EdTechHub

Clear evidence, better decisions, more learning.

Deaf Reach
Schools | Training Centers | Colleges
A program of Family Educational Services Foundation

SANDBOX SPRINT REVIEW

EdTech Interventions for Deaf Learners' Sandbox
Sprint 2 Review

UKaid
from the British people

THE WORLD BANK

unicef
for every child

About this document

Recommended citation	Rahman, A., Siddiqui, M., Shaikh, S., Geary, R., Awasen, A., & Plaut, D. (2021). *EdTech Interventions for Deaf Learners: Sprint 2 Review* [Sandbox Sprint Review]. EdTech Hub. https://doi.org/10.53832/edtechhub.0131 Available at https://docs.edtechhub.org/lib/D7JX8S7S. Available under Creative Commons Attribution 4.0 International, https://creativecommons.org/licenses/by/4.0/.
Licence	Creative Commons Attribution 4.0 International https://creativecommons.org/licenses/by/4.0/ You—dear readers—are free to share (copy and redistribute the material in any medium or format) and adapt (remix, transform, and build upon the material) for any purpose, even commercially. You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner but not in any way that suggests the licensor endorses you or your use.
Notes	EdTech Hub is supported by UK aid and the World Bank; however, the views expressed in this document do not necessarily reflect the views of the UK Government or the World Bank.
Reviewers	Molly Jamieson Eberhardt

EdTech Hub Sandboxes and Sprint Reviews

A sandbox fast-tracks promising EdTech interventions by providing funding, tools, and access to evidence. It provides a space for partners to test and grow ideas in conditions of uncertainty. We break sandboxes up into short sprints, learning and iterating as we go. Each sprint informs changes and new ideas for the next.

Sprint Reviews (like this one) allow sandbox partners to share their insights by capturing what was tested, what was learned, and how it might inform their intervention moving forward. In doing so, these documents also serve as case studies for the broader EdTech community. For more information, please visit https://edtechhub.org/innovation/.

Contents

1. Summary of Sprint 2

What did we do?

Edtech Hub provided low-cost, refurbished laptops to 200 deaf learners in Grades 1–6 across three Deaf Reach Schools in Pakistan, loaded with curricular content in the following subjects: English, Urdu, mathematics, and science. This took place over one month, in October–November 2020.

Of the total sample, 100 learners were also provided with mobile phones and an internet connection to increase connectivity with the school. This was done to enable children and caregivers to engage with teachers twice a week to test if this would improve learning and engagement with the content.

Our minimum proofs (metrics by which we would know our test was a success) were:

- Learners with online support are able to address and resolve challenges 25% better than learners working offline.

- Ninety per cent of laptops and mobiles distributed are functional.

- Learners report using the laptops to study content at least 4 days a week.

- Learners with online support will accomplish at least 70% of their learning outcomes.

- Learners with no online support will accomplish at least 60% of their learning outcomes.

What did we learn?

To collect data, we conducted interviews, administered short written tests, and undertook surveys. A summary of the findings is given in Section 1.6. Topline figures are as follows:

- Learners in the online group showed significant learning gains, with a 35% higher rate of improvement compared to the offline group.

- Learners from both sample groups regularly engaged with content with only a 6% variance in engagement levels.

- Ninety per cent of laptops and mobile phones showed no hardware or software issues, and 93% of online users and 73% of offline users self-reported finding the content easy to navigate.

How does this affect what we do next?

Sprint 2 validated our hypothesis that increased feedback and assistance from teachers would improve scores and overall learning outcomes. Moving forward, we will:

- Continue to conduct online sessions and make efforts to improve learner attendance.

- Provide digitised Pakistan Sign Language content to our partners in Gaza, Palestine, which will be translated into Arabic.

1. Introduction

Deaf Reach, a programme of the Family Educational Services Foundation, runs seven schools across Sindh and Punjab in Pakistan, with a focus on academic and vocational learning. The curriculum caters to the needs of the Deaf and is administered in Pakistan Sign Language.[1] Deaf Reach's holistic approach also equips deaf learners with marketable skills that they can use for future employment and career building.

With the Covid-19 pandemic impacting everyday life, we continue to serve the Deaf community by providing education, access, and information. To accomplish this, we have implemented a distance learning programme. To ensure that this programme enables deaf children to retain and make progress in learning in core subjects, we are testing various approaches in a sandbox with EdTech Hub. Our key question is: *What EdTech interventions are most suitable for providing distance learning for deaf children?*

Our goal is to grow an approach that is proven to work through real-world testing.

1.1. Deaf Reach Sandbox: Sprint 1

Sprint 1 was a one-month experiment conducted in September–October 2020, among primary-level learners at Deaf Reach Schools, Colleges, and Training Centres. Learners received low-cost laptops loaded with 56 stories in Pakistan Sign Language. These stories were supplemented by worksheets and activities to help learners review their lessons and to gauge their academic progress. Each signed video was accompanied by a voice-over in Urdu and English so that hearing members of the family could also benefit from these resources.

1.2. Deaf Reach Sandbox: Sprint 2

As part of Sprint 2 with EdTech Hub, learners received refurbished laptops loaded with content based on four core subjects: English, Urdu, mathematics, and science. These laptops were distributed among primary- and secondary-level learners in Grades 1–6 across Deaf Reach campuses in Karachi, Hyderabad, and Rashidabad in Pakistan.

Sprint 2 focused on building connectivity between teachers, learners, and caregivers to make learning easier and encourage more engagement among deaf learners. For that reason, the sample size was divided into two groups —

---

[1] See https://www.psl.org.pk/home Retrieved on 12 November 2022

one online and one offline. To create the online sample group, a total of 100 learners were given low-cost smartphones with an internet connection in order to connect teachers and learners virtually. The teachers interacted with learners via WhatsApp twice a week to assist them and answer questions and queries. By introducing connectivity, we tested to see if learner engagement increased and eventually improved learning outcomes.

To initiate Sprint 2, an in-person orientation session was attended by caregivers and learners. Both online and offline groups were given training on how to navigate the new devices and connect with teachers from home. Each learner was provided with a folder with lesson plans, timetables, and worksheets that were maintained and updated as the programme progressed.

The findings outlined below highlight the gains of digital interventions, the introduction of online connectivity, and the challenges of adapting the distance learning programme model in a rural setting.

1.3. Research questions guiding the sprint

- Do learners with online connectivity (the online group) retain their language and learning skills at a higher rate than those without online connectivity (the offline group)?

- What effect, if any, does online connectivity with teachers have on learning outcomes among primary and secondary deaf learners?

- How can Deaf Reach modify device operations and hardware to improve user experience and ensure the devices are not misused?

1.4. Sprint 2: Minimum proofs

- Learners with online support are able to address and resolve challenges 25% better than offline learners.

- Ninety per cent of laptops and mobiles distributed are functional.

- Learners report using the laptops at least 4 days a week.

- Learners with online support will accomplish at least 70% of their learning outcomes.

- Learners with no online support will accomplish at least 60% of their learning outcomes.

2. Survey method

A total of 200 learners from Grades 1–6 received low-cost laptop devices across three locations in Sindh, Pakistan. Of these, 100 learners were in the online group, and 100 were in the offline group.

Table 1. *Demographics: target sample*

No. of Participants	Classes	Locations
200 deaf learners	Grades 1–6	Karachi, Hyderabad, and Rashidabad

2.1. Materials

We used a written test, feedback survey form, and interview as research tools to gather information on academic progress, learner and caregiver engagement, device efficacy, and overall experience of at-home learning.

The written test was divided into four sections based on the four core subjects of the distance learning programme and administered to Grades 1, 4, 5, and 6. Each section had a total of 10 marks and was designed to be objective. In addition, the Annual Status of Education Report (ASER) test was used to measure Urdu, English, and mathematics among deaf learners of Grades 2 and 3. The ASER tools are based on the primary-level curriculum and examine reading, comprehension, and basic numeracy skills. It was particularly important for us to create and administer a concise and simple test based on the academic level and language abilities of our learners.

The feedback form helped us gather important information on learner and caregiver engagement with digital content, laptops, and mobile devices. The online and offline groups received separate feedback forms with each questionnaire including a range of quantitative questions to best record learner experience. The questionnaires were filled out using Google Forms to record responses digitally.

We also conducted a short interview with caregivers and learners to supplement the findings from the feedback form.

3. Sprint 2: findings

3.1. Academic progress

The chart below shows a significant increase in average scores across the online and offline groups. The comparative results show that both sample groups demonstrated significant academic progress.

Figure 1. *Overall average score*
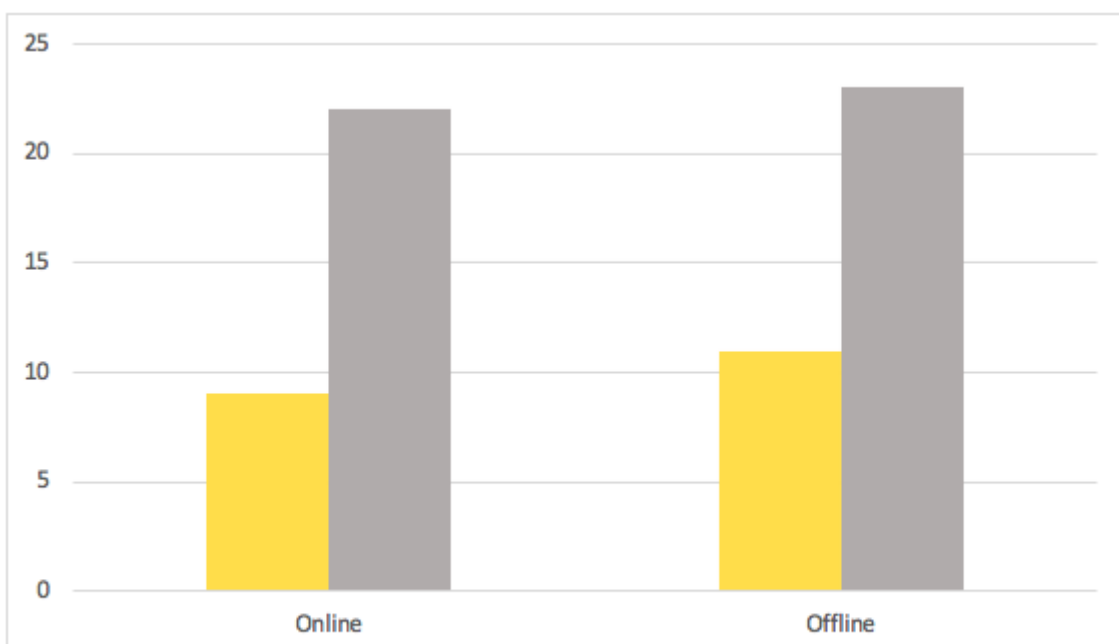
Post-test	Pretest

The pretest score for the online group averaged at 9, while the post-test score averaged at 22. This shows a 144% rate of improvement achieved in one month. For the offline group, the pretest score averaged at 11, and the post-test score averaged at 23, showing a 109% change in average scores.[2]

Both online and offline groups ultimately displayed improvements in performance and showed academic progress. However, learners from the online group displayed a 35% higher rate of improvement than those from the

---

[2] In Sprint 1, the increase in average scores was 68%. This significant increase (for both online and offline groups) is likely due to more videos being added daily on more subjects, and due to learners and teachers becoming more familiar with the structure of the videos.

offline group. This confirms that increased connectivity and assistance from teachers enhanced learners' academic performance.

The survey data shows that engagement levels were relatively high for both groups, with 62% from the online group and 57% from the offline group engaged with content at least four times a week. However, learners from the online group were able to clarify difficulties with the content, understand instructions, and attempt worksheets with the help of teachers, which resulted in greater academic progress and improved learning outcomes.

Figure 2. *Average scores by location (online and offline groups)*

Post-test	Pretest
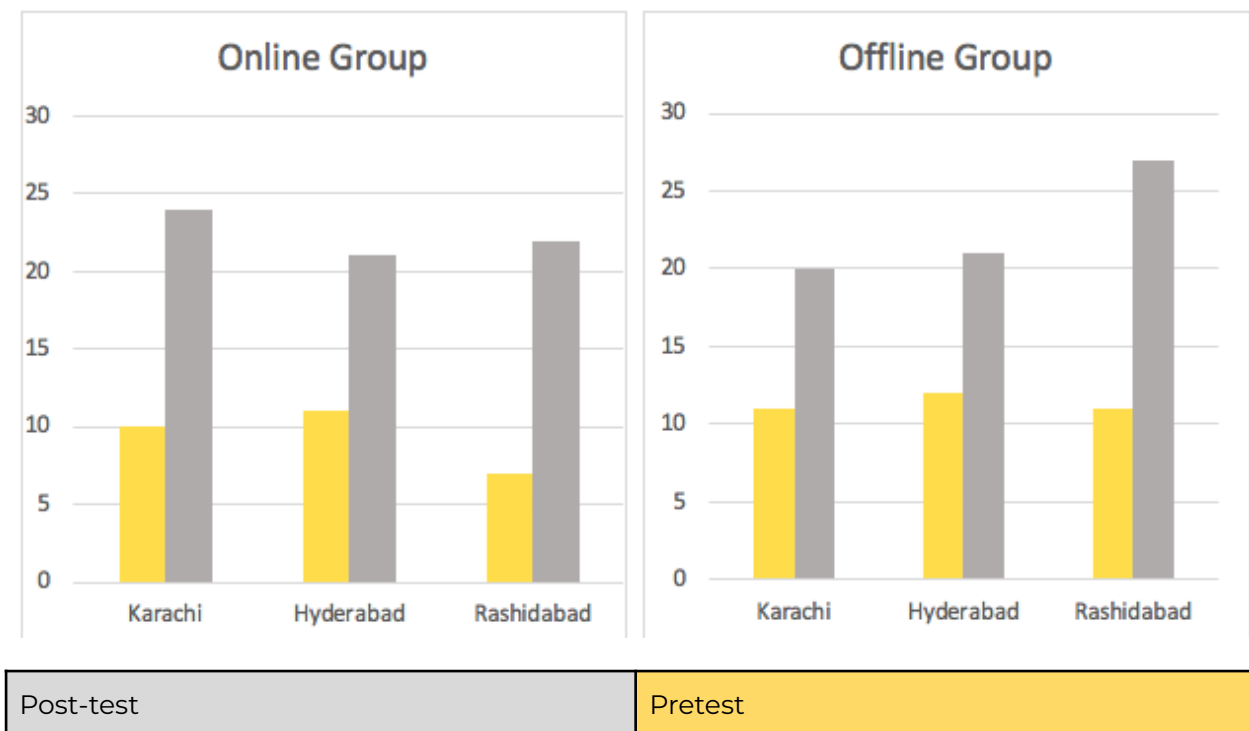
The online and offline sample groups showed similar patterns of improvement across the three locations, with Rashidabad showing the highest rate of improvement, followed by Karachi and then Hyderabad.

Learners from Rashidabad who had access to online intervention showed a 214% improvement in average score. While those with no internet connectivity showed a percentage change of 145% in average score.

Hyderabad showed the lowest rate of improvement in the online and offline groups, at 91% and 75%, respectively. According to the data gathered during the weekly online sessions, some learners from Hyderabad had difficulty in understanding the video content and language interpretation and found the pace of the videos hard to follow. In addition, 36% of learners from the online

group and 30% of learners from the offline group demonstrated low levels of content engagement by viewing the videos less than thrice a week.

It should be noted that Karachi had the highest overall average score (24) in the online group. While Rashidabad had the highest average score (27) in the offline group. The data shows that online assistance proved to be more beneficial in areas with easier access to the internet and electrical facilities, such as Karachi.

Figure 3. *Average scores per Grade (1, 4, 5 and 6)*
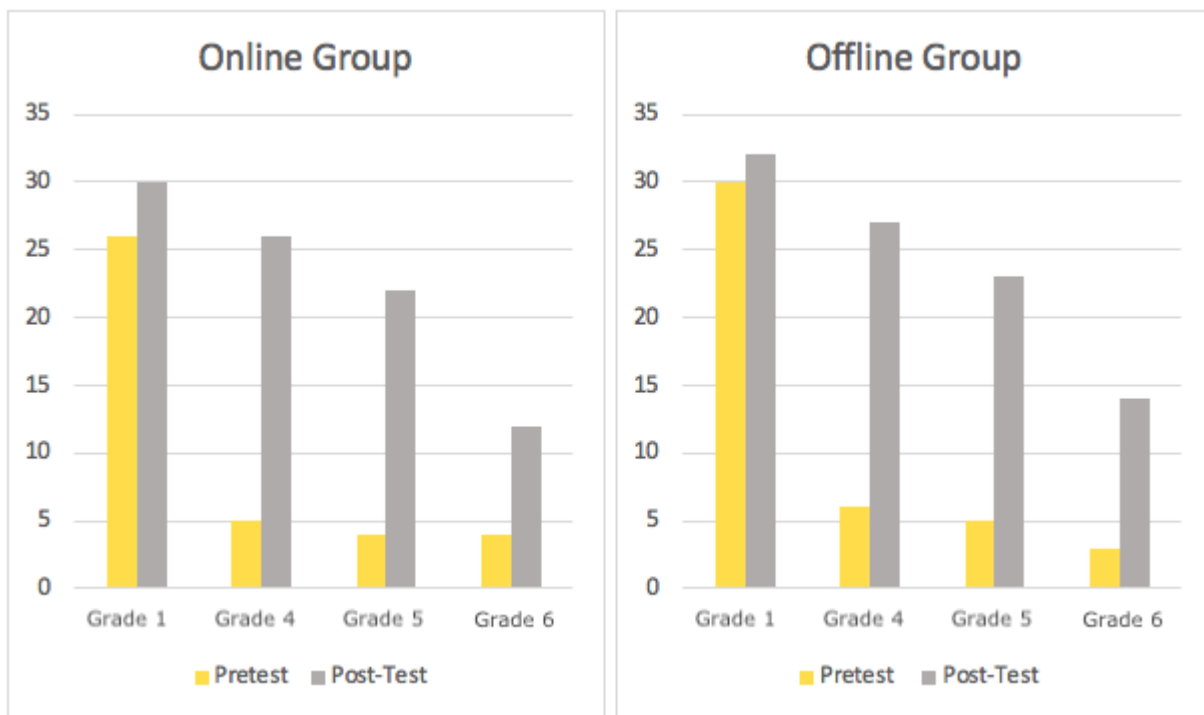
Post-test	Pretest

As shown in the graph above, both sample groups showed a steady increase in average scores across Grades 1, 4, 5, and 6.

Of the online sample, Grades 4 and 5 showed the highest level of progress from an average pretest score of 4 to an average post-test score of 24. Teachers observed that these learners were engaging with the content daily, regularly attended the weekly online sessions, and actively asked for assistance where necessary. Learners from Grades 4 and 5 were also part of the sample in Sprint 1 and therefore familiar with using laptops and remote learning.

Grades 5 and 6 showcased the highest rate of improvement for the offline group, with average scores of 4 rising to average scores of 19.

Learners from Grade 1 had the lowest rate of academic progress across the online and offline groups. Being new to at-home learning and the use of mobile and laptop devices, these learners struggled to access videos and complete worksheets.[3]

The ASER test was used to examine academic progress between Grades 2 and 3. Similar to other classes, learners from Grades 2 and 3 showed improvements in comprehension and arithmetic skills in the online group. However, these improvements were at a slightly lower rate. After the intervention, Grade 2 displayed higher fluency in language with a 13% increase in learners who were able to sign and understand Grade-2-level English vocabulary and a 7% increase in both Urdu fluency and numerical skills.

Overall, Grade 3 displayed a higher improvement in language, comprehension, and mathematical skills. These learners showed a 7% increase in English and Urdu fluency and were able to sign complete sentences at Grade-3-level Urdu. This showed significant retention of language among Grade 3 learners. In addition, learners were able to correctly solve subtraction and division questions at a 6% higher rate as compared to the baseline test.

---

[3] In Sprint 1, we identified a caregiver 'capability-enthusiasm' gap. Caregivers were very willing to help support their children but did not feel capable of doing so. The fact that caregivers could not support their children to access videos or complete worksheets is further evidence of this gap.

Figure 4. *Average scores per subject*
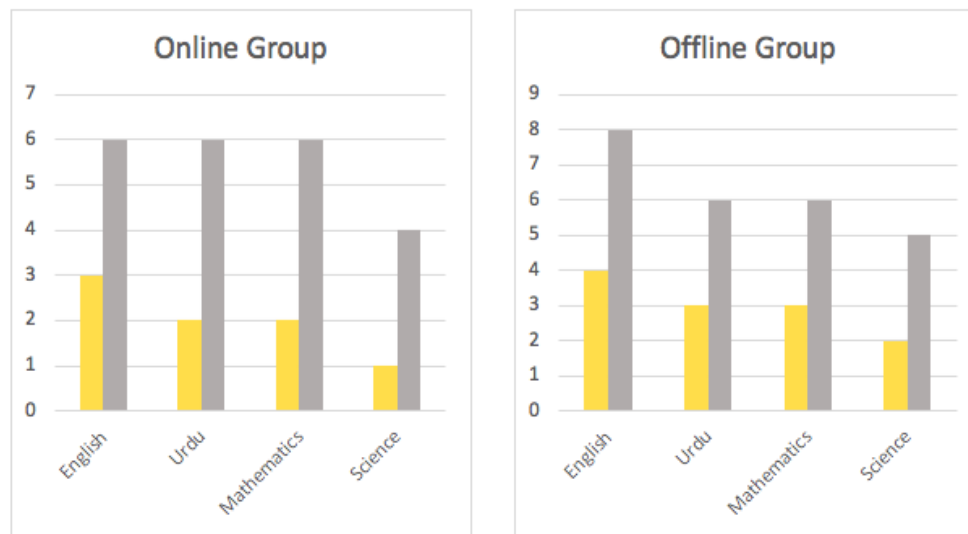
| Post-test	Pretest

At 300% and 150%, results showed that improvement rates were highest in science across the online and offline groups.

With an average baseline score of 3 and an average post-test score of 6, learners had the lowest improvement in scores for English (the online group). The average rate of improvement for the offline group stood at 100% across English, Urdu, and mathematics.

Of the learners from the online group, 22% found Urdu to be the most difficult subject. Learners struggled to understand the video content and found the videos to be too long. In some cases, learners also found the sign language interpretation difficult. Through interviews with learners, we learnt that they were unfamiliar with some of the signs used in the videos provided and therefore had difficulty in comprehending the topics.

3.2. Learner engagement

In order to gather more holistic data and enrich our findings, it was essential for us to supplement our academic results with a feedback survey. Through the survey and accompanying interview, we were able to find behavioural patterns that enriched our analysis and helped to explain the learning outcomes seen.

Figure 5. *Frequency of learner engagement*
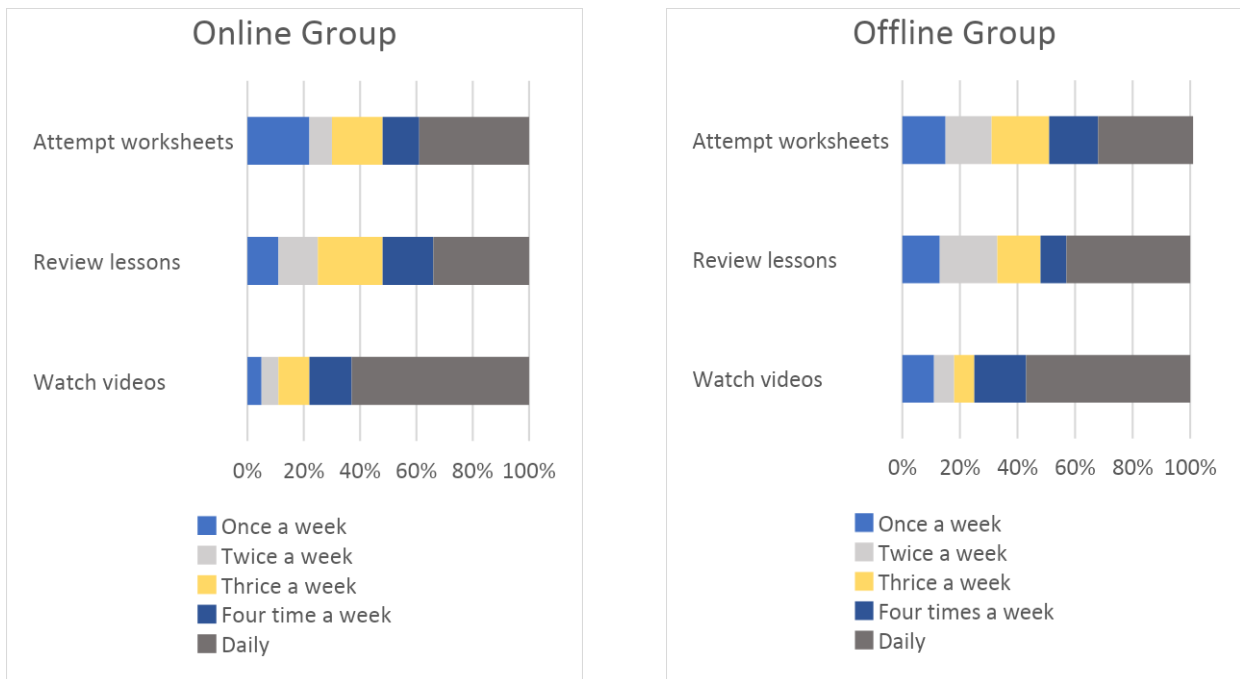
According to the data in Figure 5, respondents from both groups displayed high levels of engagement with the content. Over 63% of the online group and 57% of the offline group accessed content daily. This shows that learners from the online group had a 6% higher level of engagement with the content provided.

Of the responses received, 50% of the online group and 44% of the offline group attempted worksheets and reviewed their lessons at least four times a week. A further review of the survey and interview responses suggested that learners and caregivers from the online group found online sessions helpful. Caregivers, in particular, reported that online sessions helped to keep learners on track with their weekly school timetables.

At least 20% of the offline learners who engaged with content regularly reported that they received some level of assistance at home from caregivers, older siblings, or tuition teachers.
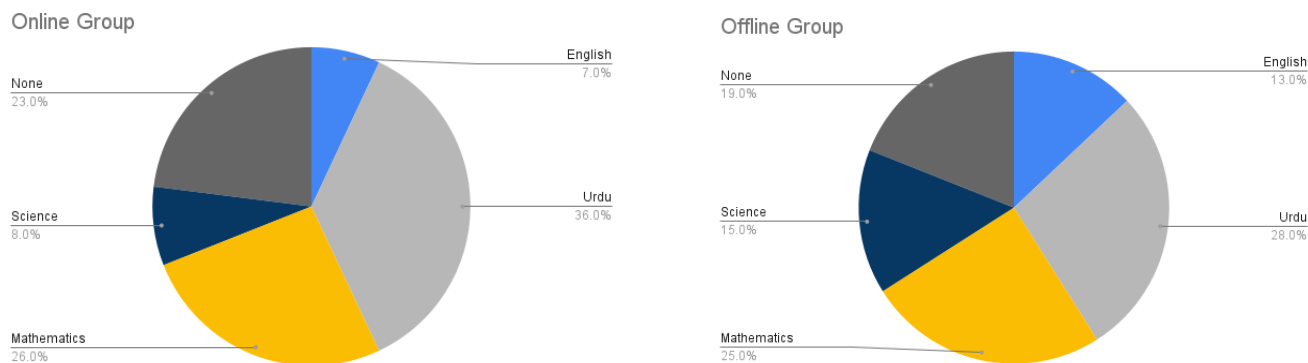
Figure 6. *Subject difficulty*

According to the survey, Urdu was the most difficult subject for both sample groups, followed closely by mathematics. This data was further corroborated by the interviews. Over 60% of the caregivers interviewed shared the view that their children found it difficult to follow Urdu topics and required further assistance to complete worksheets.

On further review, the following reasons were cited for subject difficulty:

■ Content was too difficult.

■ Sign language interpretation in the videos was too fast.

■ The worksheets provided did not match the content of the videos.

■ The worksheet instructions were unclear.

With sign language being the native language of the Deaf, it should also be noted that Deaf Reach teaches English as a second language and Urdu as a third language, therefore Urdu language retention rates can be low. This has also been observed in the learning patterns prior to the intervention.

On average, learners spent two hours a day studying at home. However, similarly to our findings from Sprint 1, caregivers from the offline group observed a lack of interest in school work towards the end of the sprint. The most common reasons highlighted were an increase in playtime, and issues with electricity, especially in rural areas, which meant that learners were unable to charge their laptops and mobile devices.

3.3. Device usability and online connectivity

As can be seen in Figure 7 below, 93% of the device users found it easy to navigate the laptops and mobile phones. When probed, caregivers said that

their children were familiar with using computers and mobile phones based on their IT training at Deaf Reach, which eased the process of switching to digital learning. Our survey showed that learners from younger classes experienced higher levels of difficulty in using the devices than those from older classes. This was also reflected in the academic results and is one of the main reasons for lower rates of improvement among Grade 1 learners.

Figure 7. *Feedback on laptop and mobile devices (online group)*
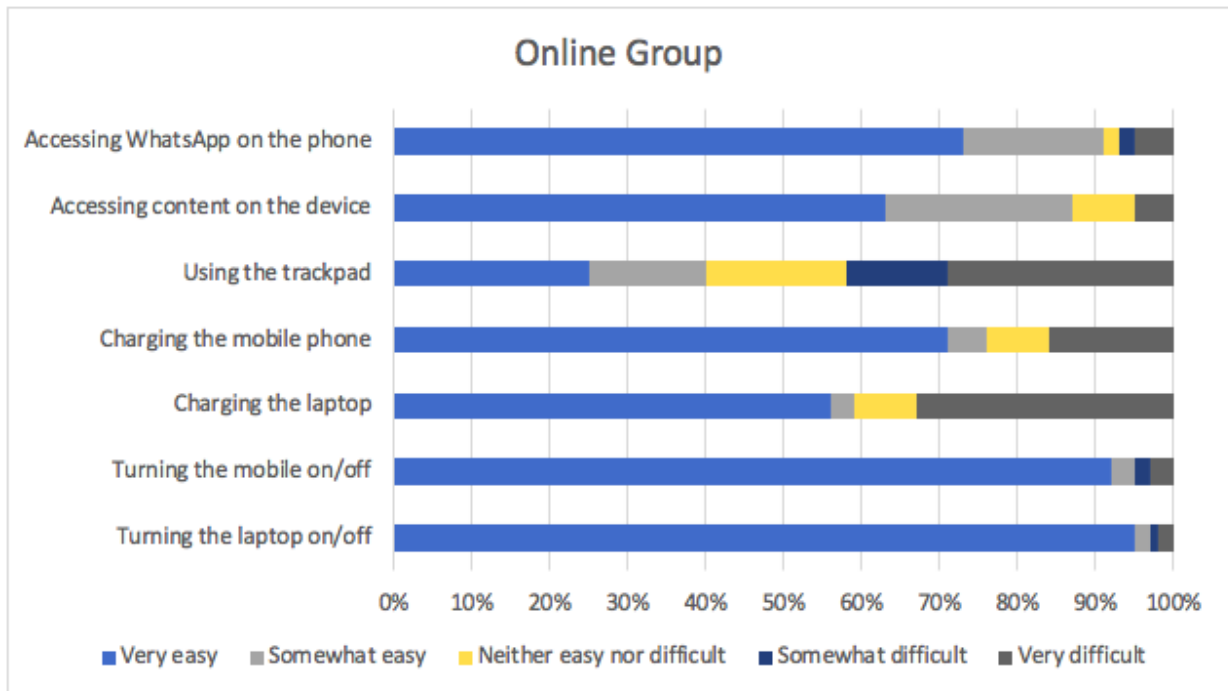
By comparison, 73% of the offline sample found the devices to be user-friendly and easy to access. Learners with access to online connectivity were quick to point out issues with the laptop devices and ask for the teacher's assistance, resulting in higher levels of confidence in understanding and using the devices provided.

Thirty per cent of learners (from both groups) faced difficulty in charging the laptops. This issue was most prevalent in rural areas, mainly consisting of Rashidabad and surrounding areas. Teachers found it difficult to connect with learners online and check progress. Once investigated, we discovered that most households had little or no access to electricity, making it difficult to charge their devices. We need to bear in mind that these families are from low-income households, so the added expense of paying for more electricity proved to be a financial burden for them. In one case, caregivers had to take

the laptop to a nearby store every day in order to charge the laptop and mobile.

Unfortunately, this prompted some families (3%) to opt out of the distance learning programme and return the laptops. The school management is currently discussing alternative methods of providing energy to remote areas, including a portable solar battery to support continued learning without hindrance.

Laptops and mobile phones were checked for possible damage to the software and hardware of the devices. The data showed that 90% of the distributed laptops and mobiles recorded no issues. Faulty laptops with battery or screen issues were repaired or replaced on request.

3.4. Mobile status

In order to ensure the safety of the devices and limit misuse, Net Nanny software was downloaded on all distributed phones. This allowed us to limit screen time and block access to some websites from the phones.

The gathered data showed cases of misuse, with 43% of the sample using the phone for irrelevant or inappropriate websites.

The most common websites and searches included:

■ Nudity, porn, and drugs

■ Google searches for local TV shows and songs

■ Downloading various social media apps (YouTube, Facebook etc.)

■ Downloading online video games

We will share the analysed data with the relevant school campuses to check if the phones in question are being used by the learners or other members of their households. We will then plan an intervention along with the families to limit misuse of the distributed phones.

3.5. Online connectivity

While discussing mobile usage and internet connectivity, 82% of those surveyed reported that online sessions had been helpful for learners' overall academic performance.

The most commonly cited reasons highlighted in our survey are as follows:

- Able to discuss difficult topics and worksheets with my teacher (51%).

- Able to inform the teacher about issues with the laptop (20%).

- Motivated to follow my timetable daily (6%).

- Improved my understanding and learning of the subjects (29%).

However, 17% of the online group felt the weekly sessions did not improve behavioural patterns related to inattentiveness or non-seriousness towards at-home learning. They stated that in-person classes were the best way to educate deaf children. According to the survey, electricity and internet service issues are the main reason for resistance towards the online connectivity model of the distance learning programme.

3.6. Caregiver engagement

Similarly to our findings in Sprint 1, 87% of caregivers from the online and offline groups stated that they actively assisted their children with the content and accompanying tasks.

Figure 8. *Caregiver capacity*
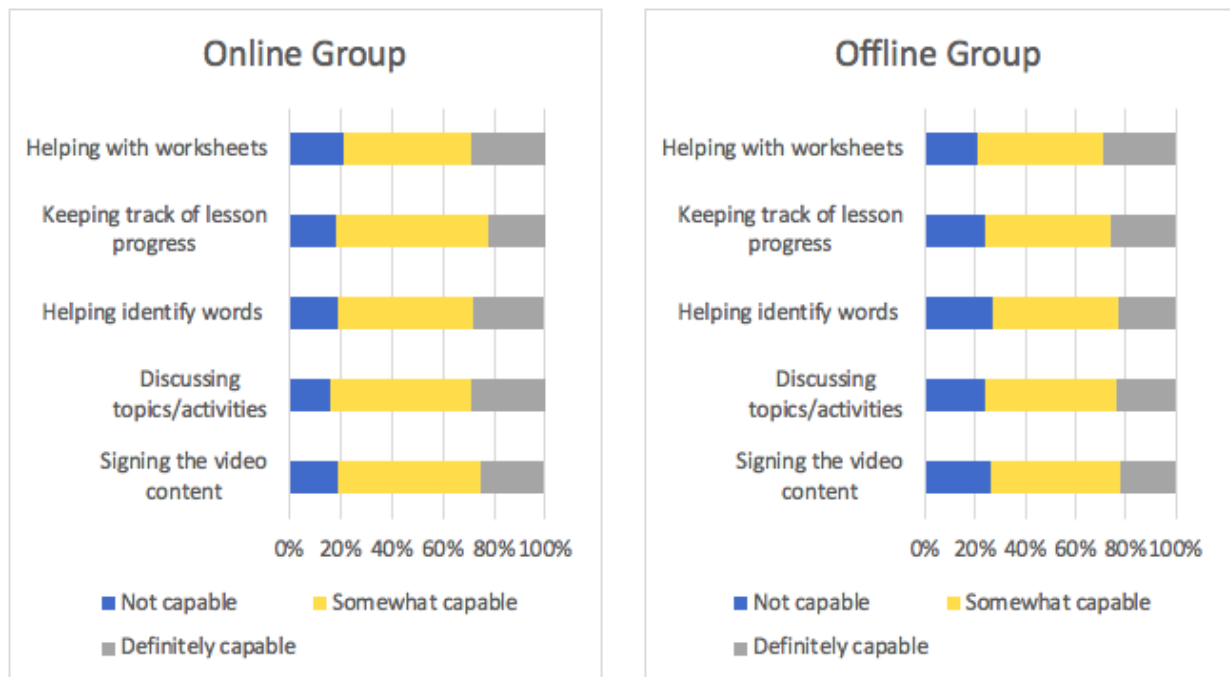
The most prevalent methods of caregiver assistance were:

- Talking about the lesson to their children (53%).

- Encouraging communication through sign language (36%).

- Helping their children to understand schoolwork (36%).

- Signing the videos for their children (32%).

In addition, caregivers (13%) stated illiteracy and lack of sign language skills as reasons for not providing hands-on caregiver assistance. These caregivers highlighted the need for continued sign language training classes, and they aspired to improve their language skills so they could actively participate in their child's learning. Learners in the offline group also specified that older siblings or tuition teachers were able to help where caregivers felt incapable of doing so.

It should be noted that 55% of caregivers across the two groups are 'definitely capable' of signing videos, identifying vocabulary, discussing content and keeping track of their child's lesson plan. This is due to their participation in the caregiver training programme held at all Deaf Reach schools twice a month. While it may be difficult to gauge actual levels of caregiver capacity without testing, it should be noted that this data marks an 8% increase in caregiver capacity as compared to Sprint 1.

4. What did we learn?

As the second phase of the distance learning programme continues, we have further cemented our beliefs from Sprint 1. This programme has proven to sustain itself beyond the scope of the sandbox and continually improves learning outcomes and academic prowess.

The introduction of online connectivity in the programme successfully improved academic performance. Learners from the online cohort displayed the highest rate of improvement among the two sample groups. However, engagement levels with the curriculum and subject difficulty remained similar, showing only slight variances in figures.

The findings from Sprint 2 are outlined below.

4.1. The positives

A 35% higher rate of improvement for the online group in comparison to the offline group confirmed that consistent connectivity between learners and teachers improved performance among deaf learners.

The survey showed that learners from the online group were able to clarify difficulties with the content, understand instructions, and attempt worksheets with the help of teachers, which resulted in greater academic progress and improvement in learning outcomes.

Rashidabad showed the highest rate of improvement at 214%, followed by Karachi, which had the highest average score in the online group. This showed that online assistance proved to be more beneficial in areas with easier access to the internet and electrical facilities, such as Karachi.

Learners who engaged with content daily and attended the weekly online sessions regularly, actively asked for assistance where necessary and demonstrated an improvement in scores between the pretest and post-test.

After the intervention, Grade 3 learners were able to sign complete sentences showing a high retention rate for English and Urdu. These learners were also able to solve subtraction and division problems successfully.

Learners from the online group had a 6% higher rate of engagement, with 63% of learners from the online group and 57% from the offline group accessing videos regularly.

Learners and caregivers from the online group found the weekly online sessions helpful. Caregivers, in particular, reported that online sessions helped keep the learners on track with their weekly school timetables.

Online users (93%) and offline users (73%) found it easy to navigate the laptops and mobile devices.

Similarly to Sprint 1, 87% of caregivers stated that they actively assisted their children with the curriculum content and accompanying tasks.

4.3. The negatives

Hyderabad showed the lowest rate of improvement in both online and offline groups. As per the data gathered, learners from Hyderabad had difficulty understanding the video content and language interpretation and found the pace of the videos hard to follow.

Learners from Grade 1 had the lowest rate of academic progress across the online and offline groups. These learners struggled to access videos and complete worksheets in the allotted time.

Of the learners from the online group, 22% found Urdu to be the most difficult subject. These learners struggled to understand the video content and found the videos too long.

Thirty per cent of the learners faced difficulty in charging the devices. This issue was most prevalent in rural areas of Sindh.

Forty-three per cent of the online sample used their mobile phones to visit inappropriate sites, watch TV shows, and download video games.

Seventeen per cent of the online group felt the weekly sessions did not improve behavioural patterns related to inattentiveness or non-seriousness towards at-home learning. The additional cost of electricity for charging devices was cited as the main reason for this.

Caregivers (13%) stated illiteracy and lack of sign language skills as reasons for not providing hands-on caregiver assistance. These caregivers highlighted the need for sign language training classes and aspired to improve their language skills.

4.4. How does this affect what we do next?

Building on the success of Sprint 2, Deaf Reach will continue to provide internet services for an additional 60 days. Our goal is to gauge the impact of a

long-term intervention on scores, learner engagement, and overall learning gains.

As part of this process, Deaf Reach will:

- Continue to conduct bi-weekly online sessions between learners and teachers.

- Make efforts to increase attendance rates during the online sessions.

- Continue to provide caregivers with training and guidance so that they can better assist and communicate with their children.

In addition, a partner organisation, Atfaluna School for the Deaf, will replicate the distance learning programme model to cater to deaf learners in Gaza, Palestine. As part of this partnership, Deaf Reach will provide curated and digitised Pakistan Sign Language content, which will be translated into Arabic. Similarly to the previous sprints, learners will be tested on improvements in reading and comprehension.