Evaluation Study: Teaching with Technology

Evaluation of Technology based intervention in Public schools of Nashik Zilla Parishad

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TABLE OF CONTENTS

Introduction

Various efforts in the past have failed to address the wide gaps in learning outcomes of students that have led governments and markets around the world to invest huge sums in technology-enabled education. The assumption being that technology, if leveraged to its potential could help bridge the student learning gaps. From computers in schools to smart classes, one to one tablet distribution and promotion of online learning portals, technology had established a strong foothold in the education space even before the COVID related school shutdowns.

The Teaching with technology (TWT) program at Leadership for Equity (LFE) is one such intervention that focuses on a one to one tech variant model that aims to improve learning gaps of students by leveraging technology in the classroom. The teaching with technology program combines One to one ICT model with certain classroom and teacher support practices to integrate technology in public school classrooms. This program tackles key challenges facing public sector schools, including:
- Providing level based teaching with technology as a medium to counter the learning gaps
- Two levels of skills required by teachers embed technology in classrooms. First, the know-how of use of technology and second is the ability to manage and facilitate technology integrated lessons in the classroom to improve student learning experience.

Objective and Scope

This document presents some findings with regards to the program's impact from the perspective of teachers. The objective here is to investigate the impact of the TWT program on teacher practices and resulting change in classroom culture. However, given the operational realities[1] the scope was narrowly interpreted and confined to teachers who participated in the program in the first as well as the second year only[2]. This limited the universe to 20 teachers in the program. Further, as part of the revised scope it was decided to focus on the classroom structures introduced to integrate technology in the classrooms and capture overall teachers' experience.

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[1] While this evaluation study was designed keeping in mind a 3 yrs program implementation strategy, the program itself shifted due to the continued COVID related school closure in March 2020. Further the program was decided to be handed over to the Nalanda team in June 2021. While these challenges required that scope be revised, any data collection was made difficult, as the second wave of the COVID pandemic in Maharastra was extremely distressing for teachers and affected the capacity of the internal team as well. Hence limited data was collected for this exercise.
This evaluation does not reflect on The Nalanda Project's effectiveness, rather throws light on the TWT program that incorporated many other elements apart from the Nalanda project. The findings of this report should only be interpreted against this specific intervention only.
[2] The program itself started in Aug 2019, with 20 teachers from 10 semi-english schools, teaching 846 students. Each school received a Nalanda hardware kit consisting of 40 tablets, 1 laptop, 1 charging cabinet, 1 dongle for LAN connection. The Kolibri platform was preinstalled in each of the tablets and laptops for students, teachers to access level based, curriculum aligned quizzes in Mathematics.

Rationale

Any systematic documentation of the program will be of value to the team and organization as: (a) It will directly feed into other interventions on tech integration- since the team will have validated responses for what is known about works at the teacher level. (b) This report will also serve as an impact report on the teacher's skill and practices along with the process document for the program.

Key Evaluation Questions (KEQ)[3]

1. Which of the classroom structures of the TWT program were most useful in improving teacher K/S/M[4] on use of tech and classroom management?
2. How much, if at all , Did the program impact the relationship between teachers and students, as well as student interest in learning Math?
3. How much, if at all, Did the program result in improvement in (a) student learning and (b) classroom attendance?
4. How has the program impacted the teacher parent relationship?

Data collected

Due to limitations of the team and among respondents, limited data was collected as part of this exercise. A teacher survey was created and 9 responses were received on it. Further, semi structured interviews were conducted with 3 teachers who were part of the program since the first year. Apart from this the findings have been supplemented with additional program data, like school selection rubric, student baseline scores, and teacher observation data.

About the program

Only certain elements of the model were investigated in this exercise. The program aims to promote effective use of tech to improve student learning:

Enabling conditions identified by the team:
1) Teachers and students from the Zilla Parishad don't usually have access to personalized learning devices, content and tech enabled data of student learning. Hence, they value the access to project resources.
2) Tech savviness of teachers is a big plus since teachers are open to the idea that technology can play a role in accelerating student learning.
3) Support from the government body, Nashik Zilla parishad

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[3] The KEQ were identified based on discussion with the team. To a large extent they had previously identified some positives of the program and the evaluation questions were designed to gather evidence on them and systematically document those. Positives of the program were identified as: (1) Improvement in teacher skills to use tech; (2) Increase in confidence, acceptability of teachers to use technology in classroom; (3) Students getting more engaged, excited to learn in classrooms and attend school; (4) Improvement in teacher - student relations; (5) Students getting access to learning resources beyond textbooks to learn (6) Students becoming more comfortable to use tech devices for their own learning.
[4] Knowledge, Skills and mindsets

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Literature

There are RCTs that suggest that there is no strong evidence where access to technology increased student learning. The interventions helped to improve computer skills but do not show direct correlation with learning outcomes. Some positive evidence was sighted where the tech variant is supported by engaging digital learning content. Hence, access to tech devices alone does not have any significant impact on student learning. Free home computers to students in fact generated negative results where studies show that home computers led to distraction of use of computers for other purposes than learning. No significant positive or negative impact of home computers were found on homework, test scores or attendance.

In the same study by Maya Escueta et.al. (2017), Per Laptop Per Child and tablets distributed to students in Kenya and Peru showed no impact. Another study in China, the only intervention that yielded positive impact on math outcomes perhaps due to the initiative was equipped by learning software that was actually consumed by students. Computer Assisted Learning or CAL differs from technology distribution programs where tech devices are not designed for general use but rather for more specific well defined software packages. Studies suggest that CAL programs show enormous promise in improving student learning outcomes, especially in mathematics. The two ways of CAL include homework supplement and in classroom curricula. The ratio for CAL in the classroom given by 'Cognitive Tutor Products' is 60:40 ratio where 60 percent is class time and 40% is computer time. Interventions that were based on classroom CAL aspects without a personalized tech medium saw no major impact on student learning. On the other hand, CAL with personalized learning presented high positive impacts. The TWT program checks all the right boxes namely, in classroom CAL, personalized tech devices and level based learning. All three components have seemed to have delivered results in the past.

Findings

Tech skill and readiness among teachers and students

Increase in teacher confidence in using technology and tabs

- One of the bigger positives for teachers has been to increase their own confidence and skill in tech use. Teachers themselves were not confident and aware of how to use tablets. However through the program their confidence and skill in use of technology in general, and use of tablets specifically has improved.
- This is not surprising as during selection, teachers selected for the program scored an average of 3 on the selection rubric. This indicated that teachers were aware of how to use basic features of smartphones, to download apps and use them, teachers are able to browse through the internet and download information. However, as per the initial teacher baseline, their knowledge of technology in the classroom was limited to mobile phones and projectors in most cases.

Preparedness to use technology during COVID related school shutdown
- Students were **accustomed to use of tech devices** in tab classes and thus found it easier to cope up with its use during the pandemic. Higher tech readiness among both teachers and students ment that teachers were comfortable teaching online and students were accustomed to learning through technology. " I was able to take math class in school, because of all the good habits built due to tab classes" (Teacher).
- It also **prepared parents and students** to connect with teachers online, as per the feedback teachers received from parents.
- It **helped retain student**s even after schools partially were beginning to reopen. "Last year when schools were alternate, even then students used to come daily to solve Math on tabs. 100% students used to come sitting far from each other and learn independently."

Student level Impact

- Overall the tab classes generated **interest and excitement** among students, primarily stemming from the novelty of the program. "Students feel happy in attending the tablet class." or that "Students used to be very happy as they would get to operate the tablets" and "that on the whole students found it easy to operate tablets and laptops", according to teachers.
- **Student attitude towards Math subject**. As a result of the interest tab classes have generated among students, teachers state that their 'fear of mathematics' has disappeared. "It was a new experience for our students to use the tablets and students do get attracted towards new things. That is why students developed interest in math because of the TWT program. Students could participate and study this subject with interest. Students could overcome their fear over math

subjects ". Students started solving math with interest. As per the survey, all teachers found that the program very much increased student interest in Math than before.

- Students' **interest in technology increased**. Teachers found that student curiosity towards technology also increased. Where in one instance teachers taught a select few students how to create tests, and students also showed curiosity to do so.
- **Access** - This was also an opportunity for students from poorer background, without access to tech devices to handle one and learn tech skills

- **Attendance** - teachers found that students would make sure they attended tab classes, irrespective of their own challenges. In one case the teacher also stated that even if her female students had household chores to do, they would make sure to attend tab classes. Or students who were not very regular also made sure to come to attend tab classes, and saw 100% attendance, where teachers " found students eagerly waiting for tab classes ". This also relates to survey findings where all teachers report student attendance used to be higher on the day of tab class.

- **Student engagement** - As a result students were on the whole more attentive during a tab class, students were curious to solve quiz questions. This program has generated curiosity and engagement among students.Teachers note that "**Students started solving with concentration"** **and that** students would **solve questions fast**.

- **Learning**[5]
  - As per teachers, the program helped by ensuring "4 basic math operation skills were built among students." and that the " Program very much improved numerical skills among students" (teachers)
  - It also helped teachers with students they earlier found difficult to teach, or weaker students, as their own individual attention to students increased. Teachers also found that weaker students were readily taking interest in learning in tab classes as well
  - On the whole, students 'interest to learn math and their 'tendency to learn' as well improved via tab classes
- **Independent learners-** Another positive result of the program that teachers acknowledge is that students have become independent learners. Teachers have noted that students themselves ask doubts, and "They started realizing and making themselves understand about which subject/course they need to revise based on the marks received."

- **Prepared students to solve multiple choice, quiz type questions.** This is a format that was particularly useful to students when preparing for scholarship exams, as well as when students

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[5] A student baseline assessment was conducted in the month of Aug 2019. This was a diagnostic math assessment, where 14 math competencies were tested through the test and score mastery of 70 percent and above was considered for grade mastery. As per the student test conducted,only 10% of grade three and four, and 20% of students from grades 5 and 6 were able to achieve their grade level competencies or lower. At the start of the program this suggested a problem of a huge chunk of students not being able to ace the competencies of the grades that they are actually the students of. The detailed baseline analysis can be found here.

were receiving quizzes as part of the learn from home content. "Even now (since school closures) students are able to solve quizzes"

Lastly teachers have mentioned that due to tab classes, they notice that:
- **Increase in confidence and self discipline** among students**.**
- Students also learnt time management

Teacher relationships with students and parents

- Teachers note a change in student relationship, where teachers felt that **"Children came closer** ", and that student teacher "bonding improved, they started telling home problems" as well.

- This program also gave teachers and schools an **opportunity to interact with parents.** In many cases parents approached teachers being happy that their students got a chance to learn on tablets.
- Overall **attention and positive feedback the school received, tab classes became an attraction**. During the admission this becomes one of the key exciting areas for schools, to attract more students. Overall, it generated a lot of excitement among parents.
- A teacher also stated that "Due to the increase in student's learning quality, **parents became more respectful towards teachers.**"
- To a large extent, teachers also agree in the survey that the program has helped teacher-parent relationship and has "It has changed parent's perspective towards school, students and teachers".

Structures as part of the program

When asked, what was different about Tab classes in comparison to the other tech based classrooms, teachers responded that:

- Preparation required by teachers beforehand - class rules and quizzes[6] had to be prepared before the class
- Students normed on the structure of the class
- Teachers were able to keep a track of all students

These aspects directly align with some of the key objectives of the programs. The program introduced specific classroom structures to help with easy integration of technology in the teaching and learning processes. These classroom structures were the primary focus of the primary data collected for this analysis. The following sections elaborate on each of them.
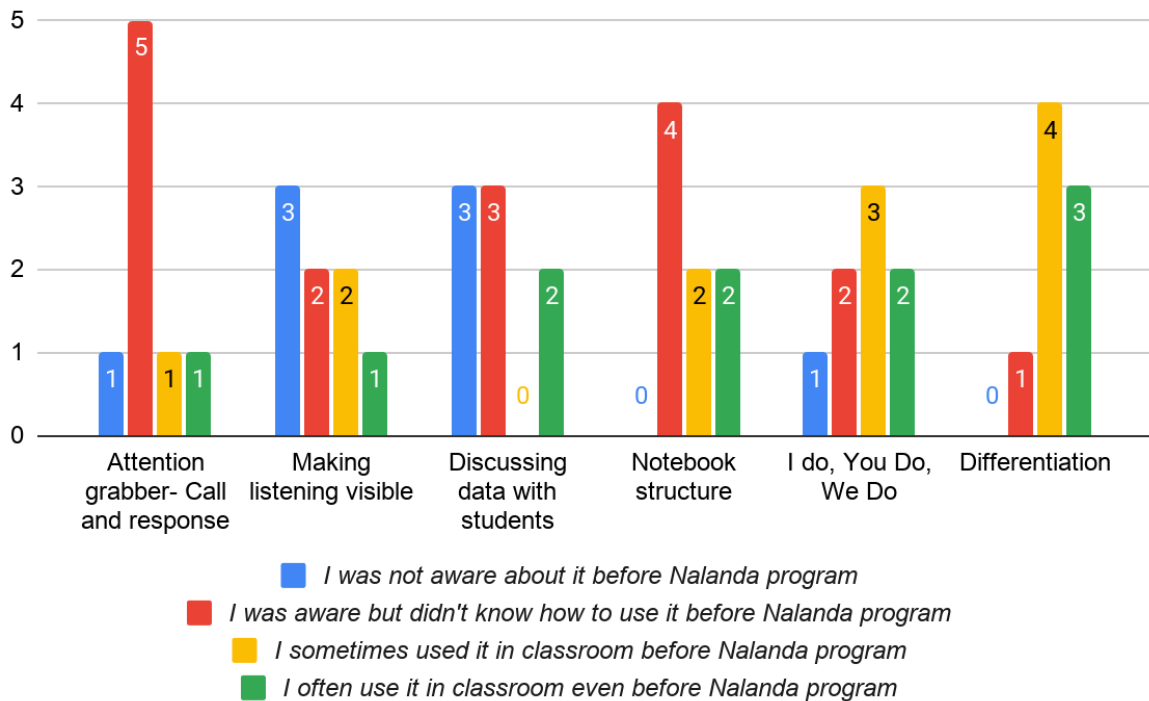
Awareness and usefulness of structures

As per the survey teachers have stated that:

- Structures where teachers had **low awareness** or lower use in the classroom before the program - **attention grabber, making listening visible, discussing data with students**.
- Structures where teachers were **aware** of them and used them previously - **I do you do we do and differentiation.**

Irrespective of teachers familiarity with each of these, in all instances, teachers found that the structures very useful in managing the classroom.

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[6] This was required as it is Important for the teacher to be well prepared before the class starts, teacher must be aware of the rigor of the sums as they are randomly selected by Kolibri platform used on tablets

Legend:
- ■ I was not aware about it before Nalanda program
- ■ I was aware but didn't know how to use it before Nalanda program
- ■ I sometimes used it in classroom before Nalanda program
- ■ I often use it in classroom even before Nalanda program

Tab class rules, inventory management and tab passing procedure

The objective of these structures was to ensure that the class should not be chaotic, the students should follow procedures to give and receive the tabs.

- Teachers have stated that tab class required everything to happen in an **organized** fashion and ensure a systematic way of taking the class. **Students are accustomed and in habit of the structure**
- Tab class rules included the passing procedure
- **Creating group leaders was helpful as it reduced the waste of time**
- Objective of Rules displayed "If students are behaving well or not, having a set of different rules during the tab class will get the students to have more value for this class".

Attention grabber

Teachers were asked to use attention grabbers to ensure that they are able to manage classrooms well.

- However, in one instance, a teacher stated that it was **not very useful as students were too old.** She found that students were giving her attention already and she did not completely understand the strategy.
- While other teachers found that it was useful, **it could help teachers focus attention** of many students in a **'quick way'**, particularly when there was some fatigue or dis-interest in the class.
- Teachers were not aware of this technique and learnt it as part of the program

I do, You Do, We do

- Again teachers found it a **useful** class structure; and
- students were also comfortable with this pattern , and it also helped them become **independent learners** as per some teachers.
- In some instances when a teacher stated that she was previously vaguely familiar with this strategy - she saw its full potential in a tab class, as it was much more applicable.

Differentiation

- Overall teachers found it **useful** during tab classes
- Teachers stated that they were able to **give personal time to students** due to this strategy

Word wall

- Teachers stated that this was **helpful**, as s**tudents got it easily,** and helped solve word problems. Objective of the word wall was to "increase the comprehension of the sum by getting the students to learn english Know the pronunciations", and in that respect met its objectives.

Making listening visible

Teachers were not aware of this technique, **did not use it as per the data collected here.** However the survey data reveals some familiarity with this, it still remains low compared to other structures.

Discussing learning data with students

- Received mixed reactions from teachers - as **not all teachers used to use this technique** to discuss with students, or used it in a limited sense where they gave class avg score to students
- On the other hand the teachers who did use this technique found it to be very helpfulful in motivating students `` **Best way to motivate children. This brought children also to know their level and aware how much they have to grow**. ”

Notebook structure

- As per teachers, this structure was very **helpful in keeping track**.
- It meant that if students got any answer wrong, the solution was right in front of them and It also **made it easier for teachers to help students with their mistakes**
- Helped students become independent learners
- This structure also encouraged blended teaching. Because of the manner tech was integrated into the teaching, teachers saw the benefit as "The taught subject/course would get revised and students would benefit more out of it."

Challenges

Content

- English language - word problems for students, only students who can understand can solve, thus leaving out students with a lack of knowledge of English Language
- Quizzes were challenging and sometimes lead to fatigue or disinterest.

Teacher Skills

- Tab classes to begin with were very challenging for teachers. Given its novelty it did generate a lot of excitement, however it required the teacher to be proficient in multiple skills at the same time - including handing tech devices, inventory management and managing infrastructure, creating quizzes and keeping all students, with different speeds, engaged at all times. "Initially it was very difficult to handle, some solved early, some took time, Time management, also administrative, taking tab charging -much attention was given, more quizzes were given who solved early or asked them to help other students. But overall tab experience was both exciting as well as a headache" (teachers)

Team Training and support

- Training helped teachers learn how to take tab classes systematically like ensuring the passing procedures, word wall, making student leaders etc.
- In the interviews conducted teachers mentioned that what teachers found helpful were the links sent on phone and training conducted for them.
- Teachers also stated that the support from team members were helpful as well. Teachers appreciated the in-classroom support to solve challenges and technical issues during their in person visits. They found the team to be positive and provide motivation.
- Lastly, trainings were very much appreciated for their enthusiasm and time management

CONCLUSION

The contribution of infrastructure in public schools is clear, as it provides access to an important resource, where it is severely lacking. As a result of which it improved student attendance, generated curiosity and engagement among students impacting their outlook towards learning Mathematics, and using technology. However beyond the infrastructure provision the other contribution of the approach to tech integration should also be examined.

What can we conclude about the effectiveness of this technology integration model?

Many of the structures introduced were crucial to the success of the program as they encourage:

- teachers to manage classrooms more effectively (tab class rules, inventory management and attention grabbers),
- encourage students to learn independently (I do, You do, We do, differentiation, word wall, notebook structure),
- ensure teachers are able to focus on lower order students (differentiation and word wall) and
- changed student attitudes towards learning mathematics (discussion on data).
- Overall the structures helped in creating a smoother process, where teachers appreciated that students were solving quickly, were self disciplined and working independently.

While the data collected here is limited, it is clear that implementation of certain structures can be more rigorous. For instance:

- The program at the beginning assumed that teachers were not able use differentiation effectively to cater to the needs of their students, (not trained, large classroom size) - however the data shows that teaches were aware of it, and found it useful - but how much more effectively there were using it needs to be still determined. It was observed to be applied in a very broad sense, where students were divided into three groups only. This indicated that the tech intervention was yet to be maximized towards personalized learning objectives.
- The data as part of this study does not find that teachers were not able to take advantage of information on the exact learning levels of the students and found it that much more useful in this program. As discussed above only three groups were created for students. It is indicated that more than teachers this information was more useful for students to keep a track and to motivate them.

Overall teachers have a positive outlook towards the program, have found it helpful , particularly in getting students engaged. This program has prepared both students and teachers for a future where hybrid education and tech integration is a definite reality. There is also a need to recognise the opportunities a program like this can create for students, teachers and school, as well as the impression it has on the community as part of its unintended consequences.

Annexure

In examining the TWT program, the scope will strictly be limited to the following classroom structures:
- Tab class rules
- Inventory management and tab passing procedure
- Structured tab (I do, you do, we do)
- Using tech for differentiated instruction (making groups as per learning levels)
- Discussing learning data with students (this is the only factor that is done to some in other The Nalanda Project classes as well)
- Debrief and reflection (did teachers do this before, building that habit)
- Classroom mgt practices - Attention grabber/ call and response, make listening visible
- Notebook structure for students