SINTHANAI SANGAMAM

Symposium Booklet

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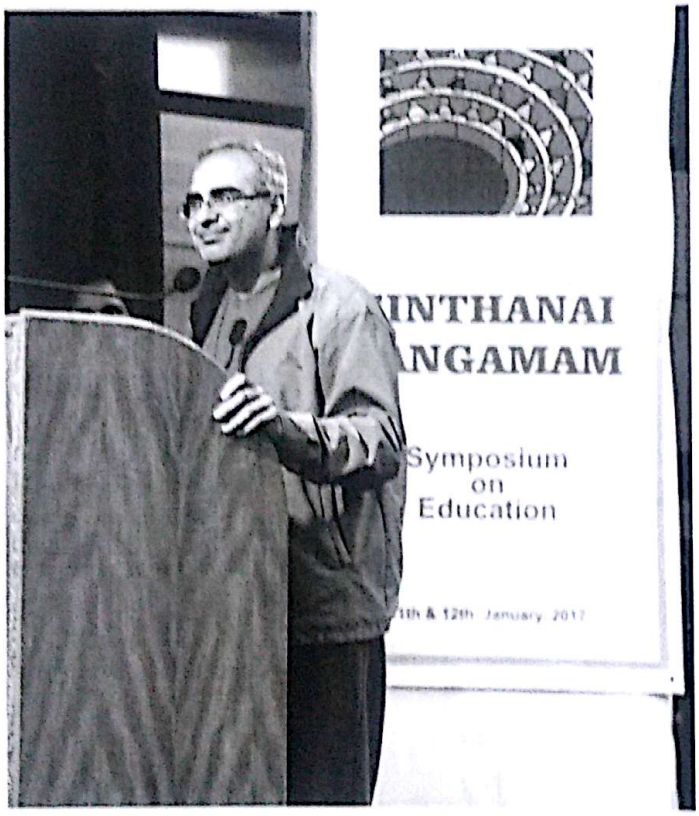
Azim Premji Foundation

STEM land center
(Science Technology Engineering Mathematics)



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The purpose of education should be more than just fitting in – getting a job and being a good citizen; it should even be beyond standing out – being good at a profession and being an independent/ critical thinker. Education should help us know ours elves and lead a life without inner conflict. STEM (Science, Technology, Engineering and Mathematics) Land is a conscious effort to provide children with an education that lets them fit in, stand out and discover themselves.

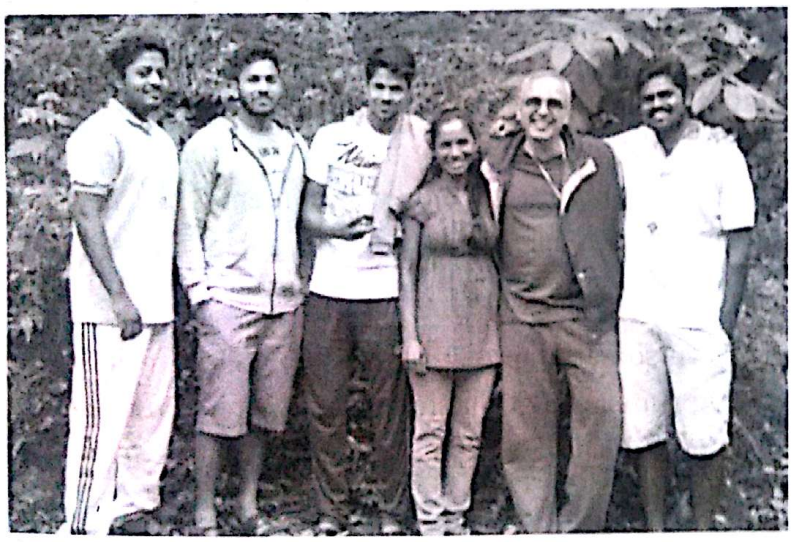
The name STEM Land...

STEM is an approach to problem solving through tinkering (playful pursuit of understanding by changing things and discovery), engineering (rigor in learning deeply and being able to predict results) and making (creating something).

Land describes a space where these are the norm. This is inspired by Seymour Papert who believed that children would learn Mathematics naturally in Mathland just as children learn English naturally in England. We hope children will learn STEM naturally in STEM Land.

STEM Land is an open space for learning located at Udavi School, Edayanchavadi village near Auroville. Udavi is an outreach school of Auroville that works with the children from the villages nearby. It is a rural school with demographics of children similar to government and NGO-run schools throughout the country. The school believes in the holistic development of the child, and school management are progressive and encourage experimentation and research. From middle school onwards, much of the time is spent on academic subjects, in line with the expectation of parents. At Udavi, children from 7-9th grade come to STEM land.

About Aura Auro Design



Six volunteer engineers of Aura Auro Design run STEM Land. Aura Auro Design is a learning organization whose motto is **to learn, grow, work, and teach**. 'Learn' is an unending education where, as engineers and teachers we are constantly learning new things. 'Grow' is our commitment to unending progress and growth as human beings. We put what we learn into action through work. 'Teach' is to share what we learn and practice.

Our partners Aura Semiconductor Pvt. Ltd. provide us technical support to volunteer three hours a day at schools.

Philosophies

Sri. Aurobindo (Aurobindo, 1910) indicates that nothing can be taught, but the teacher can support and encourage a child in the process of learning, thus guiding him towards perfection.

Constructivist Education Theory (Bruner, 1960) too indicates that knowledge is not delivered into the learner (whether child or adult) but recreated by the learner on his or her own. Children actively construct their knowledge by connecting new knowledge to what they already know. Constructivist education encourages discovery learning and learning by doing. It encourages activities that challenge a child's worldview since deeper conceptual learning comes from experiential and interactive activities. Bruner further suggests "spiral learning," claiming that any subject could be introduced to any child at any age if it is presented in some form that is honest.

More recently, Mukunda (Mukunda, 2009) describes the three aspects of learning that are relevant to schools - conceptual knowledge, procedural knowledge and higher order reasoning. Conceptual knowledge, she states, greatly benefits from constructivist approaches. In this paper, we look at all three aspects of learning.

In STEM Land, the focus is on learning and not on technology. We use building blocks to robots and Arduino programming to enhance learning of children and adults.

Core Values

Core values of the organization are:

- Responsibility: Take charge of my learning and growth.
- Equality: My ability to see and treat everyone with respect.
- Courage: To create alternatives

Responsibility

In line with teachings of Sri Aurobindo, that nothing can be taught, we believe that much can be learned by children. Therefore, we have handed over the responsibility of learning back to children.

The children initially found it hard to believe that didactic classes were not going to be conducted anymore. Instead, they were being given the freedom to learn it in their preferred style. Children plan their work and ask for inputs when they need them. Soon they were able to put this in practice though self-learning, peer-learning, multi-grade learning and interactions with adults.

There are three learning rules at STEM Land – learn something new, old and now. New refers to the variety of games, puzzles, electronics, robotics, 3D printer, etc. available to the children. Now refers to what is in the curricula that are expected of them to master. Old is when they find gaps in their learning and fill them in.

Equality

In STEM Land, everyone including children, adults and materials are treated with respect. The ground rules at STEM Land are:

- Respect yourself – Utilize the time at STEM Land well
- Respect others – Collaborate with others, but do not disturb those who are working independently.

- Respect materials – Use things with the knowledge of how they need to be used and put used things back in their place.

We consciously welcome any school and child who make the time to come to STEM Land. Last year, STEM land has been used by not only Udavi School, but also by children from Isai Ambalam, TLC, Deepanam, Last School and Future School.

Besides, there is an open electronics class every Wednesday for those interested in learning electronics and building something. We have youth who come in, utilize this opportunity and learn how to think logically and build something. E.g. A youth came in and learned Scratch and Python programming and to build and simulate electronic circuits.

Courage to Create

We were introduced to inquiry-based tools that helped us identify who we are in our best moments. We work from this possibility rather than from our fears (SAIIER, 2016)

These tools helped us work effectively by breaking old patterns and creating a new model of working and learning. We offered the same tools to the children we work with. This has supported the courage to create something new, and the children have created a visual and creative demonstration of their mastery over a subject area.

Learning at STEM Land

The children learn by creating projects (Ranganathan, 2015) using Alice and Scratch 2. In addition to the projects we create in Scratch on Mathematics, we also build software professionally and share these with the children to inspire them to action. Creating something helps improve thinking skills.

To balance the focus on 'sums' in Mathematics we put aside the formative assessment and focus on projects related to the curriculum. We find that children work well in groups and find this more intellectually challenging than solving sums. As they get more adept at it, they enjoy the pleasures of completing an entire project and seeing a tangible output.

Learning and sharing have become a normal practice. There is no attitude of hierarchy. Everyone shares what they learn with each other. A new teacher to the school was keen on learning the Rubik's cube and was doing so with the children. Individual children learn different areas within the syllabus of a term. They then support and guide others in that area. This shifts learning from being an independent activity to an inter-dependent activity. However, children still retain their independence and learn what they enjoy.

We help children assess their progress by providing them with assessments. We also prepare a portfolio of projects made by children during a term – e.g. checking if three points are co-linear, Venn diagram, etc.

Reflection shared by a teacher at STEM Land

My name is Vaidegi. I am volunteering at two schools - Isai Ambalam and Udavi. I spend one and half-hours in each school on a daily basis. Both are Auroville outreach schools. I am handling class 7 mathematics (CBSE) class at Isai Ambalam and class 8 mathematics (state board of TN) at Udavi. Rest of the day I work at Aura Auro on Engineering.

My first class was at Udavi with 7th graders. I thought that I could change many things in that class. I believed that my way of delivering mathematics concepts would change the students' attitude towards Mathematics. I solved many aptitude and algebraic questions for them. I gave them many algebraic puzzles to solve. However, I realized that I had not made much progress. Students continued to be afraid of mathematics, had an aversion for the subject. It did not increase their level of thinking, nor did it change the results. That made us think about a different approach and it led us to the concept STEM (Science Technology Engineering and Mathematics).

The first principle of STEM land is "Nothing can be taught." We give freedom to students to choose what they want to do. Children solve textbook problems, do programming in Scratch/Goegebra/Alice to demonstrate the mathematical concepts they have learned, play a strategic game, solve puzzles, and learn electronics. In STEM land, students have taken the responsibility of their learning. It is called 'Self-Directed Learning.' As a facilitator, I support/guide them when they need or when they seem to need support.

The important thing is we do not give incentives to children for fulfilling their responsibilities. We focus on the "Joy of Learning" instead. We do what we expect our children to do, as we want them to be inspired by our actions. This inspiration will motivate them to do something beyond their limits.

The video presented at the seminar is available online at:
https://www.youtube.com/watch?v=ReCEyQeFYSI

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