Bridging the Digital Divide - A Blended Learning Pilot in Odisha

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Context

Covid-19 gave rise to multiple challenges across several sectors, everywhere. While the challenges were startling in health and livelihood sectors, education also suffered severely. Unfortunately, the first measure taken by many governments in developing countries was school closure. Many studies indicated that school closures will have a significant negative impact on the learning levels of children, while children with socio-economic disadvantages will be affected more severely (World Bank, 2020). The education landscape changed dramatically with institutions and systems being required to innovate, including adopting e-learning techniques.

India has the largest public schooling system in the world. In the government-school context, many students have limited or no internet access, and many are unable to afford digital devices in their homes. As cited by many studies, online teaching-learning has created a digital divide among students (Pravat Kumar Jena, 2020). Furthermore, the prolonged closure has had a disproportionately negative impact on the most vulnerable students enrolled in public schools. While some studies find that online learning increases retention of information, takes less time, and might be here to stay, impacting education globally, there are serious issues that need to be addressed, starting with access to devices and the internet.

As a response to school closures, Akshara Foundation (AF) designed the Alternative Learning Project [1] (2021), leveraging existing resources within the education system, such as textbooks and workbooks provided by the state government, and government-approved digital content on the DIKSHA [2] platform. Blending these digital and non-digital resources, AF piloted the 'Bridging the Digital Divide' (BTDD) program during the pandemic.

The Pilot

Odisha has around 33,000 government primary schools. The pilot was carried out in five schools located in Mendhashal Gram Panchayat of Bhubaneswar Block (Khordha district). The pilot covered 105 students enrolled in grades 4 and 5 in not just government schools but also in Ashram Schools. [3] BTDD was piloted with the aim to support students' math learning at home. AF provided a device -- a smartphone pre-loaded with math content – to children and assessed their learning through *Ujjwal* workbooks. [4] The strategy was to work individually with the selected students and track their learning process during the pilot project period of five months. The students were selected based on their availability during the program period and their parents agreeing to them spending two-three hours daily in a community space.

Program Design

The BTDD curriculum was aligned to the syllabus prescribed by the Odisha government and included existing resources like Energised Textbooks [5], Ujjwal workbooks, and digital content mapped to a Dual Lesson Plan, called so as it consisted of two sets of lesson plans – one, based on the workbooks (physical), and the second, based on the content loaded in the smartphone (digital). The Dual Lesson Plans were developed based on the condensed curriculum guidelines issued by the Centre. (In July 2020, the Central government condensed the syllabus by 30% to accommodate the reduced instruction time due to school closures, and issued guidelines to state governments regarding the same.) The curricular content followed in the program was aligned to the broad principles of math teaching as

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1 The Alternative Learning Project 2021, https://akshara.org.in/wp-content/uploads/Alternative-Learning-Project-report-online.pdf?x52312

2 DIKSHA is an education resources portal of the Ministry of Education.

3 Schools-cum-hostels run by the Department of ST & SC Development, Minorities and Backward Classes, Odisha. Due to school closures, their students had returned home from schools.

4 Ujjwal workbooks are math practice books of the Government of Odisha supplied to government school students of grades 4 and 5. They complement the textbooks with grade-appropriate content for practice.

5 Energized Textbooks refer to physical textbooks containing QR codes which enable access to digital content on various topics https://diksha.gov.in/help/getting-started/explore-diksha/understanding-qr-code.html

suggested by the National Curriculum Framework 2005, Position Paper on Mathematics, and the truncated math syllabus and textbooks followed in government schools.

BTDD decided to build its pedagogical strategy – Dual Lesson Plan – based on the workbooks that were already with the students, and the digital content developed by AF during pre-Covid times. The government had provided these workbooks and instructed students to practice math daily when schools were shut. In addition to that, AF envisioned that the digital content it already developed for math learning called Building Blocks, could also be made available through dedicated devices. The mapping of condensed syllabus was carried out on these two existing learning resources, viz, the Ujjwal workbooks and the math digital content. After mapping the syllabus, two sets of lesson plans were designed. The first set that was developed was based on the Ujjwal workbook, and the second was developed by mapping the digital content to the condensed syllabus. The digital content was pre-loaded on the smartphones.

Furthermore, AF designed weekly worksheets containing 10 questions for practice, to engage students in concepts in which they trailed. The worksheets contained problems that were uniquely formulated, based on the syllabus, but not linked to the questions in the textbooks or in Ujjwal. These worksheets enabled students to practice math problems, in addition to what was specified in Ujjwal and the digital content. The volunteers distributed the worksheets to the students every week. The students were expected to solve these worksheets on their own during the daily class held in the community space. They submitted them at the end of the class. The volunteers assessed the worksheets and gave feedback to the students on the subsequent day. The volunteers documented the scores and reported their reflections to the team leader. This process ensured a continuous evaluation of students' learning.

As mentioned earlier, the digital content was provided through Building Blocks[6], developed by AF, which was already approved and uploaded by the State Council for Educational Research and Training (Odisha) on the DIKSHA platform. Building Blocks provided supplemental opportunities for students to daily practice math at home in a fun way through interactive and gamified digital content. The content is grade-compatible and aligns with the mathematics syllabus and textbook.

The Dual Lesson Plan document consisted lesson plans and the inputs for transaction. In addition to this, a weekly worksheet was developed to engage students with concepts they didn't understand well. The worksheets contained problems not found in either the textbooks or Ujjwal. Each volunteer was provided with the Dual Lesson Plans, worksheets, and the digital content pre-loaded on a smartphone. To ease the day-to-day transactions, a booklet called the Daily Task Guide was developed and given to the volunteers beforehand, to enable them to plan their daily tasks. The team leader's role was to mentor, guide, support, and monitor the volunteers and address pedagogical and implementation challenges.

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6 https://play.google.com/store/apps/details?id=com.akshara.easymath&hl=en&showAllReviews=true

Implementation

AF appointed a team leader to lead the implementation team comprising nine volunteers from the local community. Though the minimum requirement for volunteers was for them to have completed grade 12, some were post-graduates, while others had diplomas in education. Each volunteer engaged a defined cohort of students in a designated community space.

BTDD began a continuous capacity-building program with a five-day interactive session that included content on the impact of Covid-19 on learning, uncertainties of school re-opening, and adherence to Covid-19 protocols. Key components of the program included daily routines, pre-loading digital content, math teaching for grades 4 and 5, review of workbooks, follow-ups with students individually on conceptual understanding of math, and obtaining feedback. This session was delivered by AF's resource team. The volunteers took sessions for two hours daily from Monday to Saturday.
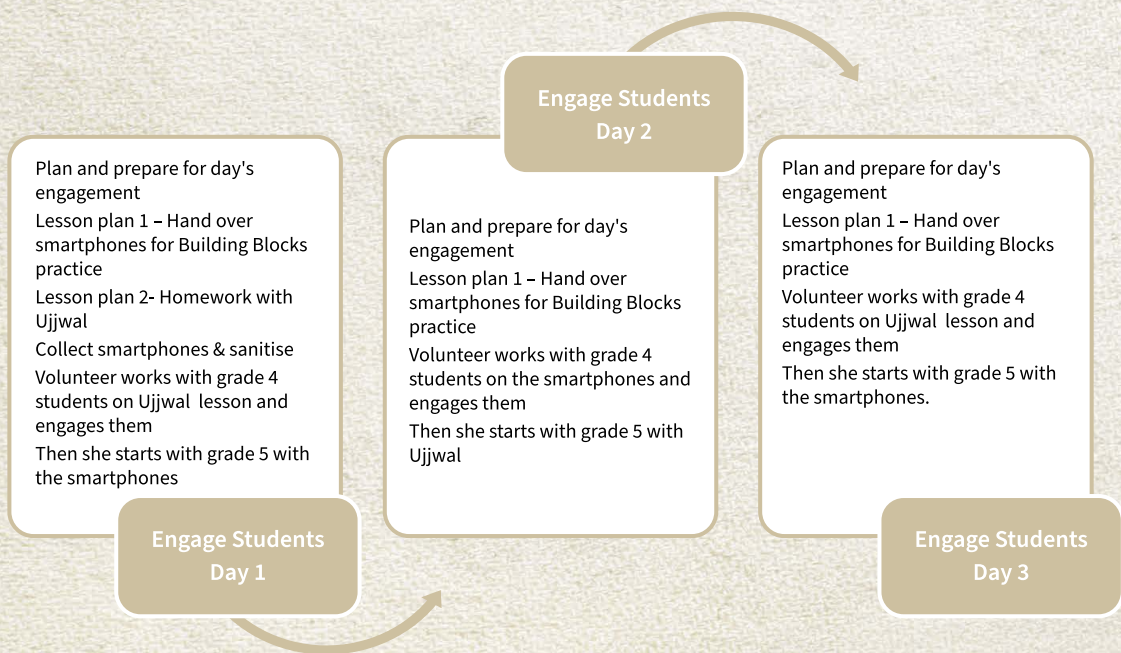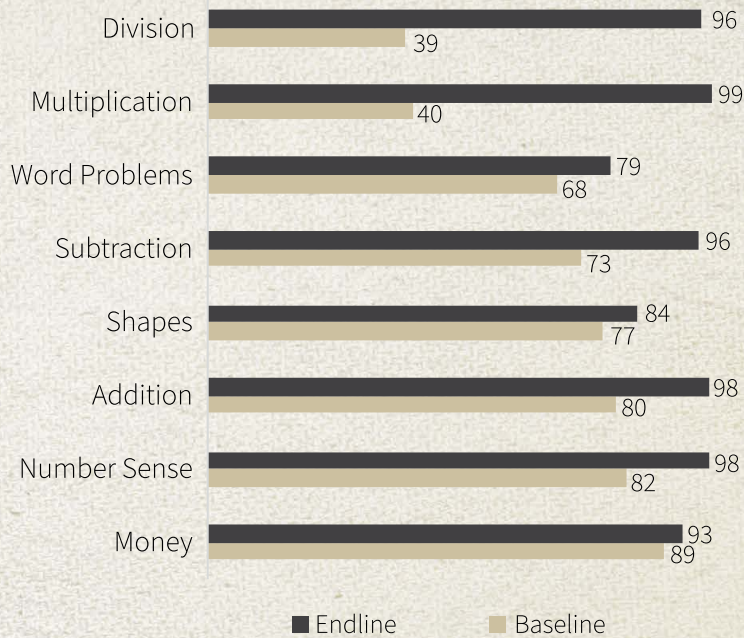
Engage Students Day 2

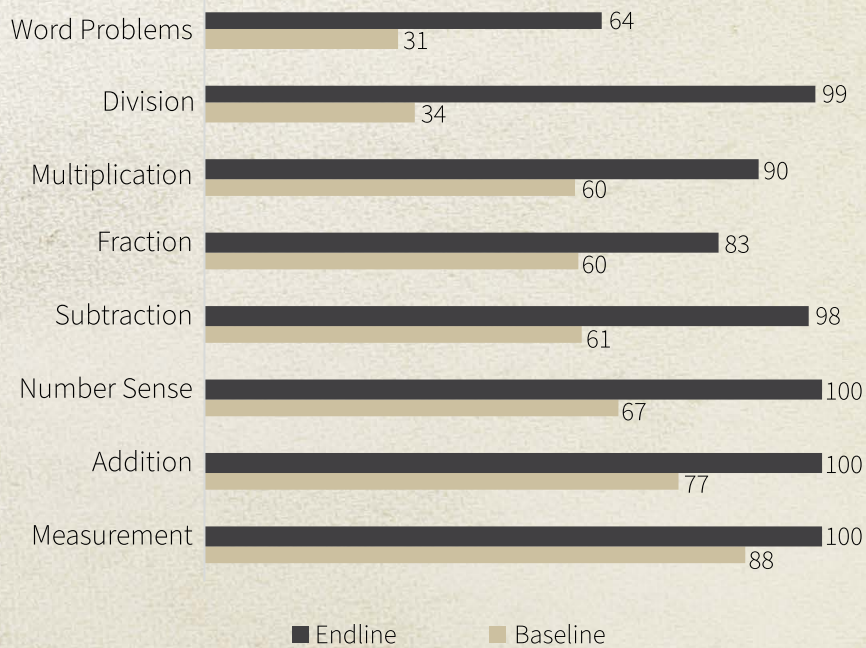**Engage Students Day 1**
- Plan and prepare for day's engagement
- Lesson plan 1 – Hand over smartphones for Building Blocks practice
- Lesson plan 2- Homework with Ujjwal
- Collect smartphones & sanitise
- Volunteer works with grade 4 students on Ujjwal lesson and engages them
- Then she starts with grade 5 with the smartphones

- Plan and prepare for day's engagement
- Lesson plan 1 – Hand over smartphones for Building Blocks practice
- Volunteer works with grade 4 students on the smartphones and engages them
- Then she starts with grade 5 with Ujjwal

Engage Students Day 3
- Plan and prepare for day's engagement
- Lesson plan 1 – Hand over smartphones for Building Blocks practice
- Volunteer works with grade 4 students on Ujjwal lesson and engages them
- Then she starts with grade 5 with the smartphones.

Fig. 1: Daily engagement with children

Grade 4 Average Scores
N = 57 (in%)

Category	Endline	Baseline
Division	96	39
Multiplication	99	40
Word Problems	79	68
Subtraction	96	73
Shapes	84	77
Addition	98	80
Number Sense	98	82
Money	93	89

■ Endline ■ Baseline

Grade 5 Average Scores
N = 48 (in%)

Category	Endline	Baseline
Word Problems	64	31
Division	99	34
Multiplication	90	60
Fraction	83	60
Subtraction	98	61
Number Sense	100	67
Addition	100	77
Measurement	100	88

■ Endline ■ Baseline

Pedagogical Process

A Dual Lesson Plan Handbook was developed by AF, which provided lessons covering various concepts with weekly timelines, so that the volunteer would know exactly which concept she/he had to deliver week after week.

Fig. 2: working with the app

Volunteers prepared themselves before a class, by making daily plans, pre-loading the content suggested by the weekly plan, reviewing the Ujjwal component that the students would be guided to do on that day, and solving the problems provided in the workbook and textbook. The volunteers consulted AF's math resource team if they faced any challenges regarding pedagogy and noted suggestions. The timings of the class depended on the volunteer and the village where it was held. All volunteers took classes for two hours from Monday to Saturday. Volunteers followed the weekly timetable given below. They also followed safety guidelines like masking, sanitizing the devices and their hands, apart from other protocols.

Weekly Routine

1. Day 1: Gather all the selected students in a designated community space, like a temple or a Gram Panchayat community hall. Assign worksheets from Ujjwal to all the grade 4 students. Meanwhile, engage grade 5 students with smartphones and guide them to practice with Building Blocks with games linked to the particular lesson plan. At the end, collect all the phones and sanitize them.

2. Day 2: Repeat the same process reversing the Dual Lesson Plan activities. Worksheets from Ujjwal assigned to grade 5 students and engage grade 4 students with smartphones to work on Building Blocks-related lesson plan.

3. Distribute worksheets related to lessons/concepts covered during the week on Saturday.

4. The same process was repeated throughout the month. Sunday was a holiday.

5. Volunteers made notes at the end of each day to review the session and follow up with children the next day.

Reflection And Planning

Every fortnight there was a day-long interaction session, during which the volunteers exchanged experiences, took stock of their learning, clarified doubts, charted their progress, and were given the work plan for the subsequent fortnight.

Learning Gains

As many as 57 grade 4 students and 48 grade 5 students (total 105 students) were assessed by the volunteers through a baseline conducted in January 2021 and an endline conducted in April 2021 to measure learning outcomes. The grade 4 tests were based on grade 3 competencies and grade 5 tests on grade 4 competencies. The blueprint of the question paper was based on the competencies and micro-competencies specified by the National Council for Educational Research and Training for grade 3 and grade 4 students. The content of the questions differed from baseline to endline. However, the blueprint and rubrics remained the same. The test was to identify if students had acquired the language and math skills of the grade below their current level, and could read and comprehend the instructions given in the question paper. The written test had 15 questions. As per the High

Distribution of students by score bands				
	Grade 4		Grade 5	
Score Bands	Baseline	Endline	Baseline	Endline
First Division 60%+	79 (45)	100 (57)	60 (29)	100 (48)
Second Division 45-59%	16 (9)	0	31 (15)	0 (0)
Third Division 33-44%	5 (3)	0	4 (2)	0 (0)
Below 32%	0	0	4 (2)	0 (0)
Total No. of Students	100 (57)	100 (57)	100 (48)	100 (48)

Figures in parentheses are the absolute number of students

School Certificate Examination (HSCE) Odisha[7], students are required to score 33% to pass the exam. An analysis was carried out based on the HSCE criteria.

The table above, shows that at the time of the baseline, more than 75% of grade 4 students (45 out of 57) and 60% of grade 5 students (29 out of 48) had secured First Division. Less than 5% of the students scored 100 out of 100 in the baseline test, an indicator of them retaining their learning levels of the previous grade. The endline found that all students had moved to the First Division bracket. However, a drill-down analysis gave an idea about the micro-concepts in which the students had acquired skills and those in which they were having difficulties. A competency-wise analysis of grades 4 and 5 students was carried out to see the scores gained across the competencies.

At the time of the baseline, many students were struggling with problems related to multiplication, division and word problems. Though there was substantial improvement with regards to word problems and fractions towards endline, students were struggling with some basic competencies that they should have acquired in the previous grades.

Challenges

BTDD had to negotiate with the government and the local community to get approvals from the Education and Social Development departments and the Gram Panchayat. Finding a

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7 HSCE is a qualifying criterion conducted by the Board of Secondary Education Odisha http://www.bseodisha.nic.in/?q=node/42%27%3B

learning space acceptable to all the stakeholders was another challenge. From the academic perspective, the challenge was what to include and what to skip. As math requires a spiral pedagogy, the program based on condensed curriculum had to be designed carefully. Motivating local female volunteers with an education background was a task, which was resolved when the Gram Panchayat got involved in sourcing volunteers. One of the major challenges was to get children back to the learning track as students had forgotten what was taught, and engaging their attention was difficult.

During implementation, sticking to the prescribed lesson plan was a challenge for volunteers due to varying learning levels of the students. However, as they intensively engaged with the students, it increased bonding and enhanced understanding of value of the program, thus resolving this issue. This meant that volunteers were spending more time than what had been planned. Lastly, the students and volunteers faced technology issues such as unresponsive digital content including navigation and gadget-related issues. To scale the program, the government needs to invest in procuring more devices, which may be a challenge along with buy-in from the teachers on the new teaching-learning strategy.

Concluding Observations

The Covid-19 outbreak effectively led to the closure of over 1.5 million schools, affecting 286 million children from pre-primary to secondary levels, around the world. As many research studies have pointed out, the learning loss with regards to language and math will affect the education system severely, unless some emergency measures are taken to resolve this.

The pedagogical strategy, process, and learning gains of the BTDD pilot indicate that the blended model could be the way forward, engaging children in a meaningful learning environment. The model focused on processes and possibilities in mathematics education, which could be adapted to other subjects as well. There is a need to design programs and catching-up strategies to enable children to recover what has been lost during the last two academic years and bring them back to expected levels of learning. Once schools reopen, pre-loaded digital content and teachers working individually with students at their pace could be the strategies necessary for children to learn. While digital solutions are thought of as a way forward, in reality, the digital divide has resulted in pushing students without digital facilities to a greater disadvantage. Needless to say, that rural children are more susceptible to marginalization than most others. It is in this context that AF designed and implement the blended learning model that had innovation at its core.

This essay concludes that AF's journey with its pilot during the pandemic proved that the concept of blended learning could be made to work with investment plans on provisioning the digital device and building the capacity of teachers. The blended learning program could be implemented as a strategy to help students continue learning with digital content at home after physical schooling hours ◆

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