

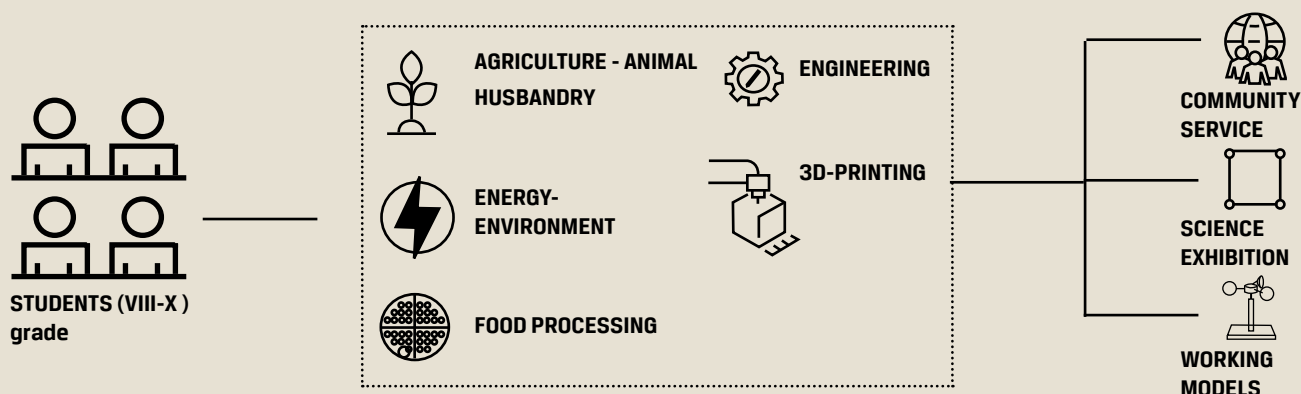


B.4 Introduction To Basic Technology *(in partnership with Vigyan Ashram)*

Under this program, pre-vocational training targets schools with students in lower socio-economic strata in and around the Pune region. This is done through promoting small makers lab with traditional tools in secondary schools. The fundamental building blocks of the program are:

- STEM (Science, Technology, Engineering, Mathematics)program in school
- Learning While Doing pedagogy in school
- Project based learning
- Students involved in Socially useful productive work (SUPW).
- Students provide various services to the community as part of their learning.
- Integration of 'Work Activity' with School curriculum

The premise behind the project is (i) Helps on developing intelligence of a child, (ii) Develops creativity, logical thinking, skills, values like dignity of labour, team building, gender equality etc., and (iii) connects education with the real life problems



Summary

The project has helped generate interest in STEM, as evidenced by many students from IBT classes taking science or technical courses after their secondary schooling. The IBT students also reach out to the community with technology-based solutions. Another positive has been that the IBT schools and students have received recognition and awards for the science projects and prototypes developed in IBT classes. However, the IBT program has a recurring cost regarding the salary of IBT instructors, project consumables, and additional machinery for executing sophisticated prototypes. This cost will need to be borne by students or the school, which, in the case of schools catering to children from economically marginal backgrounds, would be challenging to meet. This weakness has reduced the project's sustainability score..

Rating of IBT Project

Assessment Criteria	Rating	Score
Coherence	High	5
Relevance	High	5
Effectiveness	High	5
Efficiency	High	5
Social Impact	High	5
Sustainability	Moderate	3.2
Overall	High	4.7

A. COHERENCE

RATING : HIGH

A.1 External Coherence

NEP 2020 sets out the road map for STEM education in India. Some of the key features to which the project conforms include:

- Experiential and hands-on learning to play an important role in STEM education
- Emphasis on key concepts, ideas, applications, and problem-solving. Critical thinking and holistic inquiry-based, discovery-based, discussion-based, and analysis-based learning will be the focus
- Emerging technologies to be introduced to students at school level

A.2 Internal Coherence

The project is in concurrence with the 'empowerment' driver of the LTIMindtree CSR Program.

schools, students are not able to understand the concepts of science clearly and thereby are not able to relate applications of the concepts in the environment around them. The study also noted that the way science is taught in schools cannot motivate students to learn science. The survey revealed that most students opined that if science is taught through activity, they understand concepts more clearly.

A.2 Science teaching methodology needs a revamp:

Another study² puts forth some additional reasons why science is losing its popularity with schools students - (i) ill equipped labs, (ii) shortage of science teachers and elementary school teachers who have studied science atleast till class XII level, and (iii) the existing science education in school takes a subject based approach and not a discipline based approach. Discipline based approach emphasises the need to teach science as a way of understanding the world, and comes with the view that knowledge of science—both the content and the method—is important as it informs our understanding of the everyday physical world which would not be available to us through common sense and everyday experience alone.

² Three Challenges Facing India School Science Education / Padma M. Sarangapani, <http://www.esocialsciences.org/> (accessed on 28 Jan 2024)

B. RELEVANCE

RATING : HIGH

A.1 Comprehension of science poor amongst students:

A research paper based on the study conducted on the present status of science education in secondary schools of Palghar district, Maharashtra¹ found that in most of the

¹ Remya VR, Chavan, Chetan, Present Status of Sciene Eduation in Secondary Schools, Internationa Journal of Scientific Reserch and ENgineering Development, Vol 5, Issue 1, Jan-Fen 2022

Factsheet

A. Location

Pune district- 36 schools schools in 2022-23

B. Age Group

Grade VIII-X

C. Beneficiaries

Beneficiaries: Total 5603 beneficiaries (number of students). Total 2951 boys and total 2652 girls

D. Project Period

2018-19 to 2022-23

E. Students benefitted (2021-22)

5603 (2951 boys and total 2652 girls)

F. Domains under the project

- Engineering
- Energy/Environment
- Agriculture/Animal Husbandry
- Food Processing

G. Total Learning Hours: 18852 hrs

H. Learning Sessions: 6284

I. Fieldwork Location: Sumati Balwan, Nimbalkarwadi, Katraj, Pune

J. Project Budget

Rs. 2.42 crore



LTI MINDTREE Supported IBT School wins the prestigious 'Made in 3D – Seed the Future Entrepreneurs Prize'

Atal Innovation Mission (AIM) in collaboration with La Fondation Dassault Systemes India celebrated the culmination of its flagship program for school students, 'Made in 3D – Seed the Future Entrepreneurs' under AIM's Student Entrepreneurship Program (SEP) season – 2023-24 during the grand finale held in Pune. This event marked the conclusion of an eight-month journey dedicated to fostering innovation and entrepreneurship among young minds.

The season 2023-24 of this program witnessed a special focus on connecting students with Krishi Vigyan Kendras, resulting in a significant number of projects centered around the rural ecosystem theme. From 140 schools across India, the top 12 teams showcased remarkable innovation in product design and demonstrated a keen understanding of finance, business, and marketing strategies in their start-up pitches.

Esteemed dignitaries, including Mission Director of the Atal Innovation Mission, NITI Aayog Dr. Chintan Vaishnav, Managing Director of Dassault Systemes India Deepak NG, CEO of Dassault Systemes Solutions Lab Sudarshan Mogasale, and Technology Advisor of Akshara International School, Pune Jayesh Rathore, graced the award ceremony with their presence. Dr. Chintan Vaishnav delivered an inspiring address highlighting the importance of innovation in the Indian education landscape and the program's relevance in nurturing future innovators and entrepreneurs.

Securing the coveted first place were students from Shri Dada Maharaj Natekar Vidyalay, Chikhali, Pune, a LTI MINDTREE supported IBT school. Orchid School, Pune, clinched the second spot, while Springdales School, Dhaula Kuan, Delhi, secured the third position. These successes underscore the transformative impact of the program in nurturing India's next generation of innovators and entrepreneurs.

The Programme is jointly organized by AIM, NITI Aayog, and La Fondation Dassault Systemes' to instill an innovation and entrepreneurship mindset among school students across India. Top-performing teams from the ATL Marathon conducted by AIM are nominated to participate in this prestigious program.

In this program selected schools form a team of six students and a teacher to form a pseudo startup. As a startup, the students have to identify a dream product to address challenges they see around them, design it using 3D digital technology, manufacture it, and create a marketing campaign which consists of a product brochure, product advertisement video and pricing strategy.

In the 2023 season alone, 140 schools from 29 states and union territories participated, showcasing the program's widespread impact in nurturing young entrepreneurs and igniting a passion for innovation among students.



Adjustable sugarcane cutting device which won the award @ Shri Dada Maharaj Natekar Vidyalay, Chikhali, Pune

C.1 IBT students are most likely to pursue technical and science subjects after X standard : A general trend noticed at the IBT school has been that students opting for science and technology-related streams has increased after introducing the IBT curriculum. For instance, at the Suman Balwan school (sample school), about 70% of the students who pass their X class board exam take up ITI Diploma, Polytechnic, and science streams. This was negligible before the IBT was introduced. Similarly, at Shri Dada Maharaj Natekar Panchakoshadharit School, another IBT school, 65% of the students take up technology or science streams after X class; the figure was 20% pre-IBT.

Students opting for science and technical education after X at Shri Dada Maharaj Natekar Panchakoshadharit School

Year	ITI	Dip in Eng	Poly-technic	Science	Commerce	Other	Tot
2018-19	2	-	2	2	2	6	14
2019-20	3	4	3	2	1	-	13
2020-21	3	3	3	1	6	1	17
2021-22	2	1	5	5	1	5	19
2022-23	1		2	4	1	3	11
Total	11	8	15	14	11	15	74
	65%			35%			100%

C.2 IBT curriculum has effectively engaged students in learning by doing : The program prescribes nature as its syllabus. It broadly defines basic concepts and technologies to be taught and syncs with the academic syllabus. It is flexible and can be adapted to local conditions. The assessment team could see such activities in the sampled school. The assessment team spoke to the students, found they had felicity in crafting various technical processes and devices, and knew the scientific theory behind them. The various projects seen in Sumati Balwan School (sample school) are described with photographs in the following pages of the report.

C.3 Recognized as a subject: IBT started as a formal subject with dedicated periods in the timetable with formal permission from the State Examination Board (SSC) in

1987. Vigyan Ashram led the program and kept on updating and experimenting with it. Formally, it was conducted under the monitoring and implementation mechanism of the State Education Department and Directorate of Vocational Education & Training. This helped demonstrate its importance in the government system, and it helped IBT become part of the core curriculum of Maharashtra state. It was reported that students with an IBT certificate get preference in ITI admission.

C.4 Cognitive performance of IBT students is high: A controlled study was done to understand how IBT students (n=163) rate cognitive ability compared to non-IBT (n=178) students. The sample was drawn from IX class. The test was carried out as per Bloom's Taxonomy. The results are summarized below :

	% increase in performance of IBT students over non IBT (overall)
Information	11.71%
Understanding	22.7%

IBT Curriculum

AGRICULTURE - ANIMAL HUSBANDRY

Drip Irrigation, Sprinkler, Vermi-Composting, Humidity Chambers, Aqua Portal, Nursery Technique, Azolla Culture, Seeding Tray, Vaccination Poultry, Rice Cultivation, Crop Using SRI, Mulching, Silage, Food Concentrate For Animals, Pest Control, Soil Testing

ENERGY-ENVIRONMENT

Solar cooker, LED Lighting, Biogas, Soakpit, Watershed, Smokeless stove, Checkdam Construction, Earthing, Inverter, Computer applications, Plain table survey

FOOD PROCESSING

Solar drying, Food preservation, Drying of vegetables, Medicinal plant cultivation, Mosquito control (Gappi Fish breeding), Making Phenyl, Liquid Soap, Water Testing, Healthy Diet, Soya Milk, Hb Blood Testing

ENGINEERING

Ferro cement, Bamboo treatment, Different Agriculture Tools, Ventilation, Low cost housing, Toilet, Pedal power, Fabrication, Plumbing, Construction

3D-PRINTING

Design of 3D objects and printing them on a 3D Printer provided to each project school



The climbing wall installed by the students of Sumati Balwan School under the IBT program. Interestingly the bulk of the installation work was done by girls @ Sumati Balwan



The rings at the school gym fabricated by IBT students @ Sumati Balwan



Preparing plot for kitchen garden @ Sumati Balwan



Tree house classroom constructed by students @ Sumati Balwan



Jeewamrit, an organic fertilizer prepared by fermenting the mixture of cow/buffalo dung and urine and used in school kitchen garden.



The pot moulding machine fabricated at the school @ Sumati Balwan



Platform made by discarded plastic bottles @ Sumati Balwan



Students display various wiring configuration at the IBT electrical lab @ Sumati Balwan



Mobile stand made of bamboo crafted by the students. The stand amplifies the ringing sound of a mobile phone and makes it audible from far



An IBT student explains working of a rain gauge made by her @ Sumati Balwan



The mechanical workshop @ Sumati Balwan



Apply	36.28%
Analyze	20.95%
Evaluate	55.30%
Creativity	63.39%

Source: Finding were presented & published in a peer reviewed research paper at IEEE Global Humanitarian Conference 2012 held at Seattle, USA (refn: <https://vigyanashram.com/UploadedFiles/IBT%20Documents/impact%20assessment%20summary.pdf>)

C.4 Community services provided by IBT students: Under IBT students do science projects which addresses a community need. Students get real life training. Some projects are listed below: from various IBT schools :

- i. **Construction of tree platform** (Anudanit Ashram School, Padsare tal): IBT students constructed a round platform around a tree in the school vicinity. They dug the foundation, arranged the bricks using the right bond configuration, created mortar proportionally, used tools like a level tube, trowel, plumb bob, line rope, etc., and plastered the structure. The platform is now used to sit under the shade of the tree.
- ii. **Appliance repairing and maintenance camp** (Multiple IBT schools) The students worked on repairing and maintaining electrical and electronic devices in the villages or localities where the school is located. They repaired/maintained appliances such as fans, irons, mixers, torches, radios, motors, etc., and the school earned revenue.
- iii. **Installed a LDR kit for street light** (Shree Devi Shanta Durga High school): Students installed an LDR kit, which operates bulbs on all 55 light poles in the village. The device automatically switches street lights on and off based on whether sunlight is available.
- iv. **Establishing terrace garden and irrigating using grey water** (Dnyansanvardhini Madhyamik Vidyalaya): The school is located in an urban area with no agricultural land. As an alternative, students established a terrace kitchen garden using drums, trays, bags, etc. The garden is irrigated from the greywater recycling project established under IBT. Students took an organic fenugreek crop, which was harvested and sold.
- v. **IBT foodmart** (Bhandari High School, Malvan): The school organized an 'inter-school sports competition.' The IBT students prepared and served various food items, and the quality of the food was praised.
- vi. **Decorative light manufacture and sale** (Shree Sambhajirao Palande Patil Pragati High School): During the Diwali festival, IBT students made light strings (100 - 50 bulbs). The students set up a stall and registered encouraging the sale.
- vii. **Installation of windows** (Kurze Vibhaag High school): IBT students took the initiative to replace the broken windows at the school. They fabricated the window frames using 'L' angels, metal sheets, hinges, etc., and installed them.
- viii. **Bench repair** (New English School, Baragaon): The IBT students of XI and X repaired 70 benches. This repairing mainly involved replacing the wooden planks, welding, screw fitting, etc.
- ix. **Composting** (Shri Dada Maharaj Natekar Vidyalay, Chikhali) : The students help recycle waste from the school kitchen and campus and conduct waste col-

lection drives during festivals at the immersion ghats. They turn all this waste into compost, sell it to the community at Rs. 30/kg, and use it in school vegetable plots.

- x. **Fabrication of sprinkler stands** (Lokmanya Tilak Vidyamandir) : The school received an order from a local farmer to fabricate 1500 sprinkler stands. The IBT students designed a strong and low cost stand mostly using scrap metal. The students used engineering machines such as welding, power cutter, grinder, drill machine, painting, measuring marking equipment, etc.
- xi. **Electrical light fitting** (Nagaj, Ghatnandre, Adarsh Prashala): The IBT students redid the wiring and electrical fitting of V-X classes. They installed three electrical points in each class and seven in the corridor.
- xii. **Smart stick** (Shri Dada Maharaj Natekar Vidyalay, Chikhali): Students developed a walking stick for older people that has a torch and a sensor that alerts them to obstacles on the path. The stick has been provided to the elderly at the old age home on the school campus.

C.4 IBT model has got approbation through awards, recognition and replication: The IBT program is recognized as a Multi Skills Foundation Course (MSFC) under the National Skills Qualification Framework (NSQF). Vigyan Ashram has provided online support to Atal Tinkering Labs in Chhattisgarh and Andhra Pradesh in partnership with UNICEF. This is being extended to Uttar Pradesh and West Bengal. *The Shri Dada Maharaj Natekar Vidyalay, Chikhali, an LTIMindtree-supported school, has won the prestigious 'Made in 3D—Seed the Future Entrepreneurs Prize' awarded by Atal Innovation Mission (AIM) in collaboration with La Fondation Dassault Systemes India. It is dedicated to fostering innovation and entrepreneurship among young minds.*

C.5 IBT teaches business acumen along with technical skills: IBT projects in schools are designed to fulfill a felt need of the school or the community. Many community projects have generated revenue, and those done for the school have led to substantive savings.

Some examples of IBT student project that has earned revenue		
Project	School	Revenue (Rs.)
Repair and maintenance of electrical appliances of villagers	Multiple schools(7 schools)	Rs.48,000+
Intallation of LDR kit to control village street lights	Shree Devi Shanta Durga High school	Rs. 1000
Fenugreek crop on school terrace kitchen garden	Dnyansanvardhini Madhyamik Vidyalaya	Rs 980
Food supply at sports competition	Sant Dnyaneshwar Vidyalaya	Rs. 1025
Fabrication of ladder for school	Anudanit Ashram School	Rs 2000 (saving)
Manufacture of decorative lights during Diwali	Shree Sambhajirao Palande Patil Pragati High School	Rs. 4500

Fabrication and installation of school windows	Kurze Vibhaag High school	Rs 7500 (saving)
Repair of school benches	New English School	Rs. 1,13,040 (saving)
Fabrication of 1500 sprinkler stands for local farmers	Lokmanya Tilak Vidya-mandir	Rs. 30000
Installation of wiring and electrical fittings	Adarsh Pathshala	Rs. 10000
Note: All the schools listed are not funded through LTIMindtree		

D. EFFICIENCY

RATING : HIGH

D.1 IBT classes a part of the school timetable: IBT has been integrated into the school schedule. For instance, in the sample school, IBT classes are held for one hour each three days a week.

D.2 Local Instructors: Implementing IBT needs skilled, technically qualified instructors, which is challenging, especially in rural areas. Hence, instead of specifying formal qualifications for instructors, IBT asks for instructors with 'demonstrable skills.' Young local entrepreneurs, such as electricians, masons, fabricators, etc., are selected and trained as instructors. This helps to create a sustainable local human resource.

D.3 Open Education Resources: Vigyan Ashram has started developing 'Open Education Resources (OERs)' for the IBT in the last few years. These OERs are lesson plans that help teachers integrate work and subject areas. These OERs are available at www.learningwhiledoing.in.

D.4 Technovation to showcase talent in practical use of science: To recognize the innovation of IBT students, LTI-Mindtree supports Technovation, an exclusive science and technology exhibition held for IBT students. Established in 2021, Technovation has provided a platform for showcasing talent and promoting healthy competition amongst IBT schools. All the shortlisted projects are featured in the Technovation web portal (<https://technovation.online/>). It also encourages volunteers from LTIMindtree to help organise the event. In 2023, the Technovation was held at Shivaji Nagar. Some of the projects on display included Smart Bujgavane (Scarecrow), a Compost sieve machine, a Low-cost treadmill, a 3-D printed window glass cleaner, a Smart mop for floor cleaning, a Supari sheller, a Mango pulp stirrer, a Sharpening device, and a Multipurpose table, all designed to address a specific community need.

D.5 Expertise of Vigyan Ashram: Collaboration with Vigyan Ashram, the pioneer in IBT, has helped in efficient roll out of the project.

E. SOCIAL IMPACT

RATING : HIGH

E.1 Introduces a scientific temper in the school: While IBT is for VIII to X class students, the spill-off effect is that the entire school benefits. For instance, in the sample school, there was a demand from parents and students to introduce a program like IBT in other classes as well. IBT has

now been extended to junior standards as a 'hobby class.'

E.2 Helps in future employment: In a study by Vigyan Ashram, out of 31% of IBT students who did not pursue higher studies after Class 10, only 15% remain unemployed. The rest are employed/self-employed or engaged in agriculture. The percentage of students starting their enterprise/becoming self-employed is almost three times higher than the control group. While livelihood promotion is not an immediate objective of IBT, the high employability of IBT students is a welcome externality.

E.3 IBT has influenced the New Education Policy: Vigyan Ashram was invited to consultation meetings on the New Education Policy 2023. Based on its experience, Vigyan Ashram provided insights into how pre-vocational education can be introduced in schools. Many of the recommendations emanating from the IBT experience have been included.

E. SUSTAINABILITY

RATING : MODERATE

F.1 Project schools wish to continue IBT: it was reported that there is a demand from the parents to continue the IBT program. IBT is a differentiator and attracts students. The school management of the sample school is also keen to continue the program.

F.2 LTIMindtree supported IBT schools can get new donor support: IBT requires recurring costs like instructor fees, consumable purchases, etc., which will need to be borne by an alternate source once the LTIMindtree support ends. Vigyan Ashram is a reputed organisation that collaborates with many CSR programs. Once the LTIMindtree support is over, Vigyan Ashram can expect to be able to link LTIMindtree IBT project schools to other donors.

f.3 Most schools resource strapped to carry on the IBT program through their own means: In the sample school, while the school management did not appear to be sure on how they will continue funding the IBT program, some options were put forth - (i) Selling the products produced by IBT students, (ii) Parents with specific skills will be requested to help with the classes, and (iii) Request for CSR support. It was mentioned that charging a lab fee will not be possible given that students to the school come from economically marginal backgrounds. However, it is felt that making IBT self-sustaining through the sale of products produced appears unlikely, given that, as of date, the sale of products is low volume.

OVERALL RATING

RATING : HIGH

The project has helped generate interest in STEM, as evidenced by many students from IBT classes taking science or technical courses after their secondary schooling. The IBT students also reach out to the community with technology-based solutions. Another positive has been that the IBT schools and students have received recognition and awards for the science projects and prototypes developed in IBT classes. However, the IBT program has a recurring cost regarding the salary of IBT instructors, project consumables, and additional machinery for executing sophisticated prototypes. This

cost will need to be borne by students or the school, which, in the case of schools catering to children from economically marginal backgrounds, would be challenging to meet. This weakness has reduced the project's sustainability score.

SUGGESTIONS

None

Computation of the rating of the IBT Project

Criterion	Performance Indicator	Weightage	Score (out of 5)	Weighted score	Weighted Average & Rating	Refn in report & comments
A. COHERENCE	External Coherence	0.5	5	2.5	5.0 [HIGH]	A.1
	Internal Coherence	0.5	5	2.5		A.2
B. RELEVANCE	Comprehension of science poor amongst students	0.5	5	2.5	5.0 [HIGH]	B.1
	Science teaching methodology needs a revamp	0.5	5	2.5		
C. EFFECTIVE-NESS	IBT students are most likely to pursue technical and science subjects after X standard	0.2	5	1.0	5.0 [HIGH]	C.1
	IBT curriculum has effectively engaged students in learning by doing	0.2	5	1.0		C.2
	Community services provided by IBT students	0.2	5	1.0		C.3
	IBT model has got approbation through awards, recognition and replication	0.2	5	1.0		C.4
	IBT teaches business acumen along with technical skills	0.2	5	1.0		C.5
D. EFFICIENCY	IBT classes a part of the school timetable	0.2	5	1.0	5.0 [HIGH]	D.1
	Local Instructors	0.2	5	1.0		D.2
	Open Education Resources	0.2	3	1.0		D.3
	Technovation to showcase talent in practical use of science	0.2	5	1.0		D.4
	Expertise of Vigyan Ashram	0.2	5	1.0		
E. SOCIAL IMPACT	Introduces a scientific temper in the school	0.4	5	2.0	5.0 [HIGH]	E.1
	Helps in future employment	0.3	5	1.5		E.2
	IBT has influenced the New Education Policy	0.3	5	1.5		
F. SUSTAIN-ABILITY	Project schools wish to continue IBT	0.2	5	1.0	3.2 [MODERATE]	F.1
	LTIMindtree supported IBT schools can get new donor support	0.2	5	1.0		F.2
	Most schools resource strapped to carry on the IBT program through their own means	0.6	2	1.2		F.3
OVERALL					4.7 [HIGH]	