CENTRAL SQUARE FOUNDATION

Lessons from the Project on

Understanding EdTech Usage at Home Using Dedicated Devices

Part I of Report

Implementation Playbook on Procurement, Provisioning, Distribution and Maintenance of Devices for Educational Purposes

August 2022 - May 2023

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Acknowledgement

Executive Summary

Photo credit: CSF. Location: Almora, Uttarakhand.

Device distribution programmes have been a part of the educational policies of many countries even prior to the pandemic, ranging from the high-profile *One Laptop Per Child programmes* to large-scale government-supported initiatives to distribute tablets to students in the K-12 segment. However, many of the past programmes have not been able to achieve the educational outcomes that they set to accomplish. For example, the Inter-American Development Bank's report — assessing the impact of the OLPC programme in Peru — highlighted that even though the programme exponentially expanded access to digital devices in the country, it did not demonstrate a significant learning impact on Math and Language. The Commonwealth of Learning's extensive research on 11 countries that launched government-led tablet initiatives, also concluded that a majority of these were limited to providing tablets rather than including educational frameworks in their programme.

In recent years, an emerging body of evidence indicates that EdTech can support student learning outcomes in schools and at home. Globally and in India, there has been phenomenal growth in the EdTech market, with the user base for the K-12 segment (primary and secondary education) in India increasing from 45 million to 90 million between 2020 and 2022. There has also been a similar increased interest in EdTech by state governments. In 2022, 24 state governments in India expressed interest to include education technology in over 98,000 schools, thereby committing to spend over US $470 million. However, limited access to devices continues to be cited as one of the key reasons preventing low-income families from benefiting from the use of EdTech. Hence, different state governments in India have been investing in device distribution programmes[1] over the past several years.

Drawing on the learnings from past device distribution programmes, this project identified and consolidated the various levers required to create a device distribution model that would provide insights about EdTech usage at home using dedicated devices. For this project, devices installed with Mobile Device Management (MDM) software, an internet package and two learning solutions (BYJU's *Think and Learn* app and Educational Initiatives' *Mindspark* app) were distributed to 600 students (Grade 4 and 8) in 83 government schools in Almora, Uttarakhand for learning at home.

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1   In India, Punjab, Delhi, Gujarat, Tamil Nadu, Odisha, Chhattisgarh, Uttar Pradesh, and Haryana have implemented device distribution programmes.

This action research was conducted over a period of 7 months (from November 2022 to May 2023) under the guidance of Prof. Tarun Jain, Associate Professor of Economics at the Indian Institute of Management, Ahmedabad. During the course of 7 months, the project design was optimised through rapid iterations with tech-based and programmatic interventions in treatment groups to encourage the use of and engagement on EdTech solutions. The project implementation was carried out in iterative cycles (ranging from 6 to 8 weeks), wherein learnings from each cycle were used to design the interventions for the subsequent cycle.

There have been several key insights from the project and these have been divided into two parts to contribute to our collective knowledge on the setting up of device distribution models for educational purposes and deriving insights on the usage of EdTech at home using dedicated devices. **Part 1 is this implementation playbook, which provides learnings relating to procurement, provisioning, distribution and maintenance of devices**. Part 2 describes the programme that was deployed to encourage the use of EdTech on dedicated devices. It explains the iterative research design and the insights obtained through the technological and programmatic interventions to encourage the usage of EdTech at home.

Upon the commencement of the project, it was important to identify the purpose for which the devices were being distributed - e.g. practice, self-learning, remediation, etc. Consequently, it was important to identify the EdTech learning software that would be most suited to the learning directive of the programme. Thereafter, devices with suitable technical and functional capabilities to support the software needed to be procured. Devices were procured under appropriate warranty coverage (1 year in this case) and the on-field IT team had a clear understanding of the damages that were covered under warranty. Additional replacement devices and licenses were budgeted for early on to safeguard against any disruption of learning that could be caused by device damage or loss.

Once the devices were procured, they were provisioned using a Mobile Device Management (MDM) software. A MDM software is installed on devices to optimise functionality and safety for a fleet of devices from a single unified console. It is used in device distribution programmes for real-time monitoring of the devices, retrieving usage data, and physically verifying devices for inactive students, as well as for checking any misuse of the tablet. The initial provisioning of devices — where each device was set up with customised user settings and a requisite package of apps — required a large staging area with high-speed internet and technical expertise. Keeping in mind these requirements, it is recommended that the initial provisioning of devices is carried out by the MDM software partner to ensure quick and real-time resolution of any MDM-related concerns that may arise during provisioning.

Appropriate awareness and training for the students and the learning agents (teachers and parents) was identified as a critical step in the programme. The 'device distribution day' was planned as an opportunity for teachers, parents and students to come together to activate their devices and SIM cards, build familiarisation with the devices and learning solutions, and align on the goals for usage on the learning solution. The 'device distribution day' was also used as an opportunity to administer a learning baseline test for the students.

A proactive issue-resolution mechanism was a critical enabler to ensure the usage of devices. This involved elements like providing a helpline number that the parents/students could access, and setting up a similar process with the local service centre in the targeted areas to ensure timely servicing of damaged devices. This was coordinated by an on-field IT assistant who interacted with the MDM software partners and the learning solution partners at the back end to facilitate quick resolution of any MDM or learning solution-related issues.

The purpose of this playbook is to serve as an implementation toolkit that synthesises our learnings for any stakeholder looking to set up a device distribution programme for educational purposes. Detailed in the following sections are in-depth insights drawn from the various stages of implementation of the project on **Understanding EdTech Usage at Home Using Dedicated Devices**.

Setting the Context for Device Distribution Programmes for Educational Purposes

This section explores learnings from the device distribution programmes around the world and also evaluates Indian device distribution programmes. By understanding previous device distribution models and evaluating their evidence-based reviews, this section helps set the context and approach for this project on **Understanding EdTech Usage at Home Using Dedicated Devices.**

1.1 Landscape of Device Distribution Programmes in India and the World

During the onset of the COVID-19 pandemic, India saw widespread disruption in its education system with school closures leading to a tremendous learning gap for 320 million students. According to UNICEF's research, a significant proportion of students and their parents reported that students learned significantly lesser during the pandemic as compared to before the pandemic. In India, 80 percent of children in the 14-18 age group reported lowered levels of learning during school closures compared to when they were physically in school.

Since schools were shut during the pandemic, technology-enabled at-home learning became the mainstay of government programmes to ensure the continued learning of students. While some state governments attempted to provide some form of home learning solutions and digital learning programmes through DTH channels, radio, SMS, IVRS and WhatsApp, the digital divide emerged as a key challenge to reaching children at home.

Globally, countries in Latin America and Africa have experimented with device distribution programmes to address the digital divide in their country. Uruguay with its Plan Ceibal was the first country in the world to provide all primary school students with free laptops in 2009. High-profile EdTech initiatives for developing countries such as the 1 million OLPC XO laptops distributed to students in Peru, shed more light on the 1-to-1 educational computing initiatives[2] all over the world. Some other prominent examples that indicate how portable computing devices (laptops and tablets) are becoming part of educational policies and planning processes all over the world[3] include the distribution of free laptops to 6,000 primary schools in Kenya and the distribution of free iPads to 640,000 students in Los Angeles[4].

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2   Uruguay, Peru, Rwanda, Nepal, Portugal, USA, Kenya, Georgia, Japan, Singapore, Indonesia, Brazil, Thailand, and Turkey are some of the countries that have implemented device distribution programmes. Read more at
    https://blogs.worldbank.org/edutech/big-educational-laptop-and-tablet-projects-ten-countries

3   World Bank Blogs. (2013). Big educational laptop and tablet projects - Ten countries to learn from. Read more at
    https://blogs.worldbank.org/edutech/big-educational-laptop-and-tablet-projects-ten-countries

4   The Board of Education for the Los Angeles Unified School District (LAUSD) has approved a $30 million contract with Apple Inc. in the first phase of a district-wide plan to have 655,000 students equipped with tablets, which is eventually slated to run over $400 million.

Chart 1: There have been numerous global and domestic attempts to provide digital hardware to supplement learning

Global

1. **One Laptop per Child: Uruguay** (2006 onwards), **Peru** (2007 onwards), **Rwanda** (2010 onwards), **Nepal** (2007 onwards)

2. **Laptop distribution: Portugal** (2008 onwards), **USA** (several states; 2002 onwards), **Kenya** (2004 onwards), **Georgia** (2010 onwards), **Japan** (2020), **Singapore** (2020)

3. **Tablets in school: Thailand** (2012 onwards), **Turkey** (2012 onwards)

Domestic

Punjab
1,75,000 free smartphones distributed to students (Aug 2020)

Delhi
Free laptops distributed to 15,000 students in Schools of Excellence and those scoring above 80% in 10th board exams (2020)

Haryana
Free laptops distributed to students scoring >90% in 10th board exams (2019)
Free tablets distributed to 500,000 students in grades 10, 11 and 12 (2022)

Uttar Pradesh
1,500,000 free laptops distributed to grades 10 and 12 graduates (2012-15)

Chhattisgarh
5,000,000 smartphones distributed to women (2018)

Gujarat
Tablets given to grade 12 graduates for Rs. 1000 (2017 onwards)

Odisha
Free laptops distributed to 15,000 meritorious students (2019)

Tamil Nadu
Free laptops distributed to grade 10 and 12 graduates (2011 onwards)

Aakash Project
Tablets distributed to students across the country (2011-2012)

Past programmes
Ongoing/2020 onwards

Source: World Bank; State government websites

In India, it was the Aakash project in 2011 that paved the way for the introduction of a new low-cost educational tablet into the hands of students in a developing country. Since the launch of the Tamil Nadu government's Free Laptop Scheme in 2011, over 51.67 lakh laptops have been distributed to students until 2020. In 2023, the Tamil Nadu government restarted the Free Laptop Scheme 2023 under which all students who have passed the 10th or 12th standard examination from a government or aided school can avail the benefits of this scheme.

The advent of the pandemic has shifted the debate on EdTech from *"if"* to *"how"* and has accelerated the adoption of online learning by over a decade. While past programmes focused on hardware distribution, they often did not include a clearly stated learning directive or focus on designing behavioural nuances that go into EdTech adoption and engagement. For example, the One Laptop Per Child programme in Peru took considerable investment and was able to expand access to digital devices in the country exponentially. However, since the programme did not integrate the laptop into the curricula, nor did the laptops include specific Math or Language software, it was not shown to have a significant learning impact on Math and Language. Hence, the Inter-American Development Bank's report assessing the impact of the OLPC programme in Peru highlighted the importance of "combining the provision of laptops with a pedagogical model targeted toward increased achievement by students". The Commonwealth of Learning's extensive research on government-led tablet initiatives in 11 countries also highlighted how there was limited discussion on procurement decisions for tablet purchases, financial or organisational models used in planning these initiatives, and the pedagogical frameworks used in the learning content provided in these tablets. Chart 2 below summarises the identified issues with previous device distribution programmes for educational purposes.

Chart 2: Previous device distribution programmes overlooked four key features that could encourage sustained device usage

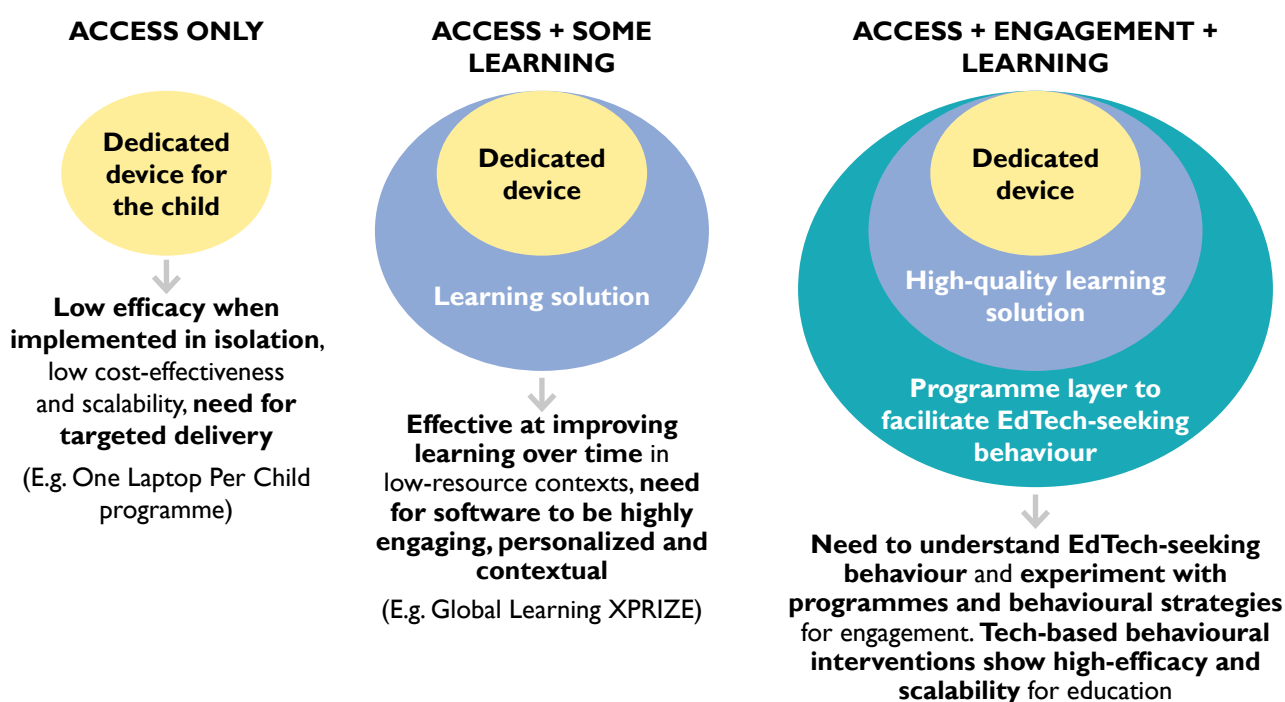| 1	2	3	4
Lack of a **strategic approach** towards learning	**No directives** on how to use the device effectively	**No incentives** to drive sustained engagement over time	**No monitoring mechanisms** or rigorous evaluations
Learning as an outcome was not explicitly stated as a programme objective	Devices were not integrated with a cohesive learning strategy	No financial or non-financial incentives to drive continued usage of the devices over time	With only a handful of rigorous programme evaluations existing, model scaleup is a challenge

1.2 Identified Levers to Set Up a Device Distribution Model for Educational Purposes

Besides solving for 'access', it is important that such programmes have targeted measures in place to encourage device usage and engagement with the learning platform. Many programmes have ignored important design elements such as having a strategic approach towards learning, directives on how to use the device effectively, incentives to drive sustained engagement over time, and monitoring mechanisms or rigorous evaluations to ensure model scaleup.

In light of the amount of investment that the EdTech sector is attracting, we aim to cover through this playbook the nuances of what it takes to run device distribution programmes for educational purposes for any stakeholder of the education system such as policymakers, educationists, teachers and private players.

Drawing on the learnings from past device distribution programmes, the approach adopted for this project on *Understanding EdTech Usage at Home Using Dedicated Devices* involved the distribution of devices loaded with two learning solutions, a Mobile Device Management (MDM) software[5], an internet package, and the application of tech-based incentives blended with structured programmatic support.

Chart 3: A dedicated device model coupled with learning solutions and a programme layer to facilitate EdTech-seeking behaviour was selected to encourage the adoption and usage of learning solutions

ACCESS ONLY

Dedicated device for the child

↓

Low efficacy when implemented in isolation, low cost-effectiveness and scalability, **need for targeted delivery**

(E.g. One Laptop Per Child programme)

ACCESS + SOME LEARNING

Dedicated device

Learning solution

↓

Effective at improving learning over time in low-resource contexts, **need for software to be highly engaging, personalized and contextual**

(E.g. Global Learning XPRIZE)

ACCESS + ENGAGEMENT + LEARNING

Dedicated device

High-quality learning solution

Programme layer to facilitate EdTech-seeking behaviour

↓

Need to understand EdTech-seeking behaviour and **experiment with programmes and behavioural strategies** for engagement. **Tech-based behavioural interventions show high-efficacy and scalability** for education

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5   MDM software is installed on devices to customise functionality and ensure safety for a fleet of devices from a single unified console. It is used in device distribution programmes to enable real-time monitoring of the devices, retrieve usage data for all the devices, set customised user settings and to check against any misuse on the tablet.
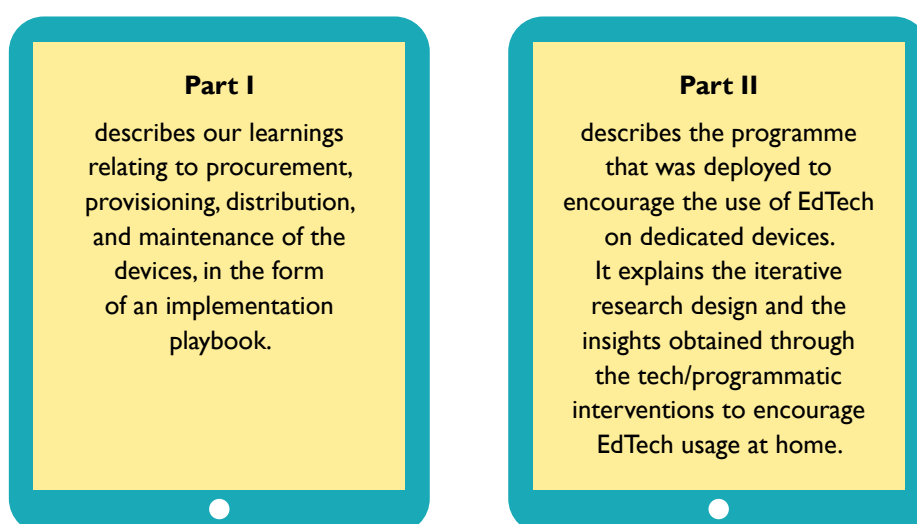
The project involved other mission-aligned organisations, EdTech solution providers, on-ground implementation agencies and behavioural research partners for:

- **Procuring devices** with suitable technical and functional capabilities for the learning solutions, with the right specifications around screen size, audio quality and processors, an effective internet data package, and MDM software

- **Providing two types of learning solutions:** One solution that is curriculum-aligned, complete with quizzes, games, tests, and engaging video lessons with the right engagement hooks, whereas the other was a Personalised Adaptive Learning (PAL) solution that encourages inquiry-based learning with learning level-based questions, grade-level assessments and videos in Hindi and English

- **Driving sustainable usage and engagement** through the evaluation-led diagnosis of barriers to engagement, designing and iterating on behavioural and programmatic interventions to encourage the use of and engagement on EdTech

This programme is a collaboration and draws on the strengths of the following partners:

- **Hardware/Internet and insurance provision:** ACT For Education aims to enable the bottom three quartiles of India's population to learn at home by harnessing the power of EdTech. The fund intends to do this by seeding capabilities of education-centred non-profits as well as for-profit organisations and accelerating their impact at scale

- **Learning software:** Through its 'Education for All' social impact programme, BYJU's provided premium licenses to BYJU's *Think and Learn* App, which contains more than 50,000 videos, tests, quizzes, games and engaging video lessons, making it a complete learning companion. Educational Initiatives provided licenses to its evidence-based PAL tool, Ei Mindspark, which was evaluated by J-PAL, MIT to show a two-four times gain in learning outcomes. In addition to supplying the provision of learning software, both partners also provided training around the software, weekly data, and continued support on troubleshooting software issues

- **Implementation partner:** Sshrishti Trust, was identified as the implementation partner for identifying/onboarding beneficiaries, device distribution, data collection and for on-ground implementation support to deploy interventions

- **Research partner:** This action research was carried out under the guidance of Principal Investigator Prof. Tarun Jain, Associate Professor of Economics at the Indian Institute of Management Ahmedabad, with extensive research expertise in Economics, Education, Gender, Health, and Public Policy

The project that was carried out from November 2022 to May 2023 aimed to **identify best practices for the implementation of a device distribution model for educational purposes and iterate tech-based nudges to encourage EdTech usage at home with dedicated devices**. The findings from the project are collated in two parts:

Part I

describes our learnings relating to procurement, provisioning, distribution, and maintenance of the devices, in the form of an implementation playbook.

Part II

describes the programme that was deployed to encourage the use of EdTech on dedicated devices. It explains the iterative research design and the insights obtained through the tech/programmatic interventions to encourage EdTech usage at home.

Part I of Project: Implementation Playbook on Procurement, Provisioning, Distribution and Maintenance of Devices

Part I explores learnings relating to procurement, provisioning, distribution and maintenance of the devices from the project on **Understanding EdTech Usage at Home Using Dedicated Devices**. The project commenced in November 2022 after the completion of baseline data collection of beneficiaries and MDM provisioning of devices. The device distribution, training for parents and students on device usage, and the activation of students on learning solutions were completed in a phased manner in December 2022.

Chart 4: Timeline of the project on Understanding EdTech Usage at Home Using Dedicated Devices
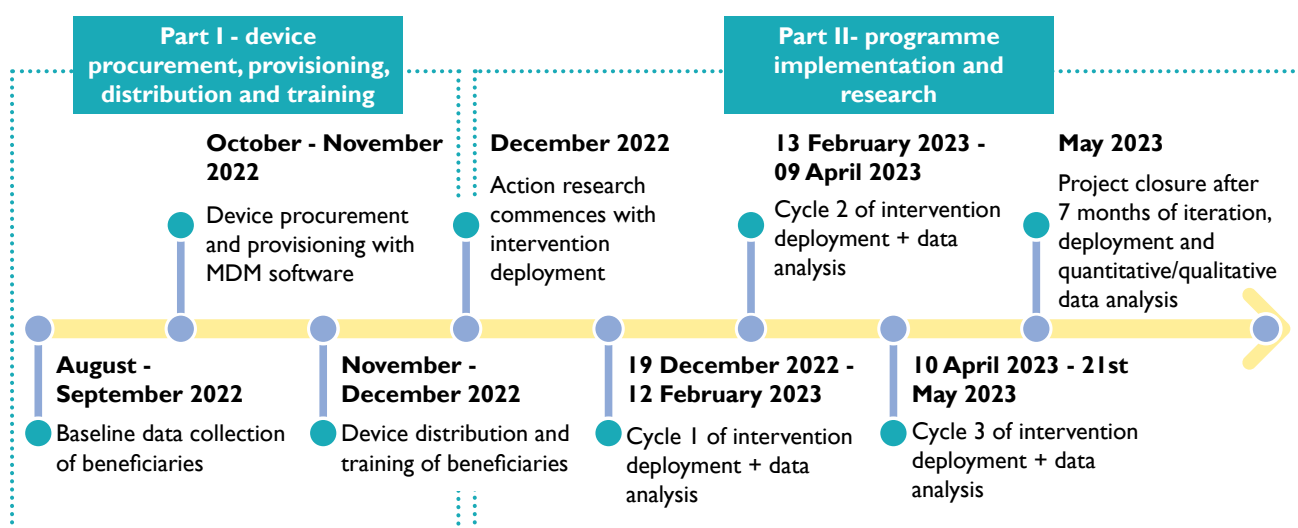
This section details our learnings from the various implementation processes that were carried out on the project from August 2022 to December 2022:

Table 1: Summary of implementation processes in the project on Understanding EdTech Usage at Home Using Dedicated Devices

Process	Description
2.1 Procurement of devices	This section includes details regarding: • Selecting device specifications and pricing • Ensuring device safety and budgeting replacement devices • Identifying mobile network vendors and internet package

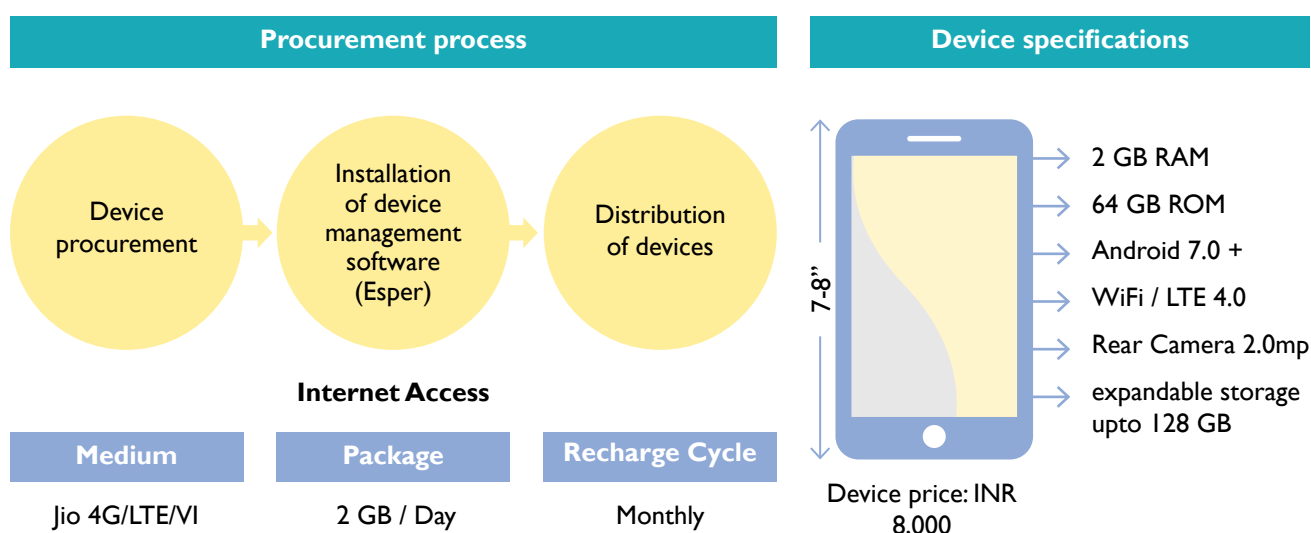| Process	Description
2.2 Provisioning of devices and the institution of a student protection policy	All devices for the project were installed with MDM software to provision them with customised user settings, apps and safety protocols. This section includes details of • Key features of MDM software used in the project • Maker-Checker model for provisioning of devices

2.3 Distribution of devices and training of beneficiaries	This section outlines:
	
	• Details of the implementation team
	• Prerequisites for device distribution:
	  ⊙ *A pre-distribution checklist* that includes the creation of a distribution plan, data tagging of devices and preparation of training collaterals
	  ⊙ *A distribution checklist* that includes the creation of consent forms, activation of SIM cards, distribution of devices, training of beneficiaries and the administering of baseline tests

2.4 Issue-Resolution Mechanism	This section highlights our learnings from: • Setting up an issue-resolution mechanism through the creation of a helpline, on-field IT support and troubleshooting support from local service centres, learning solution partners and MDM software partners • Technical issues and identified mitigation measures

2.1 Procurement of Devices

🖐 Selecting Device Specifications and Pricing

The project commenced with the identification of purposes for which device distribution was being conducted for educational purposes that includes student practice, self-learning, remedial learning, etc. Based on the learning directive for the programme, the EdTech learning solutions were identified and then devices with suitable technical and functional capabilities to support these learning solutions were procured.

Chart 5: The project leveraged devices with the right specifications conducive to an engaging learning experience for the child

Procurement process			Device specifications
Device procurement	Installation of device management software (Esper)	Distribution of devices	2 GB RAM 64 GB ROM Android 7.0 + WiFi / LTE 4.0 Rear Camera 2.0mp expandable storage upto 128 GB

Internet Access

Medium	Package	Recharge Cycle
Jio 4G/LTE/VI	2 GB / Day	Monthly

Device price: INR 8,000

The devices were intentionally set at a pricing of INR 8,000 per device, considering that similar device distribution programmes by state governments in India had secured devices worth ~INR 12,000 with a one-year warranty. This helped ensure that the budgets were in line with previous device distribution programmes adopted by other state governments.

🛡️ Ensuring Device Safety and Budgeting for Replacement Devices

Throughout the project, several steps were followed to ensure device safety:

- ☑ Devices were procured under appropriate warranty (one-year in this case) coverage.

- ☑ The on-field IT assistant had a clear understanding of the damages that were covered under warranty.

- ☑ Ongoing troubleshooting support was also set up with local service centres in the targeted areas to avail the free servicing under the warranty coverage.

- ☑ Replacement devices and licenses were budgeted early on to ensure that there was no disruption to learning that could be caused by device damage or loss.

- ☑ Tablet covers matching the requisite size of the devices were provided to beneficiaries to ensure device safety and prolonged usage.

📶 Identifying Mobile Network Vendors and Internet Package Providers

The mobile network vendors were identified by the implementation team in Almora through the following process:

- ☑ The implementation team completed a quick assessment of which mobile network vendors had the best network coverage and highest penetration in targeted block areas of Almora, Uttarakhand.

- ☑ The project manager from the implementation team was responsible for a monthly follow-up with the mobile network vendor, which ensured that monthly recharges were done promptly to provide uninterrupted connectivity to all beneficiaries.

- ☑ The payments to the mobile network vendors were also made every month by the implementation team and budgeted under the internet provision of the hardware costs.

The internet data package for monthly recharges was selected based on:

- ☑ *The type of content to be used on the devices*: The internet data package needed to be adequate to ensure optimal usage of the audio-video content on both the learning apps (BYJU's and Mindspark) and the edutainment apps (YouTube Kids and Google Chrome).

- ☑ *Internet packages provided in similar device distribution projects in India*: Based on the internet package that was provided for other device distribution programmes in India such as the Tamil Nadu government's Free Laptop Scheme, a package of 2GB per day was provided to ensure optimum usage of learning content on dedicated devices.

2.2 Provisioning of Devices and the Institution of a Student Protection Policy

Once the tablets were procured, the next stage was the provisioning of the devices which included onboarding the devices onto Mobile Device Management (MDM) software. MDM software is installed on devices to optimise functionality and safety for a fleet of devices from a single unified console. It is used in device distribution programmes to enable real-time monitoring of the devices, retrieve usage data for all the devices, set customised user settings, and check against any misuse of the tablet.

For this project, it was imperative to select an MDM partner that provided provisions for:

- Real-time monitoring of devices

- Remote management and troubleshooting support

- Installation of whitelisted applications

- Generation of customised reports on device usage

- Setting custom controls to ensure student safety

- Deployment of tech-based nudges

Detailed below are some of the key features of the MDM software that was procured for this project, which enabled effective provisioning, monitoring, and management of all devices from a unified console.

Key Features of the MDM Software Used in the Project

Table 2: List of key features of the MDM software used in the project

Sl no	Purpose	Feature Breakdown	Feature Description
1	**Device Operations**	Nested Device Groups	Helps create groups for flexible management of devices
		Android Studio Plugin	Helps deploy updates to all devices by uploading APKs directly to the MDM console
2	**Device Provisioning**	No-Touch Provisioning	Helps enable seamless, no-touch provisioning on devices
		6-Tap QR Code Provisioning	Helps provision new devices by scanning a QR code
		Pipelines for DPC	Help in the installation of apps to a single or a group of devices through a pipeline
3	**System and Hardware Security**	System Lockdown	Automates device lockdown for unauthorized usage
		Android System Settings	Allows or blocks user access to the System Settings app
		Custom Settings App	Creates a custom app to limit user access to device settings
		Mass Reboot	Reboots the entire device fleet
		Factory Reset Protection	Blocks user access to the device factory reset
		Google Account Restriction	Prevents users from adding their own personal Google accounts
		Call & SMS Restrictions	Blocks SMS/calls on the device
		Whitelisting/Blacklisting	Whitelists select apps and blacklist unapproved apps
4	**App management**	Block/Permit Apps	Helps define user app permissions via console
		Configure App Permissions	Helps set a list of URLs that can be accessed
		Device App State	Helps set the app to Show/Hide on the device
		Group App Install	Helps install and update apps and app versions
		CMS (Content Management System)	Helps upload files and transfer them to devices or vice-versa
5	**Remote troubleshooting**	Remote View and Control	Helps to remotely view devices to troubleshoot performance
		Remote Debugging	Generates bug reports for device, app, and OS anomalies
		Remote Reboot	Helps to remotely reboot a device, group, or entire fleet
		Remote Wipe	Helps to remotely wipe device data
		Tracking Devices (Geofence Timeline)	Uses geofencing to track device movement
		Offline Device Actions	Queues automated updates to offline devices

Sl no	Purpose	Feature Breakdown	Feature Description
6	**Report and Analytics**	Automated Daily Reporting	Generates automated daily reports on device usage
		Customised Reporting	Generates custom reports on device and app usage
		Device Dashboard	Displays device performance at a glance
		Activity Feed	Provides real-time updates on users, devices and actions

*The full list of features available on the MDM software is detailed in Annexure 4.2.

Maker-Checker Model for Provisioning of Devices

Before the devices were distributed to the students, there was a requirement for one-time provisioning to be completed on the devices to make them ready before they went into the hands of the beneficiaries. The provisioning process involved the installation of the required package of apps and setting customised settings and controls on the tablet which ensured that the beneficiaries were not able to visit any unwanted websites or download any other material onto the tablet. These included restricting incoming calls, messages, camera, whitelisting apps, and a list of URLs that can be accessed by the students.

The following Maker-Checker model was followed to provision devices in batches of 10 at a time for increased efficiency:

Table 3: Devices were provisioned, monitored and packaged as per the following Maker-Checker Model

Maker-Checker Model			
Maker (A batch of 10 devices can be completed in ~70-80 mins)			
Step	**Readying the devices**	**Provisioning**	**Monitoring**
Tasks	Switching on the devices	Rename all devices	Check if all apps are present
		Create a new group on the MDM console	Make a note of pending apps
		Add devices to the group	
	Connecting devices to the Wi-Fi network	Push apps through the pipeline	Check if blacklisted URLs are blocked
	Charging devices, if needed	Manage app configurations	Check if whitelisted URLs are opening
		Push compliance policy	Check if the 'Reboot' option is removed from the Settings app
Time needed (for a batch of 10)	10 mins (1 min per device)	10 minutes to apply the command (for all 10 devices) 20 mins waiting time for provisioning to apply (to all 10 devices)	30 mins (3 mins per device)
Number of people required	1	1	2
Technical expertise needed	No	Yes	No

Checker (A batch of 10 devices can be completed in 80 minutes)		
Step	**Checking the devices**	**Packaging the devices**
Tasks	Check if all apps are present	Check if the device number on the device and the box matches
	Check if blacklisted URLs are blocked and if whitelisted URLs are opening	Search IMEI number in the master sheet to find the student's name, school name, phone number and login credentials.
	Check if the 'Reboot' option is removed from the Settings app	Paste a sticker on the device with the student's name, school name, phone number and login credentials.
	Check if the device has been renamed	Check if the 'Reboot' option is removed from the Settings app
	Package the device back in the box for dispatch	Package the device back in the box for dispatch
Time	30 mins (3 mins per device)	50 mins (5 mins per device)
Number of people required	1	2
Technical expertise needed	No	No

Audit (for random devices)		
Step	**Final Check on devices**	**Packaging the devices**
Tasks	Check if all apps are present	Check if the device number on the device and the box matches
	Check if blacklisted URLs are blocked and if whitelisted URLs are opening	Check if the device number on the device and the box matches
	Check if the 'Reboot' option is removed from the Settings app	Check if the student's name, school name, phone number, and login credentials match with the details for that device on the master sheet
		Put the device box back in the polythene bag for dispatch
Number of people required	2	2
Technical expertise needed	No	No

The biggest learning during the operational stage of this project was the requirement for a staging area during the one-time provisioning of the devices. Since the provisioning process requires technical expertise, high-speed internet, and a staging area for a larger number of devices, it is recommended that the provisioning of devices be completed by the MDM software partner involved in the project.

2.3   Distribution of Devices and Training of Beneficiaries

For large-scale device distribution programmes, strong logistical planning and having an adept implementation team on the field are critical in bringing about implementation fidelity across all processes involved in setting up a device distribution programme. This section outlines the scope of work of the implementation team and the processes to be put in place before commencing the device distribution.
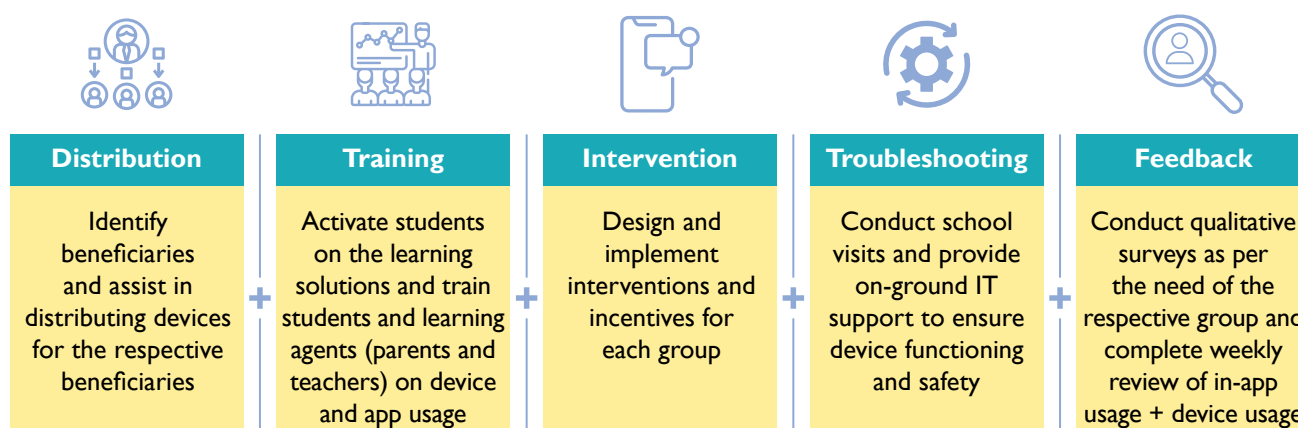
Details of the Implementation Team

Sshrishti Trust, a non-profit organisation with 19 years of experience in scaling sustainable development programmes and tech-based programmes in Uttarakhand, Himachal Pradesh, and the Northern India was selected as the implementation partner for this project in Almora, Uttarakhand.

Table 4: Composition of the Sshrishti Trust implementation team for this project

Team Member	Number of People	Unit Cost	Role
Project Manager	1	~INR 35,000	The project manager was responsible for leading the team of field coordinators to ensure efficient implementation on the field and impactful utilisation of resources on the project.
Field Coordinators	6	~INR 15,000	A total of 600 students in 83 government schools across four blocks in Almora were divided between a team of 6 field coordinators. The field coordinators were responsible for the identification and onboarding of beneficiaries, distribution of devices, training of beneficiaries and learning agents, on-ground implementation support to deploy interventions and incentives, providing ongoing troubleshooting support, and data collection whenever needed.
IT Assistant	1	~INR 25,000	The IT assistant ensured the effective resolution of device/software or app-related issues and the timely redistribution of devices back to the beneficiaries. In addition, the IT assistant was also responsible for the real-time monitoring of devices and tech-based interventions deployment through the MDM console.

Chart 6: Scope of work for the implementation team for this project

Distribution	Training	Intervention	Troubleshooting	Feedback
Identify beneficiaries and assist in distributing devices for the respective beneficiaries	Activate students on the learning solutions and train students and learning agents (parents and teachers) on device and app usage	Design and implement interventions and incentives for each group	Conduct school visits and provide on-ground IT support to ensure device functioning and safety	Conduct qualitative surveys as per the need of the respective group and complete weekly review of in-app usage + device usage

Prerequisites for Device Distribution

Having an exhaustive distribution plan and checklist for the days leading up to the distribution day ensures that the implementation team is adequately prepared and well on track to implement a device distribution programme. The following subsections provide insight into the pre-distribution and distribution day checklist followed on the project on *Understanding Edtech Usage at Home Using Dedicated Devices*:

Table 5: Components of the pre-distribution and distribution day checklist

Activity	Components
Pre-distribution checklist	• Creation of a cluster-wise distribution plan • Data tagging and labeling of devices • Creation of consent forms • Preparation of training collateral
Distribution day checklist	• SIM card registration and activation • Signing of consent forms • Training of beneficiaries • Baseline screening test • Calendars to encourage habit formation of EdTech usage

Pre-distribution Checklist

Before distribution, the implementation team needed to gather at a staging area to plan and prepare for the distribution day to ensure that potential implementation challenges were accounted for.

☑ *Creation of cluster-wise distribution plan*: Based on the school schedule, availability of parents and students, and accessibility as per weather conditions, a distribution plan was put together for 600 students in 83 government schools in Almora. After aligning with the schools on a date for distribution and training, transportation was arranged accordingly for the field coordinators and for the devices to be carried. Parents and students were informed 2-3 days before the distribution day requesting their presence for the device distribution and to bring identity proof for the SIM card registration and activation. On the day before the distribution, parents and schools were also reminded through follow-up calls by the field coordinators to ensure 100% attendance.

Table 6: Sample cluster-wise device distribution plan

1st Day Training					
Date	**Time**	**Block**	**Number of beneficiaries**	**Schools covered**	**Field coordinator responsible**

☑ *Data tagging and labelling of devices*: To ensure the accuracy of data collected and easy identification for troubleshooting purposes, a one-time data registry exercise was completed by the implementation team wherein each device was tagged to a particular student. Both the learning content and the MDM software licenses were already tagged to each student on the device. These devices were then segregated school-wise and the IMEI numbers of each device were recorded to create a data repository for any operational, troubleshooting, or research purposes in the future.

Table 7: Sample template for data tagging of devices

Name of the Student	School Code	School Name	Number Tagged to the License	Device Name	IMEI Number	Serial Number	Intervention Group

Furthermore, each device was also physically labeled with details of the student's name, school name and login credentials for learning apps. This simple exercise was effective in the easy identification of devices and also in ensuring continued access to learning apps. Labelling of the devices led to a lot of operational efficiencies on the distribution day by enabling mass activation of all students without external assistance and also ensured that the students continued to have access to learning apps should they forget their login credentials during the duration of the project.

☑ *Creation of consent forms*: To encourage accountability and device safety, a consent form was signed by both the parent and school principal. The consent form outlined the objective of the project, the purpose for which the devices were being given, preliminary guidelines on device management, details of licenses provided, contact details of a helpline and other troubleshooting support, and a corresponding clause for device theft/misplacement/breakage to be reported (FIR to be filed and copy shared with field team). These consent forms were created by the implementation team in collaboration with other relevant stakeholders and then translated into the local language before they were finalised for printing.

☑ *Preparation of training collateral*: Along with the distribution of devices, the beneficiaries as well as parents and teachers were provided learning directives for the project and trained on how to use the device and learning apps. To prepare for this training, the field coordinators were given orientation sessions on the features and functionalities of the learning apps conducted by the BYJU's and Mindspark product teams.

Post orientation, the field coordinators prepared their training scripts which included details such as the objective of the device distribution programme, details regarding the device, internet package, learning apps and helpline contact number, do's and don'ts to ensure the safety of the device and a deep dive into each learning app and its features. Some demo videos were collected from the learning solution partners and collaterals were prepared by the field coordinators to aid in the app run-throughs in schools. Training plans were prepared keeping in mind the facilities that were present in the schools where the training was to be conducted. Once the training plans and scripts were finalized, the field coordinators went through multiple run-throughs to ensure that they were adequately prepared for the distribution day.

Distribution Day Checklist

On the distribution day, the following three processes occurred in tandem, which helped build a strong foundation for the project and increase adoption and sustained engagement on the device:

☑ *SIM card registration and activation*: On the day of the distribution, the field coordinators needed to ensure that the mobile network vendor arrived on time. As soon as the parents started coming in, the vendor started issuing SIM cards to the parents/guardians of the beneficiaries after biometric registration and submission of their valid identity proof. While most sims were automatically activated, some SIM cards required an additional activation time of 5-10 minutes per student. Once the new SIM was activated, the field team ensured that the internet connection was functioning on the device before they were distributed to the beneficiaries.
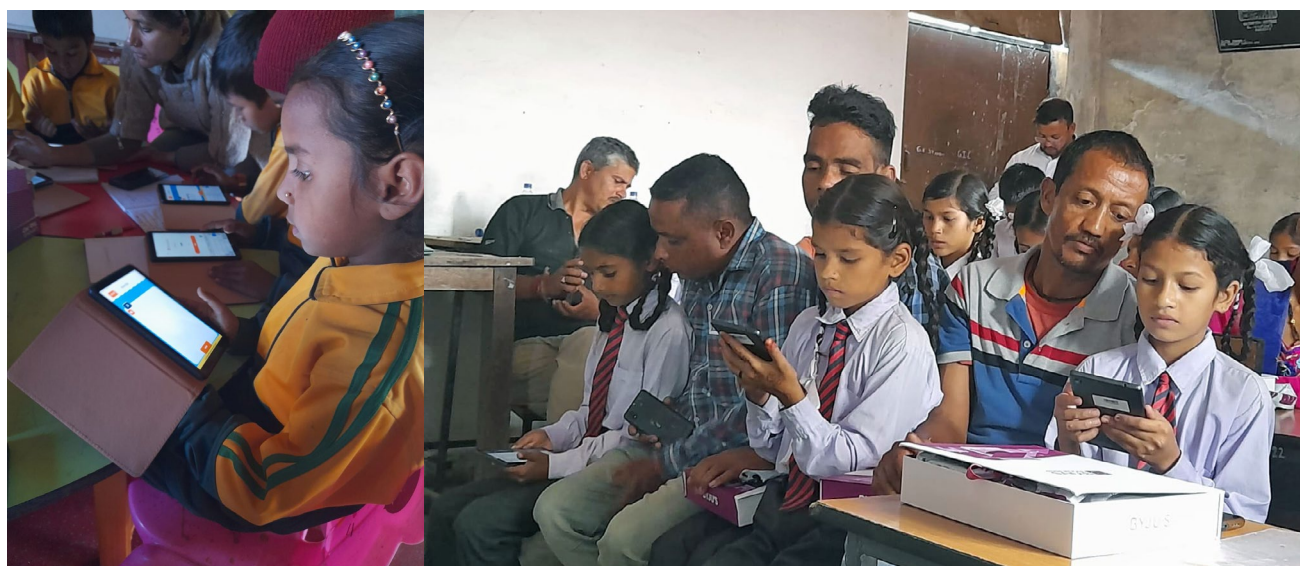
Photo credit: Sshrishti Trust. Location: Almora, Uttarakhand.

☑ *Signing of consent forms*: Once all students received their devices with activated SIM cards, the field coordinators began giving directives on device usage. The prepared consent forms helped the field coordinators ensure that they gave all the necessary directives around the objective of the project, the purpose for which the devices were being given, preliminary guidelines on device management, details of licenses provided, contact details of a helpline, and other available troubleshooting support.

Through this session, the field coordinators were able to provide a learning directive for students to spend at least 30 minutes on the learning apps daily and also reiterate simple do's and don'ts when it comes to device management. This also acted as a platform for parents to raise any concerns or doubts they may have regarding device usage and management. This session ended with a quick check-for-understanding (CFU) session with the parents and students to gauge and clarify their understanding of the purpose of the programme and device usage. Following this, the consent form was signed by the parent/guardian of the beneficiary and then countersigned by the principal of the school. One copy of the signed consent form was given to the parents while another copy remained with the field coordinators for their records.

☑ *Training of beneficiaries*: After the device distribution and signing of consent forms, training was provided to the students and their parents/guardians/teachers on two key aspects: device management and usage of learning apps. While simple directives on device usage were given in the earlier session, the field coordinators also provided a demo on how to use the device while teacher volunteers who were available in some schools assisted students with any queries. For the latter part of the training, trainers showed beneficiaries introductory demo videos of the learning apps and then proceeded to help the students log in to their learning apps. On the day of the distribution, it was observed that Grade 4 students had trouble spelling their names and identifying alphabets in English, hence the passwords were immediately changed to alphanumeric (e.g.: a000016) to enable an easier login process. After this, the field team did a detailed walk-through of what features were available on the learning apps, while students simultaneously explored them on their respective devices. This helped both the students and parents (as learning agents) to identify and learn about what features were available on the learning apps and clarify doubts in real time, if any.

Glimpses from the training given to students and parents on device management and usage of learning apps

Photo credit: CSF. Location: Almora, Uttarakhand.

☑ *Baseline screening test:* Since the device distribution, consent form signing and training were complete, the parents were given the option to leave, if they wished to, whereas the students stayed back to complete their baseline screening tests on the learning solutions. The baseline screening tests help in accurately assessing a baseline learning level of each student and then monitor any growth in their learning levels throughout the project. The test consisted of about 30-45 questions in Math to be completed without any external assistance, which helped assess what learning level content was shown to the students while they used the PAL learning solution.

Students completing the baseline screening test on learning solutions during the training given in Almora, Uttarakhand

Photo credit: Sshrishti Trust. Location: Almora, Uttarakhand.

☑ *Calendars to encourage habit formation of EdTech usage*: Calendars were also created and shared with the students during distribution day to encourage habit formation of engaging on learning apps for 30 minutes every day. Students were directed to mark completion on these calendars every day for a month and share pictures of the completed calendars on the parents' WhatsApp groups.

Chart 7: Calendars shared with students to encourage habit formation of engaging on learning apps every day

2.4 Issue-resolution Mechanism

For this project on *Understanding EdTech Usage at Home Using Dedicated Devices*, setting up an issue resolution process for the safety and smooth functioning of devices was of utmost importance to ensure seamless access to student learning content. Here are some of the steps that were followed to ensure that issues were resolved and devices were distributed back promptly.

Setting Up an Issue Resolution Mechanism

- *Sharing troubleshooting videos/posters over WhatsApp:* A lot of the technical difficulties faced on the devices such as low network coverage, low battery charge, etc. could be easily resolved by the beneficiaries themselves without having to seek external help. For such scenarios, a poster or video was created to inform the students/parents of simple steps to resolve these issues. This also enabled the students to take accountability for the overall management of their own devices and request assistance from their parents/ guardians before reaching out to anyone else

- *Creation of a helpline:* For issues that required external help, a helpline was created by the implementation team by registering a SIM card to a designated field coordinator. Details of this helpline were shared with the parents during the distribution day to help them take necessary action to ensure the smooth functioning of their own devices. Upon receiving calls, the designated field coordinator either assisted the parents remotely or informed the IT assistant to collect, fix and redistribute devices within 2-3 days

- *Providing on-field IT support*: For this project, the presence of an on-field IT assistant was pertinent to ensure the timely check, repair and redistribution of devices. Since the beneficiaries were not equipped to troubleshoot software/hardware concerns, the appointment of a designated IT assistant helped set up an efficient process for quick and efficient issue resolution

   The IT assistant registered details of all concerns received in a tracker to keep track of calls received on the helpline, devices collected, date of collection and redistribution of devices, and time taken for resolution. This tracker was then shared with the implementation team every week to ensure that all issues were resolved promptly and devices were redistributed within 2-3 days to avoid any disruption in the student's learning

- *Ongoing support from a local service centre:* During the procurement of devices, details of all available service centres were collected from the hardware partner so that the IT assistant could institute a process to receive ongoing support from the local service centres to resolve any persisting hardware issues that may occur. The IT assistant also gathered information from the service centre about hardware concerns that were covered under warranty and created a list of tentative prices for servicing hardware issues and a tentative time for resolving each concern

- *Ongoing troubleshooting support from the MDM and learning solutions partners*: Due to the complex nature of device distribution projects, there is often a need for quick iterations and deployments to ensure both system and hardware security. Setting up a weekly process with the MDM software partner helped address these concerns remotely and gather bug reports on any device, app or OS anomalies to be taken up with the required stakeholder

There were also temporary issues with the learning solution such as the unavailability of content due to a faulty SD card, the requirement of PIN to log in into the learning solution, and the changing of the phone number associated with the learning solution account if the existing number is lost, misplaced, etc. Such app-related issues were comprehensively addressed with the help of the CSF team and then taken up with the requisite team of learning solution partners

In addition to the mechanisms outlined above, certain provisions can be set through the MDM software which can safeguard against some common and critical issues that arise in device distribution programmes. Some of these issues and the mitigation measures identified through the project are outlined below.

Technical Issues and Identified Mitigation Measures

The following table contains details of the various technical issues that arose during the project and mitigation measures that were identified either during the implementation of the project or upon conversations with other stakeholders.

Table 8: List of issues that arose during the project and identified mitigation measures

Issue	Identified Mitigation Measure
Devices getting locked by a pattern/PIN code	In cases where the device was already locked out, it had to be collected back and factory reset. Once the device was reset, it was reprovisioned with the MDM software and requisite apps before redistribution. If the MDM software allows for it, it is also possible to disable the provision for setting a pattern lock on the devices for students on the MDM console.
Devices getting factory reset	A device can be reset through two methods: (i) Soft reset by selecting the 'Factory reset' option through the 'Settings' app. This soft reset function was disabled for all users through a compliance policy on the MDM console. (ii) Hard reset by using the power and volume buttons on the side of the device. The hard reset function can be disabled by either disabling the power or the volume buttons. This can be done in two ways: • If the device hardware and MDM software partners are the same (E.g.: Samsung devices and Samsung MDM), then power/volume buttons can be easily disabled. • If device hardware and MDM software partners are different, disabling buttons is only possible for certain Android versions where an API would need to be collected from the hardware partner to be pushed through the MDM software.
Jailbreaking of devices and installation of unwanted applications	During the provisioning of the devices via the MDM console, the admin created and pushed a compliance policy, which (i) had the provision to disable 'installation of apps' and (ii) set 'Google Account Restrictions' to 0, which prevented users from logging into their Google accounts through which they were able to install apps. Additionally, it was also possible to create a backend policy that was pushed through the MDM console which triggered automatic deletion of unwanted apps from all devices.

Chapter 03
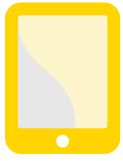
Key Learnings

Adequate planning, a thoroughly trained field team, effective communication with stakeholders and implementation fidelity are key to setting up a device distribution programme for educational purposes. Summarised below are some of the key learnings from this project on *Understanding EdTech Usage at Home Using Dedicated Devices.*

3.1 Learnings from Procurement of Devices

(i) Selecting Device Specifications and Pricing

- Procuring devices with large screen sizes (7 inches), good audio quality and adequate storage space (2GB RAM) helped create a better learning experience on the devices for students
- Procuring devices in a price range that was informed by previous state government programmes helped ensure that they were in line with device distribution programmes adopted by other state governments

(ii) Ensuring Device Safety and Budgeting Replacement Devices

- Devices were procured with one-year warranty coverage and local service centres were identified in targeted areas to avail the free servicing under warranty coverage
- Tablet covers were also provided to all beneficiaries to ensure device safety and their prolonged usage
- Replacement devices and licenses were budgeted and provided wherever devices were beyond reasonable damage to ensure that there was no disruption to learning

(iii) Identifying Mobile Network Vendors and Internet Package

- Mobile network vendors were identified by the field team after a brief assessment of vendors with good network coverage and the highest penetration in the targeted areas
- The internet data package of 2GB per day was selected based on:
  - ⊙ Internet data packages that were provided in similar device distribution programmes by state governments
  - ⊙ Data packages that would be sufficient to ensure optimum usage of audio-visual learning content on dedicated devices

3.2 Learnings from Provisioning of Devices and the Institution of a Student Protection Policy

(i) Key Features of the MDM Software Used in the Project

- All devices used for this project were provisioned with MDM software to enable provisioning, monitoring and management of all devices from a unified console. The MDM partner for the project was selected based on the following requirements:
  - ⊙ Real-time monitoring of devices
  - ⊙ Remote management and troubleshooting support

- ◉ Installation of whitelisted applications
- ◉ Generation of customised reports on device usage
- ◉ Setting custom controls to ensure student safety
- ◉ Deployment of tech-based interventions

(ii) Maker-Checker Model Used for Provisioning of Devices

- During the one-time initial provisioning of devices using the Maker-Checker model, a student protection policy was instituted and the required package of apps was installed

- The student protection policy was instituted by creating a custom compliance policy which included restricting incoming calls, messages, camera, whitelisting apps and whitelisting URLs that were to be used by the students

- The one-time provisioning of devices required a large staging area, high-speed internet and technical expertise, hence this process should be carried out by an MDM software partner

3.3 Learnings from Distribution of Devices and Training of Beneficiaries

(i) Predistribution Checklist

- Before the devices were distributed to the beneficiaries, a data repository was created by the implementation team tagging each device with its IMEI number to a specific student for logistical or troubleshooting purposes

- The implementation team also charged all devices completely to ensure that they did not discharge during the training

- The login credentials were kept alphanumeric (for eg: a0000016) and these credentials were pasted behind each device to ensure an easier login experience for all beneficiaries

- The implementation team also labelled all devices with student details, which saved time and helped in the mass activation of all students on the apps

(ii) Distribution Day Checklist

- The distribution day required a commitment of around 4-5 hours to complete processes such as SIM registration and activation, device distribution, training of beneficiaries and the baseline screening test

- To ensure that all the processes were completed on time during the device distribution day, the implementation team

  - ◉ Informed the parents/schools of the time requirement of 4-5 hours so they could allot time accordingly. They also reiterated the importance of this one-time investment of 4-5 hours as this was the only opportunity to get all parents, students and teachers in one place
  - ◉ Followed up with the mobile network vendors and all parents on the day of the distribution to ensure that the distribution started on time

- Since device distribution was a time-consuming process, it was completed in clusters of 2-3 schools in one location. To facilitate this, the implementation team ensured the following:

  - ◉ The training area selected was large enough to accommodate beneficiaries and parents from 2-3 schools
  - ◉ 2-3 field coordinators were assigned to each site so that while one coordinator led the training, the others assisted in clarifying doubts within the crowd
  - ◉ Teachers were included as part of the training, wherever possible, for additional support and also to get their buy-in as learning agents for the device distribution programme

- The implementation team ensured that all tablet covers were added, SIM cards activated and the internet packages were working before handing over the devices to the beneficiaries

- The implementation team ensured that the distribution started with the SIM card registration and activation so that all the students had devices with them before the training commenced

  ◉ For some SIM cards, extra time for activation was required to ensure that the SIM card activation was complete. For example, we observed that for Vodafone (Vi) SIM cards, a call needs to be made from the new SIM card to another number to activate the SIM card. Hence, an additional 5-10 minutes was required per beneficiary to make the call to activate these SIM cards

- After the device distribution and training was complete, the implementation team segregated students into groups and allowed them to complete the baseline test under close supervision. This ensured that all students completed the baseline test without any external assistance

3.4 Learnings from Setting Up an Issue Resolution Mechanism

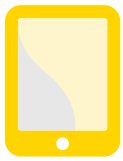### (i) Setting Up an Issue Resolution Mechanism

- A helpline was set up by the implementation team to ensure that the students and parents were adequately supported if they faced any hardware or software issues. These calls would go to a designated field coordinator who would either help resolve the issue remotely or inform the IT assistant to collect, fix and redistribute devices in 2-3 days

- An on-field IT assistant was hired to help ensure a timely resolution of any device, MDM, or learning solution-related issue

- Recurring troubleshooting support was also set up with the MDM software partner and the learning solution partners for a quick and effective resolution of any MDM-related or learning solution-related issues

- A monthly support mechanism was also set up with the local service centres of the hardware partner for more persisting hardware issues that could be covered under warranty

(ii) Technical Issues and Identified Mitigation Measures

- There were many provisions available on the MDM software to safeguard against common device issues such as devices getting locked, reset, or the installation of blacklisted apps

  ◉ In cases where the device was already locked out, the device had to be collected back and factory reset. Once the device was reset, it was reprovisioned with the MDM software and requisite apps before redistribution

  ◉ In cases where the devices were getting reset, the soft reset function was disabled for all users through a compliance policy on the MDM console

  ◉ To prevent the installation of unwanted apps on the device: (i) A compliance policy was pushed, which disabled 'installation of apps', (ii) 'Google Account Restrictions' were set to '0' which prevented users from logging into their Google accounts through which they were able to install apps, and (iii) A backend policy was pushed, which triggered automatic deletion of unwanted apps from all devices

*The lessons from the project on **Understanding EdTech Usage at Home Using Dedicated Devices** demonstrates the complexities around device distribution, the management of devices once they are distributed to children, and the effort it takes to ensure that devices are being used for the intended purpose.* Part II of the report explores the programme that was deployed to encourage the use of EdTech on dedicated devices. It also explains the iterative research design and the insights obtained through the tech/programmatic interventions to encourage EdTech usage at home.

Chapter 04

Annexure

4.1 Case Studies of Device Distribution Models

Models	Case studies
Option 1: Device only	Maine Learning Technology Initiative, USA (2002) • The Maine Department of Education distributed 1:1 portable computers to 7th and 8th grade students and middle-level educators in public schools in Maine, USA • Apple had designed the software to ensure against the installation of games, limited access to email, instant messaging, music/pop culture sites and disabling of pop-up ads OLPC, Multiple countries (2005) • The OLPC software was a pared-down version of the Linux operating system and gave children access only to a particular set of applications Chimple, Tanzania (2015) • As part of the Global Learning XPRIZE competition, tablets with Chimple software were distributed in rural Tanzania • The software had open firmware and the code was written such that only the required EdTech apps appeared on the device
Option 2: Device + data	Tianyi Taobao Shopping Handsets, China (2015) • The Alibaba Group partnered with China Telecom to sell low-cost, internet-enabled smartphones to expand their sales in less developed parts of China • Buyers received free 2G data service for 4 months. Smartphones came preloaded with either an app to access its Taobao online shopping platform or Alibaba's OS Smart Snehidi, India (2017) • A programme led by Vodafone and the NGO Hand-in-Hand (HiH) facilitated loans to female SHG members to purchase smartphones to build microenterprises, access finance through self-help groups (SHGs) and learn digital skills • The cost to users was ~$10 per month for 6 months, and 200 MB of free internet per month for 1 year was given
Option 3: Device + Edtech app + data	Vodacom e-school, South Africa (2014) • In 2014, Vodacom launched a first-ever Vodacom-branded, low-cost handset called the Smart Kicka. The product came with preinstalled apps and free 50 MB data bundles • Vodacom partnered with EdTech company Top Dog, offering educational vouchers with online content for Grades 4-12 for Vodacom customers
Option 4: Device + software + data + programmatic layer	Maine Learning Technology Initiative 2.0, USA (2021) • In 2021, the programme served 28,000 students and 2,850 educators. At full implementation in 2023-24, it will service 56,000 students and 5700 educators in grades 5-10 • The MLTI 2.0 includes 1:1 devices and software, professional learning resources, state-level technology support, and systematic monitoring and support grounded in continuous process improvement

4.2 Full List of Features of Esper MDM Software

Sl No.	Feature	Breakdown	Feature Description
1	DevOps	API Management	Platform features are offered as API services to build new integrations and experiences
		Advanced DevOps Pipeline	Create automated deployment pipelines by stage, device, group, or success criteria
		Android Studio Plugin	Upload APKs directly to an Esper Endpoint from Android Studio. Use Esper APIs, SDK, or CLI from the IDE to provision test devices and deploy updates
		Bug Reports	Generate real-time bug reports for individual devices
		Nested Device Group Hierarchy	Create groups in hierarchical order (parent/child) for flexible management of devices
		Pipelines for DPC	Use Pipelines for controlled DPC updates. Currently available for installation of apps
2	Provisioning	No-Touch Provisioning	Seamless, no-touch provisioning on device boot for Esper Enhanced Android
		Android for Work Provisioning	Managed framework for GMS-certified devices
		6-Tap QR Code Provisioning	Provision of new devices by scanning a QR code
		External Tool for Provisioning	Provision of batches of GMS and AOSP devices
		Samsung Knox Enrollment	Manage Samsung Knox devices, including security, updates, policy and configurations
		Provisioning Template	Use template QR code to streamline on-site provisioning
3	System Security	System Lockdown	Automate device lockdown for unauthorised usage
		Android System Settings	Allow or block user access to the System Settings app
		Custom Settings App	Custom app to limit user access to device settings
		Device Security	Security policy templates to lock kiosk mode, set geofencing and more
		Hardware Enhancement	Enhanced Android devices validated for use cases or purpose-built enhanced hardware
		OS Optimisation	Removes unneeded apps, monitors data transmission, optimises the kernel and automates patching
		Updated Security Policies	Create a policy on enrolment and push changes
		Mass Reboot	Reboot the entire device fleet
		User Management	Platform view/edit access
		Factory Reset Protection	Block access to device factory reset
		Google Account Restriction	Limit usage by Google account-holders
		ADB Protection	Block user access to the ADB tool by default
		Call & SMS Restrictions	Block SMS/calls or restrict pre-approved contacts
		Whitelisting/Blacklisting	Whitelisting select apps and blacklisting bloatware
		User Management - Custom Roles	Choose desired features and permissions to create one or more custom user roles

Sl No.	Feature	Breakdown	Feature Description
4	App Management	Upload Private Apps	Upload and manage different versions of private apps
		Unified Installs	Unify the install experience for Play and private apps
		Schedule Installs with Different Time Zones	Schedule app installs in multiple time zones
		Block / Permit Apps	Define user app permissions via console
		Configure App Permissions	Configure app permissions via console
		Device App State	Configure user access via the App State Manager
		Clear App Data	Clear app data to boost performance
		App Version Management	Manage and deploy multiple versions of a single app
		Bulk Enrol App Versions	Bulk upload one or more app versions
		Auto-Update Apps	Custom policy for automatic, postponed, or scheduled app installs
		Group App Install	One-click updates to group apps and app versions
		Switch Between Multi and Single-App	Kiosk Mode Update deployed devices to single-app or multi-app kiosk mode
		Password Control	Define password length and character criteria
		OTA Updates	Flexible OTA patch and feature updates for Esper Enhanced Android (EEA) devices
		CMS (Content Management System)	Centralised console management tools for device files and media. Upload files and transfer them to devices or vice-versa
5	Remote Management	Remote View & Control	Remotely view devices to troubleshoot performance
		Remote Debugging	Debugging reports on device, app and OS anomalies
		Remote Wipe	Remotely wipe device data with a factory reset
		Tracking Devices (Geofence Timeline)	Use geofencing to track device movement
		Offline Device Actions	Queue automated updates to offline device
		Remote Changes to Kiosk Mode Apps	Select kiosk mode apps and pin to full screen
		Remote Reboot	Remotely reboots a device, group, or entire fleet
		Remote Lockdown	Automate lockdown with custom criteria
		Remote Group Actions	Batch admin tools for device group management
		Softwipe a Device	Equivalent to factory reset for a device and apply a template
		Remote Video/Messaging Support	Ability to communicate with device users over video call or messaging

Sl No.	Feature	Breakdown	Feature Description
6	Hardware Security	Esper Enhanced Android (Custom OS)	Esper Enhanced Android (Custom OS) Custom
		Device Management	Manage traditional and non-traditional hardware and Android OS versions 4.x+ and 5.x+
		Device Performance Alerts	Custom alerts by event, groups and preference
		Hardware Validation	A broad range of Android devices validated for performance, interoperability, industry and use case
		Enhanced Alerts	Powerful alerts based on telemetry data and more actions
7	Reporting & Analytics	Automated Daily Reporting	Automated daily reports, performance reports
		Customised Reporting	Custom reporting by device, duration and timeframe
		Device Dashboard	Device performance and health at a glance
		Company Dashboard	Global fleet performance, operations and anomalies
		Alert Management	Custom alerts by event, groups and preference
		Activity Feed	Real-time updates on users, devices and actions
		Activity Feed V2	Detailed activity feed covering all actions on console and device. Ability to search and filter
		New Telemetry Dashboard	Advanced telemetry data in graphical view
		Reports V2	Flexible reporting model, required columns can be configured and scheduled by users
		Dashboard Revamp	Enhanced Esper console to provide a better experience for new users with Learning Centre & tutorial videos, actionable data trends in Dashboard

4.3 Step-by-step Guide to Provision Devices Using Esper MDM Software

The following is a step-by-step outline of the processes that were followed during the provisioning of devices:

1. *Onboarding devices onto the MDM console:* All devices were provisioned using the 6 Tap QR code provisioning method available on the MDM console. After the devices were connected to an internet connection, tapping anywhere on the device 6 times helped enable provisioning using a QR code available on the MDM console.

2. *Renaming of devices:* Once the devices were added onto the MDM console, they were renamed using identification factors, such as student name and phone number, for easier identification on the console.

3. *Grouping of devices:* Devices were then added to a group and the requisite controls were pushed to a group of devices at the same time.

4. *Setting a student protection policy:* The creation of a custom compliance policy helped set customised settings and controls on the device, which ensured that the students were not able to visit any unwanted websites or download any other material onto the device. These included restricting incoming calls, messages, cameras, whitelisting apps and a list of URLs that can be accessed by the students.

Table 9: Custom settings included in the compliance policy to safeguard against misuse of devices

Sl No.	Purpose	Measure Taken
1	**Device functioning**	Enable 'Default App Permissions'
		Enable automatic 'System Updates'
		'Lock screen' password set to 'None'
2	**Device protection**	Disable 'Camera' Access
		Disable 'Bluetooth' Access
		Disable 'USB File Transfer'
		Disable 'External Device'
		Disable 'Factory Reset'
		Disable 'Lock screen'
		Restrict 'Incoming calls'
		Restrict 'Outgoing calls'
		Enable 'Notification Bar'
		Enable 'Screenshot'
		Additional Factory Reset Protection was enabled by adding a Google account and generating a 21-digit code
3	**Whitelisting apps**	Disable 'Google Play Store'
		Disable 'Application uninstall'
		Disable 'Local app install'
4	**Prevent Installation of unwanted apps**	Set 'Google Account Restrictions' to '0', this ensured that users were not able to add their personal Google accounts and install unwanted apps
5	**To ensure that mobile data is always on**	'Mobile data' access was restricted to admin only, in order to ensure that the mobile data was always switched on and the devices could be monitored at all times

5. *Installation of Apps:* Applications were added to the device either through an SD card or by installing it through the MDM console. For the former, learning content was hard coded on an SD card and then inserted into the device. This ensured that the learning content was auto-logged in so that the student did not have to log in into the app each time, reduced the dependency on internet connectivity as one of the learning solutions was offline, and safeguarded against factory reset since the content was stored on an external card. For the latter, an application can be installed via the MDM console in three ways:

● *Uploading an APK File:* Learning content that is not readily available on the Playstore can be added to the MDM cloud by uploading an APK file of the app
● *Creating a Web App:* If the learning content to be added is not an app but a web repository or YouTube channel, there is a provision to convert its link to a 'Web App' on the MDM Cloud
● *Uploading from the Playstore:* If the learning content is available as an app on the Playstore, it can be approved and then added to the MDM cloud

Once the application is added to the MDM cloud, it can then be installed on a device or fleet of devices through a pipeline command on the MDM console. For this project on *Understanding EdTech Usage at Home Using Dedicated Devices*, a customised package of learning apps (BYJU's *Think & Learn* app and Educational Initiatives' *Mindspark*) and edutainment apps (*Google Chrome* and *YouTube Kids*) were installed to safeguard against device fatigue.

Table 10: Details of applications available on tablets

No.	Type	Application Name	App Size
1	System apps	Custom Settings	preloaded
2		Android Settings	preloaded
3	Hard-coded apps	BYJU's Think and Learn	83.8 MB
4	Provisioned apps	YouTube Kids	81.58 MB
5		Chrome	217.19 MB
6		Files	3.15 MB
7		Ei Mindspark	38 MB

6. *Whitelisting URLs:* For applications such as *Google Chrome*, the MDM console offers a provision to allow or whitelist access to a customised list of URLs. The list of URLs that were whitelisted for this programme can be found in Annexure 4.4.

The following table provides a step-by-step guide on commands followed on the Esper MDM console to set a customised policy, manage configuration for whitelisting URLs, and install a customised package of apps on the devices for this project.

Table 11: Step-by-step guide to provision devices on the Esper MDM console

Measure	Steps
Setting policy	**For one device:** On the MDM Console, go to 'Devices & Groups' > Select the device for which you want to apply the policy > Click on 'Compliance Policy' > Click on 'Select Policy' **For a group of devices:** On the MDM Console, go to 'Devices & Groups' > Find the group for which you want to apply the policy > Click on the 'eye' icon for that group > Click on 'Compliance Policy' > Click on 'Select Policy' > Click on 'Apply Policy'
Manage configurations (Allow list of URLs)	**For one device:** On the MDM Console, go to 'Devices & Groups' > Select the device for which you want to Manage Configurations > Click on 'Apps' > Find 'Chrome' in the App List > Click on '...' of the right end of Chrome app > Select 'Manage Configurations' > Click on 'Edit' > Enter the required JSON **For a group of devices:** On the MDM Console, go to 'Devices & Groups' > Find the group for which you want to apply the policy > Click on the 'eye' icon for that group > Click on 'Apps' > Click on 'Manage Configurations' > Under Package name, type in 'com.android.chrome' > Enter the required JSON

Measure	Steps
Pushing pipeline command (for App installation)	**For one device:** On the MDM Console, (i) Go to 'Pipelines' > (ii) Click on 'Create Pipeline' > (iii) Click on '+ Targets' > (iv) Select 'Devices' under Select Targets > (v) Type in the 'Device name eg: AAAX2' in the directory below > (vi) Select the required 'Device name' > (vii) Next click on 'Operations' > (viii) Select the required app from the Select Application drop-down menu > (ix) Select from 'Play Store App' from the Select Version (Build) drop-down menu > (x) Select 'Install' from the Select Action drop-down menu > (xi) Now repeat steps (viii) to (x) to add all the required apps > (xii) Once all the required apps have been added under Operations, click on 'Run Pipeline' **For a group of devices:** On the MDM Console, (i) Go to 'Pipelines' > (ii) Click on 'Create Pipeline' > (iii) Click on '+ Targets' > (iv) Select 'Groups' under Select Targets > (v) Select 'All Devices' > (vi) Select the required 'Group eg. Test Batch' > (vii) Next click on 'Operations' > (viii) Select the required app from the Select Application drop-down menu > (ix) Select from 'Play Store App' from the Select Version (Build) drop-down menu > (x) Select 'Install' from the Select Action drop-down menu > (xi) Now repeat steps (viii) to (x) to add all the required apps > (xii) Once all the required apps have been added under Operations, click on 'Run Pipeline'
Installing a new app	There are three ways to install a new app: **(i) Uploading an APK File:** On the MDM console, Go to 'Cloud Apps' > Click on 'Upload Apps' > Select 'APK' > Click on 'Upload'. **(ii) Creating a Web App** **(iii) Uploading directly from the Playstore:** On the MDM console, Click on 'Apps' > Click on 'Playstore Apps' > Search for the required app on the search bar > 'Approve' this required app. Go to play.google.com/work: Sign in through your managed app Google account > Go to 'Apps' > Search for required app on the search bar > 'Approve' this required app > Go to 'Managed apps' > Your approved app should be in this list.

4.4 List of Whitelisted URLs Used for the Project

Sl no.	URL	Sl no.	URL
1	"wonderslate.com"	26	"britannica.com"
2	"bighistoryproject.com"	27	"liveworksheets.com"
3	"learncbse.in"	28	"nmmsstudy.blogspot.com"
4	"edudel.nic.in"	29	"d-learn.in"
5	"learninsta.com"	30	"canva.com"
6	"cbse.gov.in"	31	"padlet.com"
7	"cbseacademic.nic.in"	32	"storyweaver.org"
8	"cbse.online"	33	"indiabix.com"
9	"cbseresults.nic.in"	34	"rknarayanlife.blogspot.com"
10	"shiksha.com"	35	"indianexpress.com"
11	"indiaeducation.net"	36	"epaper.thehindu.com"

Sl no.	URL	Sl no.	URL
12	"jagranjosh.com"	37	"epaper.timesgroup.com"
13	"educationobserver.com"	38	"epapers.timesgroup.com"
14	"kvpy.org.in"	39	"epaper.bhaskar.com"
15	"respaper.com"	40	"epaper.hindustantimes.com"
16	"tiwariacademy.com"	41	"ncfe.org.in"
17	"drive.google.com"	42	"assessment.examonline.in"
18	"docs.google.com"	43	"nrich.maths.org"
19	"google.com"	44	"learnenglishkids.britishcouncil.org"
20	"forms.google.com"	45	"edustud.nic.in"
21	"wordwall.net"	46	"diksha.gov.in"
22	"en.wikipedia.org"	47	"abcya.com"
23	"en.m.wikipedia.org"	48	"nationalgeographic.com"
24	"goformative.com"	49	"literacycloud.org"
25	"thinglink.com"	50	"roomrecess.com"

Chapter 05
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