digital technology increases the complexity as teachers, learners and parents learn new ways of working and interacting with each other. It cannot be assumed that the addition of technology will automatically lead to improvements in these four outcomes.

2.5. Mid-term outcomes

The stated impact goal relies on a combination of mid-term outcomes that must be achieved over time periods of months and years.

Figure 7. *Mid-term outcomes*



These align with the Government of Bangladesh's longer-term education strategy. They are:

- Improved teachers' application of professional learning.
- Improved teachers' motivation to engage in professional learning.
- Improvements in all teachers' achievements within relevant professional learning programme outcomes.
- Increased positive reinforcement of teacher professional learning by stakeholders.

2.6. Impacts

The TOC has one widely-understood impact goal, namely:

> *All teachers (Classes 1—12) are fully enabled to provide high-quality education for all learners, enhanced by technology.*

This resonates with both the Government of Bangladesh's *Education Sector Plan (2020–21 to 2024–25)* (↑Ministry of Education, 2020) and its *Vision 2041* (↑Ministry of Planning, 2020) plans, which rely on a highly educated population that is digitally literate. Hence, *the teachers of* the children who are in school right now are a significant group. The teachers' professional development needs are critical to ensuring that these children progress through the school system over the coming years. The careful monitoring and evaluation of TPD are crucial to support improvements to the system t over time.

The TOC focuses on the processes through which teachers can enable *all learners* (Classes 1–12) to engage fully in a high-quality education as they take up the digital resources being provided in Bangladesh. This relies on a wide and ongoing effort to decrease the technological and other barriers for both teachers and learners that prevent many learners from learning from the current materials that are provided. Hence the words *fully engaged in high-quality education* set a major goal as these barriers *must* be addressed if a fully equitable education system is to be achieved.

2.7 Underlying assumptions and dependencies

The TOC is underpinned by a wide range of assumptions and dependencies.

For programme delivery teachers' access is dependent on the following conditions being met.

a. Teachers having access to electricity and quality network coverage. [low tech high tech]

b. Teachers having access to suitable device. [low tech high tech]

c. Internet being affordable. [low tech high tech]

d. Professional learning content being high quality, appropriate, and sufficient for teachers. [no tech low tech high tech]

e. Learning modality being appropriate for teachers. [no tech low tech high tech]

f. Teachers being confident to participate. [no tech low tech high tech]

g. Teachers having time to engage with educational modality. [no tech low tech high tech]

h. Professional learning content being adapted for local languages, where necessary. [no tech low tech high tech]

i. Professional learning content being linked with comprehensive educational management and information systems. [high tech]

For monitoring and evaluation, underlying assumptions are as follows.

j. Data is accurate, valid, and triangulated, where possible.

k. Teacher (& learners) contextual and demographic data is known and disaggregated.

l. Teacher population is statistically significant.

m. Teacher population is representative of the target group.

n. Country-wide data is accurate and up to date.

2.8 Significant evidence gaps (the yellow box)

Finally, the TOC includes a section, which is shown in yellow, that highlights some significant evidence gaps relating to a lack of accurate teacher-level and learner-level data that is hampering opportunities to monitor and evaluate the longer-term impacts of TPD programmes on the teachers of specific groups of learners (see Figure 8).

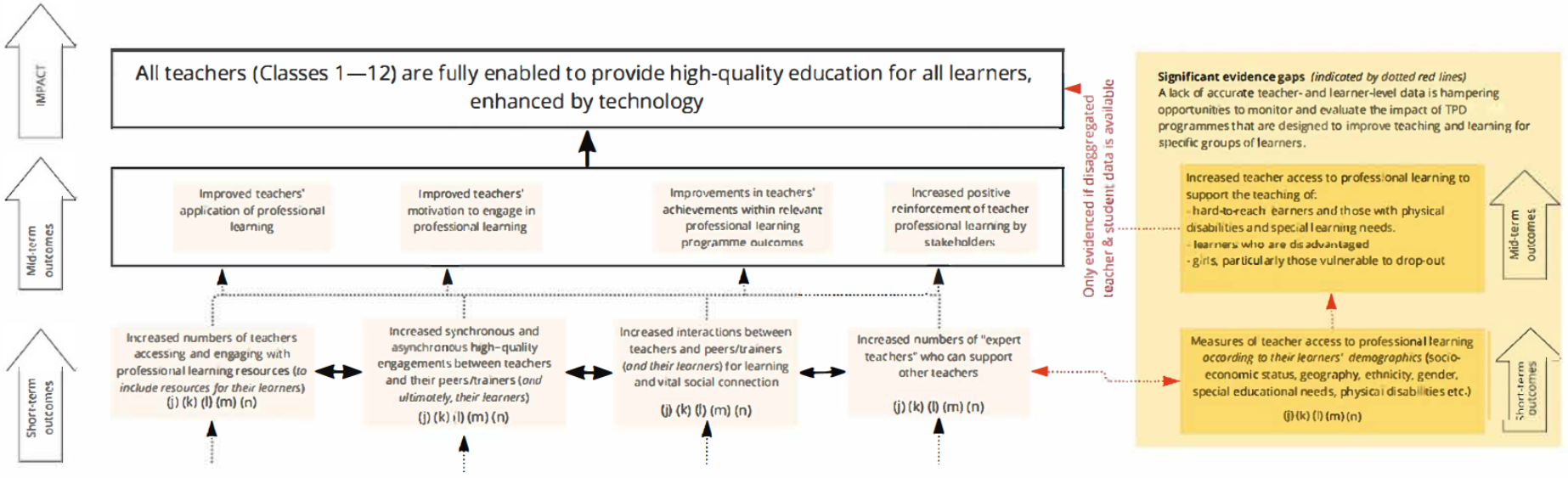
For interventions that involve teachers *and that target disadvantaged learners,* it will only be possible to gauge if teachers have achieved the stated medium-term outcomes on the TOC if the learner data is disaggregated *and* the programme design is sensitive to both the teachers' and learners' needs and context.

Hence learner-level measures will be needed, which are disaggregated by the learner demographics (socio-economic status, geography, ethnicity, gender, special educational needs, physical disabilities etc.)

The following outcomes might then become evident:

- Increased teacher access to professional learning to support the teaching of:
  - hard-to-reach learners and those with physical disabilities and special learning needs
  - learners who are disadvantaged
  - girls, particularly those vulnerable to dropout

Figure 8. *Significant evidence gaps within the theory of change*



2.9 Inferring causal pathways from the theory of change

The TOC components are connected by dotted arrows that indicate hypothesised pathways that explain how multiple teachers' engagements in the TPD activities will lead to the outcomes over time to result in the desired impact.

The causal pathways are inferred by tracing an educational modality upwards to indicate how the TPD activities it has facilitated should enable the teacher to achieve the mid- and long-term outcomes *providing* the prerequisites have been satisfied *and* the associated assumptions have been validated. For example, a teacher's viewing of a series of TV broadcasts, while relatively easy to evidence, would only result in a *high-quality* educational impact if the teacher was

also designing, teaching, and reflecting upon activities for their learners *and* engaging in dialogue with others to understand the impact of these activities on their learners.

Hence the TOC provides a tool to help TPD designers and providers to think through the causal pathway for their particular TPD programme or resource.

3. Recommendations

The goal of a theory of change (TOC) is to provide a diagram that communicates how a programme design is intended to achieve its goals and to create a tool that can enable multiple stakeholders to rally their efforts. In particular, it communicates the critical links that need to be foregrounded in monitoring and evaluation activities. The overarching TOC supports this process at the level of the education system.

The TOC offered in this paper captures a theory for how teachers' professional development programmes and initiatives within a technology-enhanced education system might work in Bangladesh to support student learning. It helps to identify gaps where more investigation / thinking is required to better understand the way in which TPD interventions can support student learning in Bangladesh. Furthermore, the TOC allows the government and key stakeholders to see what data is needed on a national scale to support the individual programme teams to monitor and evaluate the outcomes and impacts of their own work.

Based on the rigorous data collection and analysis conducted to support this paper, we offer the following recommendations:

1. **Create a single, cohesive strategy for a technology-enhanced education system in Bangladesh** that incorporates and aligns the work of government and other stakeholder organisations. This work has revealed the wide diversity of programmes and initiatives that support TPD in Bangladesh, with varying levels of technology integration.

2. **Conduct further stakeholder workshops that focus on critiquing and refining the TOC presented in this report as a multi-stakeholder dialogue.** These workshops would help to familiarise government departments and stakeholders with the teacher-centred TOC and support the creation of programme-specific versions that might enable more systematic monitoring and evaluation of programme outcomes over time. In common with the TOC for learners, the act of bringing multiple stakeholders together to share information about the TPD programmes and resources that they have designed can be facilitated by framing the activity through the lens of refining the TOC. This should include identifying both additional inputs / activities that might not have been captured in this rapid exercise, as well as further refining the

short- and mid-term outcomes and impacts identified and suggested. Furthermore, some programmes and initiatives are yet to exploit the evidence base on the features of high-quality TPD. The TOC aims to make such features explicit and accessible to all. The respective TOCs might be used to discuss these different programmes and, in doing so, widen knowledge of existing monitoring and evaluation approaches and associated findings. Be mindful that newcomers will need time and support to make sense of the key terms and concepts of the TOC. Annex 5 offers some guidance on how to facilitate activities that enable such ways of working.

3. **Develop a parent-centred TOC** that addresses the key role played by parents within the development of a technology-enhanced education system in Bangladesh. This should focus on the parental experiences and roles as detailed in the foundational pillar and on aligning with related assumptions. This will help to build strategies for reaching parents and determining the nature of programmes that will enable them to better support their children.

4. **Discuss with the government and key digital providers how to ensure that relevant data is made available to teams** to enhance the quality of monitoring and evaluation activities that are aligned with the TOC.

5. **Develop a research programme** to investigate how the TPD modalities and activities combine holistically to support teacher development over time.

6. **Identify gaps in data that represent valid 'outputs' for TPD activities** to provide better evidence that short- and medium-term outcomes have been achieved. The TOC lists a wide variety of data that might be considered as 'outputs' for TPD activities (and potentially provide additional data to evidence the related learning outcomes for their learners).

7. **Identify gaps in TPD provision to inform the design of new programmes for teachers** that aim to impact the most disenfranchised learners.

8. **Explore whether a TOC for national or district-level administration teams working in education** focused on their professional learning

needs might support the development of a technology-enhanced education system in Bangladesh.

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Annex 1. Stakeholder engagement

Annex 1 includes the list of stakeholders that were represented at the workshops according to their role designation and institutions.

Those organisations that were involved in the initial workshop are indicated with a cedilla (~) and those that were interviewed are indicated with an asterisk (*).

Organisation	Designation
Access to Information (A2i)	~Policy Advisor
	~Policy Specialist
	~Education Consultant
	~Associate Professor
	~Young Professional
A2i and UNICEF on remote learning during COVID	*~Consultant working to promote Media and Information Literacy in Bangladesh
Alokito Hridoy Foundation	*~Chairperson
Bangladesh Rural Advancement Committee (BRAC)	*~Education Specialist
	*~Education Manager
Government Teachers' Training College, Dhaka (TTC)	~Master Trainer, ICT
Innovation for Wellbeing	~Founder and Executive Director
Noakhali University of Science and Technology	~Acting Chairman, Department of Education
Teach for Bangladesh Economic Relations Division (ERD)	~Program Director
	~Teaching Fellow
Primary Training Institute (PTI)	~Teaching Instructor
	~Teaching Instructor

Light of Hope	
United Nations Children's Fund (UNICEF)	~Education Specialist

Annex 2. The initial stakeholder workshops

We adopted a similar approach to that used for the development of the TOC for learners (↑Clark-Wilson et al., 2021). As we were aware of the wide range of teacher-directed courses, programmes, and initiatives that have been devised by multiple stakeholders in Bangladesh, we began by adopting a particular structure (a *logic model*), to enable stakeholders at the initial workshop to begin to analyse their own programmes. We used the Kellogg Foundation's theory of change (TOC) approach, which has been used extensively in numerous programme evaluations worldwide (↑Kellogg Foundation, 2004). Although we did not eventually adopt this structure, we describe the process below to highlight the iterative nature of TOC creation.

A TOC needs to be focused on the main recipients of the programme — which in our case is the teachers — and the resources and activities through which the desired impacts on teachers will be achieved.

Figure 9. *The chain of reasoning that underpins a theory of change.*

A brief description of the components of a TOC follows — starting with the desired impacts and working from right to left.

Impacts

Impacts are organisational, community, and / or system-level changes expected to result from the programmes provided. More generally, these might include improved conditions, increased capacity, and changes in the policy arena. In other words, impacts are the overarching goals that implemented programmes intend to achieve. These can be expressed as short-term impacts (weeks), mid-term impacts (months) and long-term impacts (years).

Outcomes

Outcomes are specific changes in attitudes, behaviours, knowledge, skills, status, or level of functioning expected to result from programme activities and which are most often expressed at an individual or cohort level. These outcomes should be measurable through a change in the value of an output measure. Outcomes can be expressed as an increase, a decrease, or a constant value. For example, in the case of a professional development programme aimed at in-service teachers to support them to teach reading to primary school learners, a desirable outcome would be an increase in teachers' subject knowledge and pedagogic skills in a way that aligns with the programme designers' theory of change. Of course, the end goal is to improve the quality of primary school learners' reading, which would involve additional research. However, it would be necessary to first establish the impacts of the TPD programme, prior to researching the resulting impacts on learners' reading.

Outputs

Outputs are the metrics or measures that are collected as participants engage with a programme or intervention. The programme monitoring and evaluation plans should detail each measure, what it represents, the methods for its collection, and subsequent analysis. The information gathered will indicate whether the programme has been delivered to the intended audiences at the intended levels.

In the Bangladesh context, the outputs need to relate to the teachers who have engaged with relevant programmes. For example, the number of activities a teacher has engaged in, the length of time, the frequency of engagement, the number of related activities completed, the quality of their activity designs etc.

Activities

Activities are the processes, techniques, tools, events, and actions that take place within the planned programmes. In the case of technology-enhanced and blended learning programmes, multiple activities are needed by programme implementers to contribute to a successful programme. Our teacher-focused approach has placed the emphasis on the description of the teachers' professional learning activities, as created by the programme

designers / implementers as these drive the desired outputs, outcomes, and ultimately impacts.

It is useful to use 'action verbs' to describe teachers' professional learning activities that form part of the theory for how the programme works to achieve the desired impacts over time. It is the cumulative impacts of many occurrences over time, for many teachers, which may take place across different modalities, that dictate the scale of the impacts in the longer term.

Inputs or resources

Inputs are the resources such as the human, financial, organisational, and community resources a programme directs towards the work. A 'teacher-centred' focus means that these inputs should describe everything that needs to be put in place to enable the teachers to carry out the desired professional learning activities. The different educational modalities —grouped by no tech low tech high tech — each have very different sets of inputs. Prior to teachers being able to access the resources, (and, if needed, for their students to access technology as well) many preconditions need to be in place, and these are detailed in the TOC.

Assumptions

Assumptions are the list of conditions that are highly desirable for a successful programme. Many programmes are based on assumptions, which need to be documented as part of the TOC. Some of these assumptions relate to preconditions that must be implemented for programmes to have the potential to achieve their outputs / outcomes / impacts.

For example, we already know that TPD programmes might require:

- Connectivity, for example, using TV, radio, the internet, mobile data.
- Access to devices (e.g., a TV, a radio, a smartphone, a tablet, a computer).
- Access to support from a trainer / coach / colleague etc.

In many cases, early programme monitoring gathers data to support the evaluation of whether preconditions have been met and, indeed, to check if assumptions are correct.

In our initial approach, we worked with two TPD providers to create individual TOCs for their particular programme or resource.

Figure 10. *Theory of change templates.*

One provider had developed a formal 6-week programme for pre-service teachers which was a blend of face-to-face and coaching sessions alongside virtual sessions.

The second provider had developed an online portal that hosted and linked to a wide range of resources from external providers. It also offered a social media site through which teachers could upload digital content and contribute blog posts. This TPD resource could be accessed at any time for asynchronous TPD, or as a resource within more formalised programmes.

For both providers, the process to develop their initial TOC resulted in deep discussions of the teachers' learning activities, which revealed multiple opportunities to collect more insightful data for monitoring and evaluation. It was clear that there were many programme level assumptions that needed to be tested more rigorously by the programme teams.

The two draft TOCs were then used in the first stakeholder workshop to stimulate discussion in the meeting and enable clarification of the terminology of the TOC.

The groups then either worked backwards from the desired impacts — or forward from the designed activities, to decide on the most appropriate data that might need to be gathered. This data is needed to:

- validate or refute assumptions that have been made in constructing the theory;
- support the development of the theory by highlighting gaps where more or better data is needed.

Gathering information

We recommended that the groups work with sticky notes (or virtual sticky notes, such as Miro) to list the ideas for each element of the TOC. By writing each contribution on a single sticky note, it is possible to move the ideas around. It is very common to 'over assume' the impacts of programmes without realising that we might lack evidence to support this aspiration. In all cases, it is necessary to think deeply about the learning activities that students undertake — and the data that is generated through these activities, which is often not very visible remotely. The pandemic context also demands additional Covid-safe data gathering using surveys, questionnaires, field observations, and interviews (↑Kaye et al., 2020).

Deciding what data is a good proxy for the impact that is being sought will normally involve a number of conversations, especially in relation to learning outcomes.

In a multiple stakeholder TPD programme, discussions (in-person conversations, phone calls, surveys, workshops) are necessary to find the extent of available data and determine its usefulness.

In addition, an accompanying narrative is necessary to explain the components in depth so that multiple stakeholders can easily access and understand the information that the TOC is trying to provide.

The best results will be achieved if there is an intentional and critical approach in which participants question each other supportively about their 'theory' and the evidence, as well as assumptions underlying those theories.

Annex 3. Stakeholder validation process

The interviews and validation meetings, at which versions of the TOC were modelled and discussed (with accompanying feedback processes) resulted in the following overall outcomes.

Alignment with the overarching goal for the TOC and its mid-term outcomes

The in-meeting polls evidenced that both the Government of Bangladesh and non-governmental groups were fully aligned with the overarching goal for the TOC.

Summary of changes made to the TOC as a result of the stakeholder validation process

The process of stakeholder validation led to a number of common questions being asked about the TOC and its relationship to pre- and in-service teacher development initiatives that had been designed for particular content areas or contexts. Hence we offer a set of Frequently Asked Questions (FAQs) in Annex 4.

Annex 4. Frequently asked questions

Educational activities

What teacher activities does the Theory of Change focus on?

The teacher activities captured by the Theory of Change take a holistic approach that leverage education technology in three ways. The first is the use of technology in teacher professional development. The second is teachers learning with technology to support teaching, planning, and assessment practices. The third is teachers learning about technology that can support learners' outcomes. This captures the Technology, Pedagogy and Content Knowledge (TPACK) global framework, and work by ↑Hennessy et al. (2021).

Educational modalities

How do we classify different forms of EdTech by their modalities?

This is always very difficult — particularly as many technologies work and share data together — they are 'interoperable'. The main purpose for classifying educational technologies is so that we can have some common understandings of how a teacher will interact with each modality, and what data is automatically captured as a result of their interactions. It is vital that educationalists work alongside technologists to decide which data is valid from an educational perspective. Many digital systems collect vast amounts of data that is of no real value when trying to understand if, when, and how teachers' learning has happened! For the purposes of this TOC, the report has tried to classify modalities between 'no', 'low' and 'high' technology to take into account the different working contexts of teachers working in Bangladesh.

Educational impact

What is the impact that the TOC hopes to achieve for pre- and in-service teachers?

The overall impact of this teachers' TOC is to make visible how TPD — through the medium of different types of technology — can enable high-quality education for all learners. This is complementary to what the overall impact was for the previous TOC for learners (↑Clark-Wilson et al., 2021), and what the

impact will be for future TOCs focusing on other stakeholders central to the education system. The focus of this TOC is to document the pathway — with teachers at the centre — through which this overarching impact can be achieved.

Annex 5. Validating and critiquing a theory of change

Having created an initial draft, the following questions support a critical approach towards a more robust next draft.

- Are the educational modalities and resulting teacher activities clear? Can you picture what a teacher might be doing if you had a 'bird's eye view' of them engaging with the professional learning resources?
- Do the outcome measures make sense? How will data be captured? How will you check the data is valid and correct? Do you believe or trust the results?
- Do you have enough information to feel confident that the TOC is correct?

Use the TOC to pose questions for the programme (or course) design and implementation teams to support the theory and strengthen it.