epiSTEME 2015

Panel on Large Scale Field Implementations of Educational Technology Projects

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Some NMEICT Initiatives at IIT Bombay

Sridhar Iyer

IIT Bombay
Dept of Computer Science &
IDP on Educational Technology

Preamble: Goals & Metrics of TEL

- As ET researchers, we typically focus on interventions, create prototypes, and do pilot implementations on small scale.

- What do we usually measure? – Learning, Engagement, …
- For larger scale projects, we need more / other metrics.

- TEL (Technology Enhanced Learning) metrics:
  - Effectiveness: learning, perceived usefulness.
  - Attractiveness: engagement, fun.
  - Efficiency: ease of access for teachers/students, scaling to numbers.
  - Accessibility: inclusiveness, handling diversity.
- The main role of the technology is one or more of the above.
- Keep these in mind as we discuss the following projects.

National Mission on Education Through ICT (NMEICT)

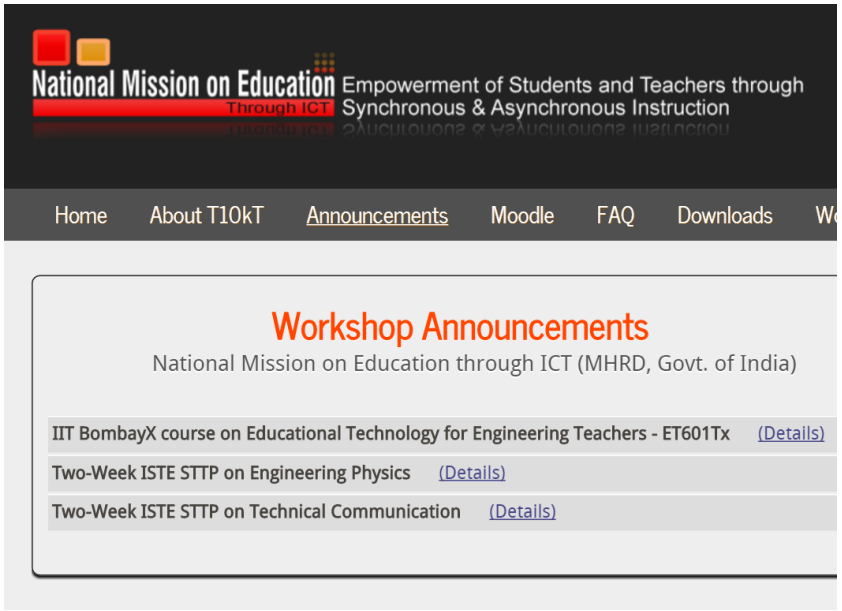
- Policy: Government of India is committed to supporting education through effective use of ICT.
- www.sakshat.ac.in

- Launched in 2009.
- 100+ projects, 20+ institutions, Rs 6000crore (~1 billion USD)

- All content under Open Education Resources
- Technology developed under FOSS
- Research in Technology for Education
- Support for conferences – T4E 2012-16, ICCE 2016.

NMEICT Project – T10KT

Teach 10000 Teachers (T10KT) features



- 310 remote centers
- 2-4 week long teacher training workshops in Engg
- 22 workshops – total of 125,000 teachers trained
- Blended mode – Live lectures and interactions, with remote / online labs and assignments
- http://www.it.iitb.ac.in/nmeict/

T10KT: Some details

- Workshops on content
  - Programming, Computer networks, Thermodynamics, …
- Workshops on teaching and research
  - Educational Technology for Engineering Teachers (ET4ET)
  - Research Methods in Educational Technology (RMET)
  - Technical Communication
- MOOC
  - Courses through IITBx - www.iitbombayx.in
  - 3 courses, 50 colleges, 35,000 students, so far
  - Course on Educational Technology starts Jan 7th, 2016.

T10KT: Some learnings

- Findings:
  - Possible to do large scale professional development, with sound pedagogy, using technology for scaling.
    - Intention to use from ET4ET, Action research from RMET.
  - Focus on pedagogy is more important than technology.
    - We know this intuitively but we also showed it from data.
  - Immersivity and pertinency are key drivers.
    - Authentic activities and immersion close to real context is crucial.
  - Early shift of ownership is crucial for sustainability.

- Research work
  - PhD thesis on model for sustainability and scale.
  - PhD thesis on analysis of T10KT participants.

NMEICT – Computer tools literacy

www. spoken-tutorial.org

10 min self-learning video tutorials

300+ tutorials developed

22 Indian Languages

~900K students trained in 4 years

fossee
better
SCIENCE AND ENGINEERING
education

www.fossee.in

Specific workshops in open-source tools such as Scilab, Python

Spoken-Tutorials: some details

- SELF Workshops (Spoken Tutorial based Education and Learning through Free FOSS study) on:
  - Basic IT skills – Use of Libre Office suite, Browsers, …
  - Programming – C++, Java, Python, …
  - Employability – Blender, InkSpace, …

- From July 2011 till date:
  - ~2000 institutions participating
  - ~22000 trainings conducted
  - ~995000 students trained
  - Community participation for organizing trainings and creating contents

Spoken-Tutorials: Some learnings

- Findings:
  - Feedback of 25,000 participants:
    - using 5 point Likert Scale (from very bad to very good).
    - 80% of the participants rate the quality of instructional content as “good” or “very good”.
    - 75% rate the overall quality of SELF workshops to be “good” or “very good”.
    - 60% rate the topics of study as “useful” or “very useful”.

- Research work:
  - PhD thesis on effectiveness of teaching-learning of programming through Spoken Tutorials.
  - Post-doc opportunities also available.

e-Yantra

e-Yantra Robotics Competition (eYRC)

Goal :
Practical orientation
Innovative BE ProjectS

Mentor students

Seeding labs:
Robotic kits given to colleges

Students

e-Yantra Robotic Teacher Competition (eYRTC)

e-Yantra Lab Setup Initiative (eLSI)

Teachers

Colleges

Goal :
- Train in theory + hands-on project
- Provide methodology for **Project Based Learning** (PBL)

Goal :
Create infrastructure
Align course +project outcomes with **practicals**

- Empower teachers
- Provide innovation platform

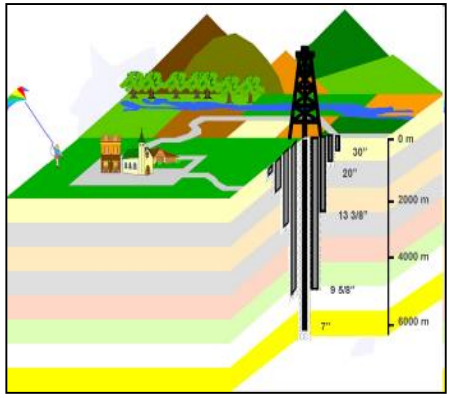
eYRC-2012(Pilot)	**4,384**
eYRC-2013	6,300
eYRC-2014 **(ongoing)**	12,428

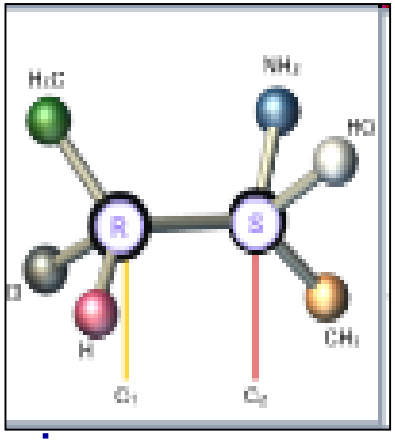
NMEICT Projects

Content generation for higher education

Project OSCAR

Open Source Courseware Animations Repository





http://oscar.iitb.ac.in

500 animations, simulations

Instructional Design workshops

http://www.vlab.co.in

Virtual Labs

OSCAR: Some details

- Interactive animations and simulations for topics:
  - 150 at School level for science and maths.
  - 300 at College level for engineering and science.
- Workshops
  - 12 workshops, 600 people trained.
  - 4 workshops on Instructional Design, 8 on Blender skills.
- Process
  - Several models tried for scaling.
  - Domain-owner model successful.
- Downloads
  - 52,000 downloads from 100 countries over 8 years.

OSCAR: Some learnings

- Findings:
  - Difficult but important to create well-designed visualizations.
    - Example - Attention to aspects of ID, VC, UI, are crucial for usability.
  - For adoption, sustained teacher training is required.
    - Example - Workshop at T4E 2015.

- Research work:
  - PhD thesis on incorporating design principles in creating educational visualizations.
  - PhD thesis on determining the right level of interactivity for a given topic and learning objective.
  - PhD thesis on training instructors to select and use visualizations in their classrooms.

Other IITB Projects

Content and outreach for CS in schools - Computer Masti

- ~400 schools in Academic year 2015-2016
- 500,000 students; 4000 teachers trained since 2009
- 70,000 views (downloads?) from across 140 countries
- http://www.cse.iitb.ac.in/~sri/ssrvm

Computer Masti: Some details

- Focus on Thinking process skills:
  - Step-wise thinking, Logical reasoning, Gathering information, Brainstorming, Mind-mapping, …
- Thematic integration:
  - Connection to real-world scenarios, Application of knowledge from other subjects, Application of CM learning to other subjects.
- Spiral curriculum:
  - Topics are revisited in successive years at greater depth.
- Guided-discovery based teaching-learning.

Computer Masti: Some learnings

- It is not enough to write a “good” curriculum, we need to write textbooks.
- It is not enough to write “good” textbooks, we need to do teacher training.
- It is not enough to do teacher training once a year, we need to do periodic visits to schools.
- It is not enough to support the implementation, we need to do measurements.
- Schools don’t always buy / use / pay for quality!

Reflections: Sustainability at scale

- Content creation, such as OSCAR, Vlabs:
  - Difficult to scale and sustain without continuous influx of funds.
  - Going beyond download counts requires systematic outreach.

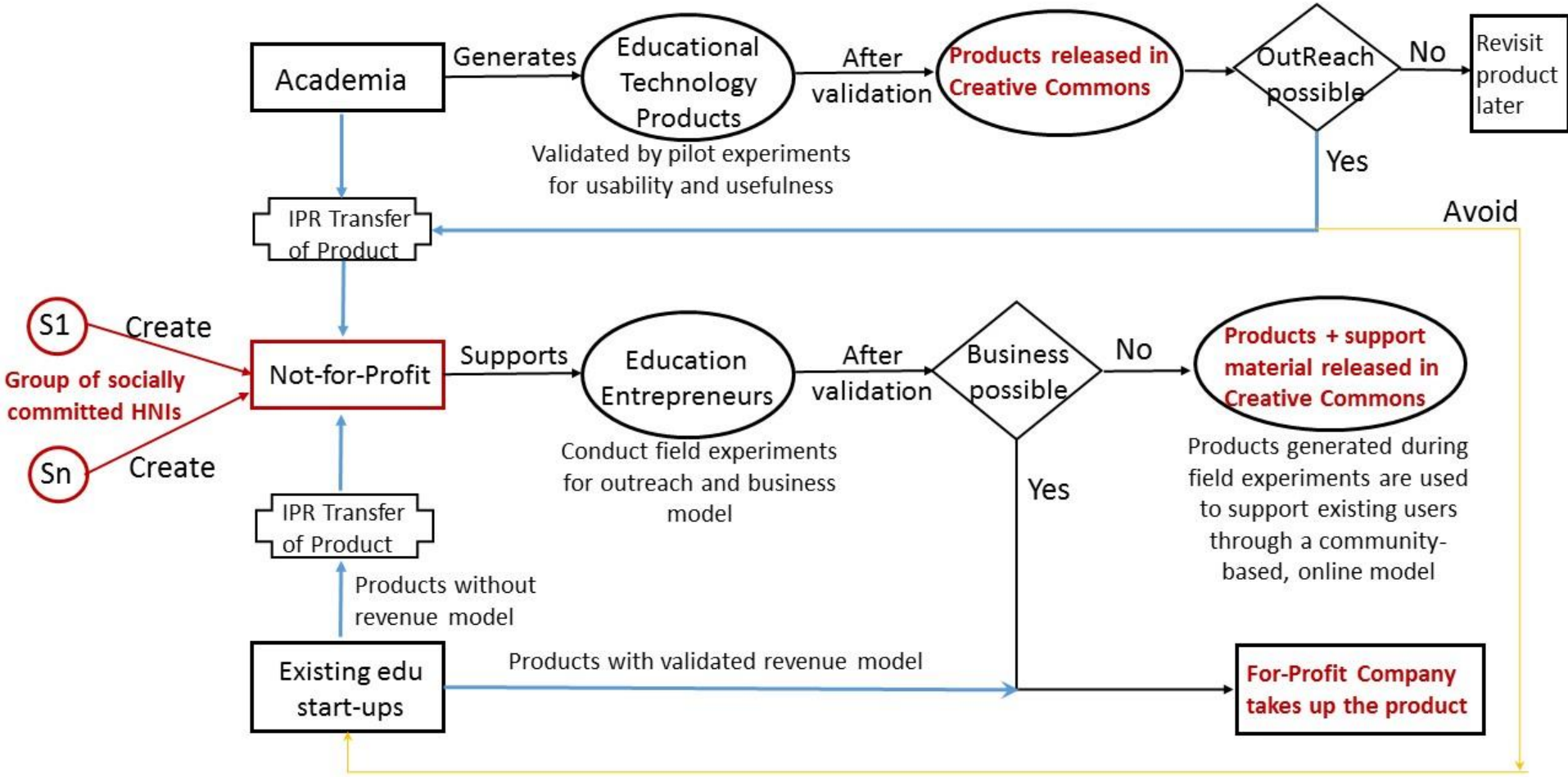
- Outreach, such as T10KT, Spoken-Tutorials:
  - Scale to large numbers; order of magnitude more funding.
  - Sustainability depends on continued funding, trainers, teams, …

- Self-sustaining, such as Computer Masti:
  - Needs investors willing to take the risk to create a company.
  - Survival depends on business model – customers, market.

The main competition to high-quality products in education sector is, ***non-use***
– Sridhar Rajagopalan, MD, Educational Initiatives

Recommendations

Proposed IITB Model for outreach



Upcoming Conferences at IITB

- LaTiCE 2016 – March 28th - April 2nd, 2016.
  - Learning and Technology in Computing and Education.

- ICCE 2016 – November 28th – December 2nd, 2016
  - International Conference on Computers and Education.

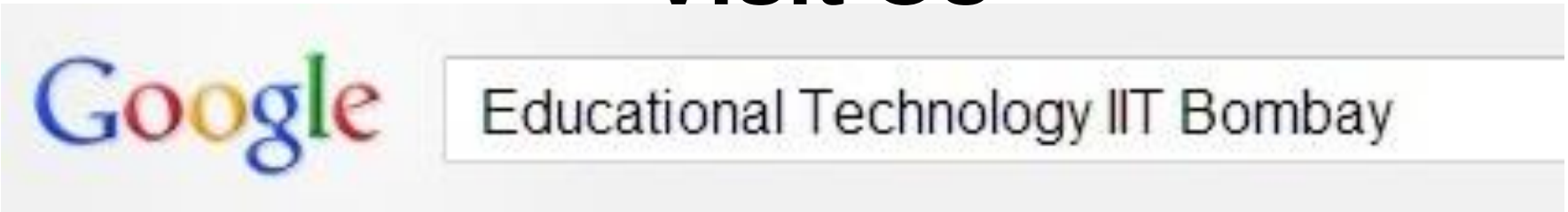
- T4E 2016 – December 2nd – December 5th, 2016
  - IEEE International Conference on Technology for Education

- ICALT 2018 – IEEE Conference on Advanced Learning Technologies

We have put in a lot of effort to get these conferences to India, so that large number of teachers and researchers can attend.

Don't Miss Them.

Visit Us



Openings:

Faculty - Short & long-term visits

Students – PhD / Post-doc in ET

Contact information:

Sridhar Iyer sri@iitb.ac.in

Educational Technology Research @ IIT B

Technology Enabled Learning of Thinking Skills

- Process skills of pan-domain applicability

- Engineering Design, Modeling, Estimation
- Data visualization, Representational competence
- Computational thinking, Problem posing
- Systems thinking, …

Teacher Professional Development

- Workshop models, Instruction design, …

Research – sample Ph.D. theses

TEL of Thinking Skills

- Development and assessment of engineering design competencies
- Spatial skills such as mental rotation of 3D objects
- Graph interpretation and data visualization skills
- Scientific abilities such as macro-micro thinking (Physics)
- Systems thinking (Biology), problem-posing (Computer Science), debugging and trouble-shooting (Computer Science).

Frameworks for content and skill development

- Framework for scaffolding programming to Hindi-medium learners
- Interactivity enhancing factors for Visualizations in engineering
- Development of guidelines to design and evaluate Virtual Labs
- Collaborative approach for programming using Spoken Tutorials

Teacher use of ET

- Teacher integration of technology in classroom
- Framework for customized visualization selection and integration

Automation of ET systems

- Automated generation and evaluation of assessment instrument
- Constructing customized textbooks from lecture transcripts