



TEACH TO LEARN

1Lab-1School Report

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The '1Lab-1School' Project Implementation Report

About the 1Lab – 1School Model

'1 Lab -1 School' is a mentoring program that connects the graduate laboratories (labs) of premium institutes to the rural high schools. Graduate students from these labs mentor high school students through a structured mechanism covering major aspects including scientific thinking, hands-on learning, device engineering and life skills. Note: *A Lab refers to a group of Graduate students under an advisor. This group comprises of MTech, MS, PhD scholars. Based on the strength of the implementing institution even the Under Grad students may be connected to the rural schools.*

Objective

The objective of this model is to provide the students from rural areas with significant exposure to both academic as well as technical skill development. Through hands-on Training motivate the students to develop a passion towards building or making equipment and devices on their own and expose them to science learning in interesting ways.

Methodology

The implementation process is illustrated below.

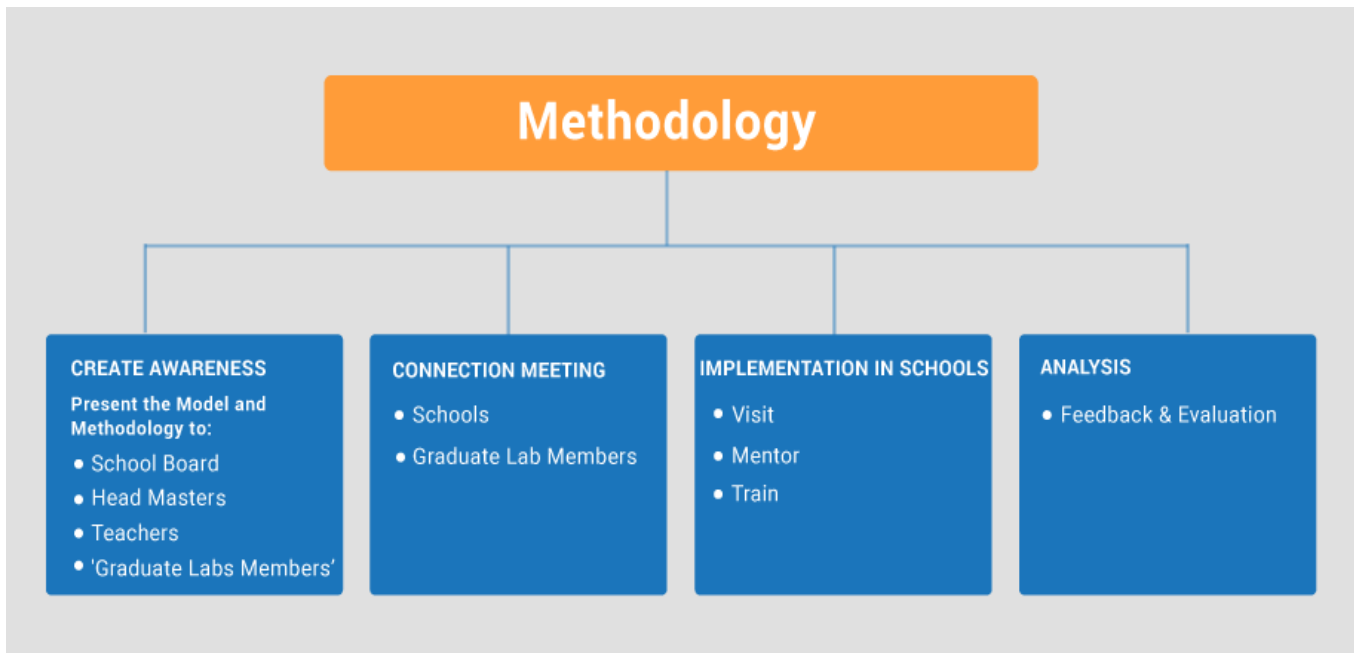


Figure 1: Methodology

Implementation Report

Project Sponsor

The 1Lab – 1 School project was fully funded and supported by Verizon India Limited

Project Support

SSA which is part of the Education Department fully supported the project and mobilized the schools for the implementation.

Implementation Period

Batch 1 - June 2018 to March 2020 | Batch 2 – June 2019 to March 2020

Implementation Locations

The project was primarily implemented in Tamilnadu across 3 Districts - Kanchipuram, Vellore and Tiruvallur.

Participants

Totally 20 Labs from IIT Madras and 20 Rural Government Schools

Batch 1

Over 80 Graduate Students (Mentors) across 11 Labs

Over 300 high school students (Mentees) and 11 teachers from 11 schools

Batch 2

Over 70 Graduate Students across 9 Labs

Over 300 high school students and 9 teachers from 9 schools

Content

Mentoring was provided through:

- Interactive presentations of everyday Science concepts using ‘Tell Me Why’ questions
- Hands on learning of the science and working of everyday devices
- Exposure to research and research-based activities

#	Tell Me Why Questions	Device List
1	Why do stars twinkle?	Wind Up Toy
2	Why does milk raise when boiled?	Bicycle Bell
3	Why is the sky blue?	Bicycle Dynamo
4	Why does popcorn pop?	Electric Calling Bell
5	Why does a whale spout water?	Weighing Scale
6	Why do our eyes take several minutes to adjust to the dark?	Electric Iron
7	How do thunder & lightning occur?	Vacuum Cleaner
8	Why can't we feel the earth spin?	Stethoscope
9	Why does iron rust?	Sphygmomanometer
10	Why do onions make you cry?	Hair Dryer
11	Why are bacteria used in making food?	Alarm Clock

12	Why do we close our eyes while sneeze?	Binocular
13	Are world maps round?	
14	How do oil spills affect aquatic life?	
15	Where Do Snails Get Their Shells From?	

Delivery

Mentors from the participating labs visited their connected school 6 times during an academic year. During each visit they carried with them multiple units of a device and provided hands-on learning of the science and mechanism of the device to the participating Class 9 students from the school. Each visited covered a whole day of activities as listed below.

TIME	ACTIVITY
9:45am	Welcome the children
	Begin with an interactive recap of previous visit details – Warm up
10:00am	Present 1 ‘Tell me Why’ question and discuss/do activity associated with the question if applicable
	Brief intro to the day’s agenda with device name
	Administer the Pre-Test
11:00am	Recess / Break
11:15am	Large Group Device Demo and Science Teaching
	Interactively teach the concepts and principles behind the device, dismantle the device systematically and in an organised manner. Use the black board to teach, use the screen to project components and their function, dismantle and show the components.
12:45pm	Lunch
1:30pm	Regroup and form 4 or 5 smaller groups 1 to 2 Mentors in each group
	Each group must have a device
	Within each group, each Mentee goes through the exercise of dismantling and assembling while clarifying and learning about the science behind it. Members act as facilitators here.
3:00pm	Administer Post-test
3:15pm	Q/A – answer any questions children may have
	Encourage them to think about the device and the science after this session
	Discuss the extended applications and further thinking for device enhancement
3:30pm	Play game/Conduct Quiz/Interact with Mentees on non-academic topics
3:45pm	Wrap up and Dismiss

Data Collection

- Pre-Test and Post Test Questionnaires were used for measuring concept learning in the Mentees
- Feedback forms were used for collecting data on what transpired in the Mentors and Mentees from the experience of mentoring

Batch 1 Implementation Details

1. Awareness Workshop

When – January 2018

Where – At IIT Madras Campus

Who - In total around 150 participants attended the Workshop. 1 Headmaster and 1 Teacher from 50 schools across 3 districts of Tamilnadu; Members from School Education Department, Advisors and Graduate Students from 15 IIT Madras Labs; Sponsor and the Project Team

What - Brought awareness among beneficiaries about the model concept, implementation details, expectations, roles and responsibilities

2. Connection Meeting

When - June 2018

Where – At IIT Madras Campus

Who– In total around 90 participants attended this meeting. 1 Head master and 1 Teach from 11 selected schools; Advisor and Graduate student Mentor volunteers from participating Labs; Members from Schools Education Department; Sponsor representatives and project team

What - Officially connected 1 Lab from IIT Madras to 1 rural Government Higher Secondary School and like that all 11 Labs and Schools

3. Field visit

When – July 2018

Where – School Premises

Who – Project staff visited the schools to conduct screening test for selection of Mentees and school staff orientation about the implementation.

What - From a total of 1295 rural school students who were in class IX at the beginning of the implementation, 385 students were selected based on screening test performance and recommendations from the school staff. Subsequently some of them dropped out after year 1 as they entered class X, but new students joined the program making the final total as 425 participants.

4. Implementation (Mentor School visits)

When – July 2018 to March 2020

Where – School Premises

Who – Mentors visited their connected school once a month except during school exam and holiday months (Sep, Dec and March)

What – Provided hands-on training through device engineering and teaching of everyday science concepts. Administered Pre and Post Tests and collected feedback.

5. Interim Meeting

When – December 2018

Where – IIT Madras Campus

Who – 1 Headmaster and Coordinator Teacher for all 11 participating schools, Mentors and Advisors from the participating labs, Project staff and representatives from the School Education Department

What – Implementation progress, issues and problems were discussed.

6. Demo Platform

When – Dec 2019

Where – IIT Madras Campus

Who – 5 Students and 1 Teacher from the 11 participating schools

What – Students demonstrated their learning and shared knowledge with students from other government rural schools.

7. Outcome

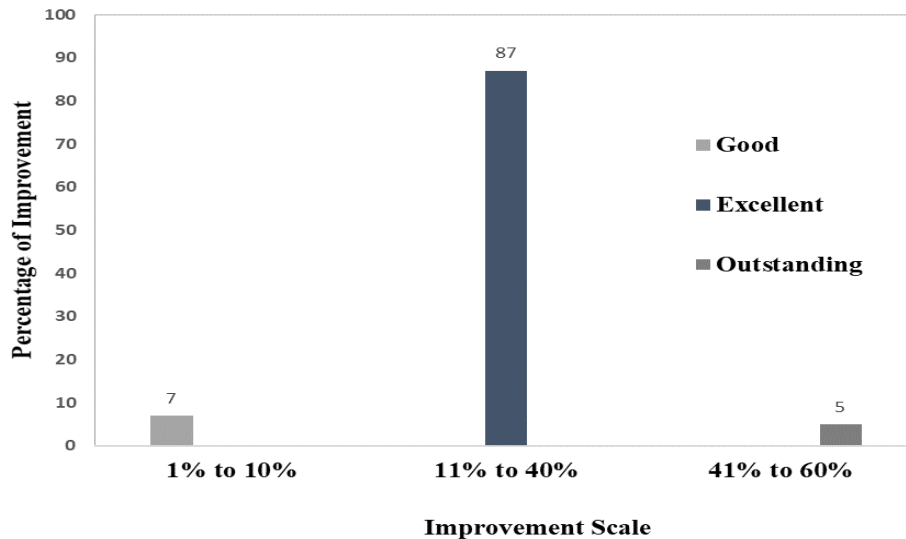
This implementation fetched data from 12 visits over two years. Mentee Pre-Test and Post – Test results after every visits and feedback responses collected periodically from mentors, Mentees and Teachers were statistically examined at the end of the implementation period to arrive at the following outcome summary.

Outcome from Batch 1 Implementation

a. Change in Mentee Knowledge Level

A Percentage Analysis was performed on the Mentee Pre- and Post-test scores to evaluate the overall performance. The resultant scores were categorised in to scales ranging from 1% improvement up to 60% improvement as they were the minimum and the maximum improvement percentage secured by the Mentees respectively. Improvement percentage is represented in the graph below (Figure 2).

Figure 2: Mentee Test Performance



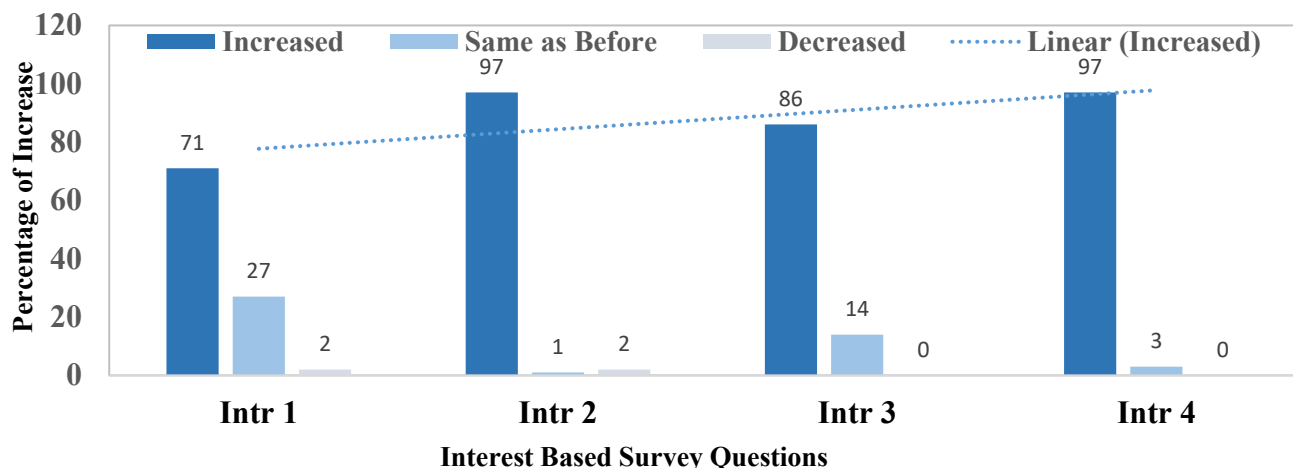
b. Change in the Mentee Level of Interest in Science

To measure the change in interest level in science particularly after joining the mentoring program, a 3-point Likert scale survey with 4 questions was administered to the Mentees where, 1= increased, 0=same as before, -1 = Decreased. The four questions are given below:

- Intr 1: Rate the change in your frequency of asking questions in science class
- Intr 2: Rate the change in your use of science-based materials and resources besides academic text book
- Intr 3: Rate the changed in your participation in science-based fairs and workshops
- Intr 4: Rate the change in the level of your interest in science

Graph illustrating the responses to the above questions is given below in Figure 3

Figure 3: Mentee Interest in Science



c. Change in Mentee motivation level

To examine the influence of the mentoring interactions on the Mentees, four influence-based questions were asked on a 3-point Likert scale. Positive responses got a score of 1, neutral responses got a score of 0 and negative responses were given a score of -1. The response percentage is represented in the table below.

Question Summary	Percentage of Change		
	Increased	Same as Before	Decreased
Study time after school	94%	5%	1%
Interest in Higher Education	84%	13%	3%
	Yes	May Be	No
Take science courses after class X	84%	13%	3%
	Often	Sometimes	Never
Taught others	61%	33%	6%

d. Development of Mentee Scientific Thinking Skills

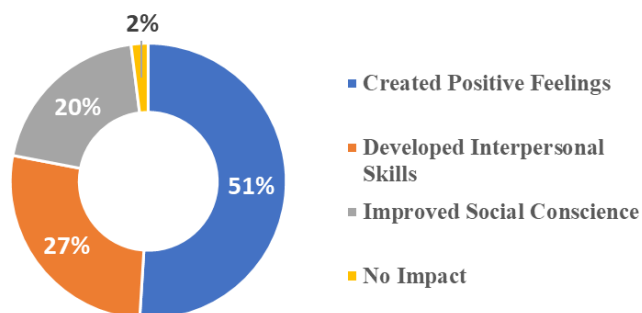
Percentage Analysis from Mentee responses to skills related questions using a survey form.

Particulars			
Approach toward devices	Positive 95%	Neutral 4%	Negative 1%
Repaired devices at home	Yes 51%	No 49%	
Made devices from scratch	Yes 70%	No 30%	
Application-Based Test Scores	Improvement 71%	No Improvement 29%	

e. Mentor Feedback related to the mentoring experience

Mentors took a survey to answer questions related to how they felt during this engagement. Their responses were sorted by identifying themes and keywords. Consolidated responses fell in to 4 categories as expressed in the figure below (figure 4).

Figure 4: Mentor Feedback



f. Teacher Feedback related to the mentoring sessions

Percentage Analysis - Teacher responses to survey questions about the Mentoring Sessions

Areas of Impact	% of Teachers
Language was not a Barrier	45%
Mentors had the ability to teach class IX	91%
Classes were interactive	99%
Mentors managed class well	100%
There was positive connection between the Mentors and the Mentees	100%

Conclusion

At the end of this 2-year implementation the project office provided a platform in IIT Madras for selected students from each school to put up a stall and demonstrate their learning. Students taught about devices and demonstrated the working to other school students from rural schools across 17 districts of Tamilnadu. The experience not only showed the long-term retention of information, it also showed how much of a positive impact this engagement had on the Mentees and Mentors.

Batch 2 Implementation Details

8. Awareness Workshop & Connection Workshop

Unlike Batch 1, exclusive Awareness Workshop was not conducted for Batch 2. Instead, with the help of SSA and the list of schools from Batch 1 Awareness Workshop, we shortlisted 9 schools that were not too far from IIT Campus (except for 2 schools that were more than 90mins away).

Similarly, for the labs also an exclusive awareness workshop was not conducted. Instead, the project team visited close to 20 labs and personally presented the model details to the Advisor and the Graduate Students. Out of those, 9 Labs volunteered to participate in this implementation.

When – June 2019

Where – At IIT Madras Campus

Who participated - In total around 75 participants attended the Workshop. 1 Headmaster and 1 Teacher from 9 schools across 3 districts of Tamilnadu; Members from School Education Department, Advisors and Graduate Students from 9 IIT Madras Labs; Sponsor and the Project Team.

What - Brought awareness among beneficiaries about the model concept, implementation details, expectations, roles and responsibilities and officially connected 1 Lab from IIT Madras to 1 rural Government Higher Secondary School and like that all 9 Labs and Schools.

9. Field visit

When – July 2018

Where – School Premises

Who – Project staff visited the schools to conduct screening test for selection of Mentees and school staff orientation about the implementation.

What - From students who were in class IX, 330 students were selected based on screening test performance and recommendations from the school staff.

10. Implementation (Mentor School visits)

When – July 2019 to March 2020

Where – School Premises

Who – Mentors visited their connected school once a month except during school exam and holiday months (Sep, Dec and March)

What – Provided hands-on training through device endangering and teaching of everyday science concepts. Administered Pre and Post Tests and collected feedback.

11. **Interim Meeting** – Was scheduled for Dec 2019, but cancelled due to cyclone. Could not reschedule until end of academic year after which schools closed owing to the pandemic.

12. **Demo Platform** – Was scheduled to happen in Dec 2020, but did not happen owing to the pandemic

13. Outcome

This implementation fetched data from 6 visits over one year. Implementation was not complete as we had to abruptly stop the visits owing to the pandemic. Therefore, data collected remain awaiting further implementation possibilities.

Testimonials

“... I learned to explain and make others understand science in simple terms. My understanding on many scientific facts and applications has also improved...”

-Shruthi L, Department of Chemical Engineering, IIT Madras

“...I had experience of teaching students who knew the language which I know (Either English or Hindi), But in this program, the challenge was to convey my message to a group of kids who did not communicate in the same language. This made me do serious planning to prepare myself and also work with my team who are all from diverse background...”

-Rahul Kumar, Department of Applied Mechanics

“...It improved my communication skills. I learned how to talk science to kids, which I haven't experienced before...”

-Herald Wilson, Department of Bio Technology

“...I learnt how to explain even small things. The experience motivated me and helped to improve my presentation skills...”

-Nilakanmani,, Department of Civil Engineering

அறிவியல் சம்பந்தமான அதிக ஈடுபாடு ஏற்பட்டுள்ளது. இதே போல் நிறைய பொருட்களை அறிய ஆவல் ஏற்பட்டது. இந்த வகுப்பு எனக்கு மிகவும் பிடித்து இருக்கிறது [My interest in science has increased. I am motivated to learn more. I liked this class]

-Desingu Raja, Class 9 GHSS Ponneri

இந்த வகுப்பில் கலந்துகொண்ட பின் என்னுடைய அருவம் அதிகரித்துள்ளது. நான் முன்பை விட அதிகமா புத்தகங்கள் மற்றும் அறிவியல் சம்பந்தமான கேள்விகள் கேட்கிறேன். எனக்கு மிகவும் இந்த class பிடிக்கும். [After

attending these sessions, my interest in science has increased. I have started reading a lot of science resource books. I have also started asking more questions in class. This program was very good.]

-D Nivetha, GGHSS, Perambakkam

Summary and Learnings

From the feedback and outcome of this successful implementation, we conclude that a mentoring relationship between Graduate Students of higher education institution and rural school students can bring positive outcome. Such relationships not only bring exposure and knowledge to the school students it also develops social responsibility and life skills in the mentors. The implementation experience has encouraged us to continue our work even though the pandemic has temporarily paused the batch 2 implementation. Some of the challenges we faced during these 2 years are, **a.** travel time and distance to school somewhat affects the energy levels of the mentors. It also takes more time from them. **b.** We noticed that school students are very quick in grasping and understanding, however, their ability to express the understanding in writing is inferior to their ability to explain verbally. **c.** Short term retention was studied through test scores. For long term retentions, at the end of 2 years we provided a platform for selected students from the participating schools. They confidently demonstrated their learning to students from other government schools. **d.** We find that such relationship connecting the two levels of education has immense potential but choosing far away schools makes the exercise expensive and tedious. We strongly feel if higher education institutions connect with local schools and provide such trainings for extended time, both mentors and mentees can benefit a whole lot.



Contact Details

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Details about our initiative is available in www.teachtolearn.co.in