SAILER and Bajaj Auto CSR, 2017-18

STEM (Science Technology Engineering Mathematics) i-SMART Classroom and Training Center

*Amount allocated: Rs. 10,90,954*

**Abstract:**

STEM Land in Auroville is an innovative learning environment of Mathematics and Science where children learn by taking responsibility of their learning, creating projects using technology and supporting others’ learning. We aim to make this environment available to all with a ‘smart classroom’ that will document the best of what happens in STEM Land and make it available online. This will include children’s projects, presentations as well as videos made to learn Math and Science through materials, creating and building. Our interactions with scientists, educators and master trainers will also be made available online (with permission from participants). The smart classroom will also be used for teacher training that we are requested to provide by schools. We will experiment with live virtual classrooms between the two locations of STEM Land in Auroville schools, which will allow the children to interact and inspire each other, and see if expanding this network would be interesting for other schools.

The smart classroom will also address the gap between theory and practice in higher education, and will complement the online certification courses offered by the IITs with practical work that will help with understanding the theory. STEM Land will develop its electronics laboratory and expand its offerings to include training for older youth and college students, as well as for technical people working in Auroville who wish to update their skills.

**Q2 report (July – September 2017):**

The goal of the project is to make the STEM (Science, Technology, Engineering, Mathematics) environment available to all through an intelligent and smart (‘iSmart’) training center.

1) iSmart classroom building

Work has been ongoing on the classroom building and most of the constructional changes of roofing, flooring, pest-proofing the ventilation and addition of a door are complete. The children of the 9th grade have themselves put the first coat of paint on the inside of the room.

Some of the electronics equipment for the room has been procured or is in process of being procured, as well as the video camera and voice recorder.

2) NPTEL Online Certification (NOC) complemented with practical work

We ran an intense course (4 days a week) that ran parallel to a NOC course on Basic Electronics offered by IITM online. Our goal was to create a course which would supplement the theoretical lessons with practical sessions, where people could build and understand aspects of what they were learning online.

On Mondays and Wednesdays we watched the course videos together, on Thursdays worked on the assignments from the course, and on Saturdays held practical electronics sessions. The practical sessions were the most attended, at times crossing 25 participants. People worked in pairs and there was good scope for peer learning, and even some children from Udavi were inspired to participate and came on Saturday for the course.
3) Educational Technology Research

The paper titled “STEM Land: Fostering Responsibility for Learning in Rural Schools” has been accepted at epiSTEM7. This will be presented by Sanjeev Ranganathan in January and will present an opportunity to re-engage with academia and researchers in Educational Technology Research.

Reflections:

For the NOC course, we learned that in future we should focus more on the hands-on electronics sessions. Participants were not too keen on getting certification, and there was very little participation in the sessions on Mondays and Wednesdays when the videos were being watched. Focusing more on the practical sessions would have made it a better course (or at least easier to organize for us and less time-intensive).

Q3 report (October – December 2017):

1) i-SMART classroom update

We have completed the physical space of the i-SMART classroom. Children from Udavi School were involved in its planning and also worked on painting and fixing the LAN cables for the room. Almost all of the equipment including electronic instruments, projector, video camera, and air conditioners have been procured and set up.

On 25th November we inaugurated the i-SMART room. Children from Udavi and Isai Ambalam had a sleepover the previous night to collaborate and share what they have learnt. Their interaction was one of the highlights of the year. Isai Ambalam children brought their projects for demonstration.

The children also recorded their work to create a video of almost half an hour displaying their projects. This video played in the background at the inauguration. The creativity of their projects and the enthusiasm of their presentation and interaction were an inspiration to all.

2) Basic hands-on electronics course #2

Based on the successful practical sessions we held with the companion NPTEL online certification course, we offered a further short and intense (7 sessions) hands-on electronics course at STEM Land. This term we were able to increase our faculty offering courses, and so this time the course was offered by Siva and Raghu. Both have completed their Masters in Electronics and had been senior assistant professors at colleges before their move to Auroville. They had both attended the basic electronics course, and were inspired to offer a course refining the material and using the equipment that was purchased through the Bajaj Grant.

About 18 people from in and around Auroville including 3 children participated in the course. They split into groups and enjoyed building a water level indicator, mobile phone charger, inverter, doorbell, and street light and learning from their peers.

3) Mindstorm robots

In our new electronics space we consolidated the Mindstorm robots along with spare parts that were donated by Future School. This has made it an ideal place to tinker with these. The Isai Ambalam children were very keen on learning Mindstorms, and this gave them a perfect space to collaborate with the Udavi School children and build robots especially during joint sleepovers. Children in Udavi also come to the i-SMART classroom for their activity classes and during free time to build robots.

Being a collaborative space for children from multiple schools to work together has been a bonus and valuable contribution of the i-SMART classroom.
Q4 report (January – March 2018):

We have been using the i-SMART class room for conducting courses, workshops and recording them. We did a “Stewardship for New Emergence” workshop for 7th and 8th grade children of Udavi School. On February we conducted a basic VLSI (Very Large Scale Integration) course. Children worked in the i-SMART classroom and did projects for Raman Young Science Innovator Award. They chose their topics which were given under different grades and innovated their projects on it. Children were active and enthusiastic to complete their projects. They recorded their projects and submitted them. The whole atmosphere for that one week was energetic and busy. We had sessions on writing research papers with Heidi Watts, and on Mathematics with Swathi (resource person from Azim Premji University). Children from Isai Ambalam School came during Saturday school, and worked on robots and had workshops on integers with Swathi.

1) VLSI (Very Large Scale Integration) Layout course

On 5th February we started a course on VLSI. It was a three week course on alternative evenings. Around 16 participants from in and around Auroville participated in the course. We focused on Digital Layout. We started by introducing CMOS technology and fabrication process. We gave an introduction to CMOS Transistors, and introduced people to stick diagrams representing various layers. We built an inverter and simulated it using LT spice. WE also used physical gates DM74S00N and bread boards, and tested the logic we had derived and then laid out an inverter, XOR gates, etc. in Magic. We extracted the layout and created a netlist to understand the connection. The netlist helps to cross-check whether the layout we laid out is correct or not. At the end of the course, participants felt good that they learnt something new like laying out gates, using Magic tool, simulation, etc.

2) Stewardship for New Emergence workshops with 7th and 8th grade

We conducted “Stewardship for New Emergence” workshops with 7th and 8th grade children at Udavi School. We want to see leadership qualities in children, and for them to be responsible for the space and freedom given to them.

Through the workshops children were able to identify ‘what they stand for’, and learnt to work from a sense of possibilities rather than from fear. They learnt tools including deep listening and, systems thinking and creativity. Every week we conducted ‘triads’ with the children which provided them an opportunity to reflect on what they have learnt. These sessions were recorded for improving our delivery with the children, and as feedback to facilitators.
3) Research sessions in i-SMART classroom
Heidi Watts has been coming to Auroville for more than twenty years, to work with schools and teachers. She has worked with children and teachers at all levels. She was the co-chair of the education department at Antioch University, in Keene, New Hampshire. We had a few sessions with her about our research papers. She gave us a broad overview of research, specifically the qualitative research that we work on, and gave us feedback on our research papers. In addition she conducted some research on us by interviewing us. The sessions on research were also recorded.

4) Resource people using STEM Land
Swati Sircar is a teacher trainer at the Azim Premji University in Bangalore, and visited STEM Land for a couple of days. She had completed MS in Math, M.Stat., B.Stat. (Hons.), and works with many NGOs and government school teachers. She is keen on hands-on activities, explorations, open-ended questions as well as computer-aided learning. She is also an origami enthusiast and uses her
Montessori exposure in her current work. She came to STEM Land and took sessions for the teachers and children on mathematics, and showed us how to use Montessori materials like Ganit mala, Pythagoras theorem, and counters for addition and subtraction.

5) **Government school teachers' visit and training**

Around 37 government school teachers and people from the Azim Premji Foundation came for training at STEM Land. Some of the teachers had heard our presentation at the Sinthanai Sangamam symposium on “STEM Land in Isai Ambalam School”. Some of them were inspired from our talk, and they visited STEM Land in Isai Ambalam and Udavi schools. Children showed them a few projects. The teachers also tried to solve cast puzzles. After lunch, the teachers gathered in the i-SMART classroom and shared what they learnt from the children. We conducted a Stewardship workshop where teachers were able to find their ‘stand’ and their fear. They also had a session on psychology and addiction, conducted by a psychologist (resource person from Azim Premji).

6) **Project presentations**

Every Saturday, children present their projects on mathematical concepts. Formerly this was done at STEM Land, and now it is done at the i-SMART classroom. Children are very interested to share their projects in the i-SMART classroom because it is very compact and they are able to see the presentation clearly. (There is an issue of echoing, and this causes a bit of a strain on having longer sessions in the room.)

**Conclusion:**

We are looking forward to connecting the iSMART classroom with the National Knowledge Network (NKN), linking the classrooms remotely. Doing so will expand our possibilities tremendously, since we have many facilitators who want to offer their services to youth and children through interactive online sessions. Meanwhile our activities continue with enthusiasm.