Emerging Learning Paradigms on the Internet: NPTEL and NMEICT from India

Mangala Sunder Krishnan
Department of Chemistry
Indian Institute of Technology Madras, Chennai

mangal@iitm.ac.in
mangalasunderk@gmail.com
NPTEL is an acronym for ‘National Programme on Technology Enhanced Learning’

NMEICT is an acronym for ‘National Mission on Education through Information and Communication Technology’

Information is NOT instruction--David Merrill
To the memory of Prof. Paul S. Goodman

PROFESSOR PAUL S. GOODMAN, Cognitive Psychology, WORLD-RENOVISED PSYCHOLOGIST, RESEARCHER, AUTHOR AND FILMMAKER AT CARNEGIE MELLON
MOOC can draw from / Contribute to:

- Open Educational Resources online
- Technology tools for the asking
- Content development online tailored to curricula
- Teaching pedagogy: Outcome based learning and guided teaching for research (open ended)
- Flipped Classrooms and online strategy
- Online Certification through MOOC
- Innovation in Universities
Open Educational Resources (OERs)

- National Efforts
- International Efforts
- Beyond OERs
Open Educational Resources (OERs)

National Programme on Technology Enhanced Learning (NPTEL)
Virtual Labs
E-GyanKosh
Design-E-kalpa
UGC-CEC content

.....
Many Asian Universities and institutions in Asian countries: Japan, Korea, China, Philippines, Malaysia, Vietnam, ... (Open Educational Resources: An Asian Perspective, edited by Gajaraj Dhanarajan and David Porter, Commonwealth of Learning, Vancouver, 2013)
Open Educational Resources (OERs)

- Project Gutenberg;
- Google Books
- OpenCourseWare MIT
- British Open University
- Stanford On iTunes and Stanford Courses
- Open Learning Initiative (Carnegie Mellon University)
- Yale University Online
- Harvard University
- University of California Berkeley....

For a more comprehensive list on all subjects, http://www.openculture.com/freeonlinecourses
National Programme on Technology Enhanced Learning

Eight partner Institutes (seven IITs and IISc Bangalore)
More than 30 Associate Partner Institutions

Professor Bhaskar Ramamurthi, Director, IIT Madras
Overall National Coordinator

Professor Mangala Sunder, Chemistry Dept.
IIT Madras, National Web courses coordinator

Professor Kushal Sen, Textiles Department,
IIT Delhi, National Video Courses Coordinator

Professor M. S. Ananth (Former Director, IIT Madras),
Visiting Professor, Dept. of Chemical Engg., IISc Bangalore (Founder of the NPTEL Project)
A Joint initiative of IITs and IISc (funded in full by MHRD)

E-learning through online Web and Video courses in Engineering, Core Sciences, Technology, Arts, Humanities and Management

http://nptel.ac.in;  http://www.youtube.com/iit

100 courses in video format and 100 in web based contents proposed in 2003 for three years

130 courses in video format and 125 in web based contents released through 2007 in the NPTEL Website
NPTEL Phases II/III (contents to be developed as 4 quadrants, integrated in the final form)

**Content—web based**

lecture notes / video lectures in an organized form

| Animations/ visuals / illustrations, video demonstrations/ documentaries and interactive simulations wherever required |
| Supplementary reading/Wiki Development on the course, other resources /open content in the internet, Case studies, anecdotal information, historical development of the subject |
| Problems, quizzes, assignments and solutions, online feedback through discussion forums and setting up the FAQ |
NPTEL

• Each course to provide contents for 40 or more one hour lectures to be used in the classrooms of colleges or for private study

• Curriculum designed using IIT syllabi and those of major affiliating Universities such as Anna University, JNTU Hyderabad and VTU Belgaum and modularized for adoption.
Sample formats (Video)

BIOMATHEMATICS
Dr. Ranjith Padinhateeri
Department of Biotechnology
IIT Bombay

Lecture No. 23
Understanding Normal Distribution

What you know from first look?

\[ P(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{b x^2}{2}} \]
Sample formats (Video) Contd.
Sample formats (Video)

Indian Institute of Technology Kanpur

Course Title
Geotechnical Measurements & Explorations

Geotechnical Measurements and Exploration

Examples

References...
Sample formats (Web)

Biophotonics

Fluorescence Microscopy
- Fluorescence microscopy relies on the process of fluorescence emission which we examined in one of the previous lectures. Briefly, certain molecules when irradiated with light of a certain wavelength called the excitation wavelength are able to excite their electrons to a higher energy state which after some vibrational relaxation moves back to the ground state followed by the emission of a photon with lower energy than the incident photon.

Basic Microscope Train
- The simplest image magnifier is a single lens. However, to get uniform images free of distortions, one needs a more sophisticated design of the image train.

1. Objective lens (25mm) (1)
2. Object (lens to be observed)
3. Eyepiece (lens to view the back multiple objectives)
4. Focus wheel to move the stage (4 – coarse adjustment, 5 – fine adjustment)
5. Frame (b)
6. Light source, a light on a mirror (7)
7. Diaphragm and condenser lens (d)
8. Stage (f)

Kohler Illumination
- Kohler illumination assures uniform illumination across the sample plane. The illumination often comes from a lamp which contains a filament. Direct projection of the illumination onto the sample plane using a condenser lens produces an image of the filament on the sample plane which is imaged by the objective lens along with the sample.
Sample formats (Web)

INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

Catalytic asymmetric Synthesis

About 800 courses on the NPTEL site already
Sample formats (Web)

Basic electronics
Prof. T. S. Natarajan,
IIT Madras

About 800 courses on
the NPTEL site already
NMEICT

http://www.sakshat.ac.in
Virtual Labs

From the slides provided by Prof. Ranjan Bose, IIT Delhi

IIT Delhi, IIT Kanpur, IIT Bombay, IIT Madras, IIT Kharagpur, IIT Guwahati, IIT Roorkee, IIIT Hyderabad, Amrita University, Dayalbagh University, NIT Surathkal, COE Pune
Motivation

Physical Distances Limit Doing Experiments

Sharing of Costly Equipment

Proliferation of Quality Labs
Objectives of the Virtual Lab Project

- To provide remote-access to labs in various disciplines of Science and Engineering.

- To cater to students at the UG level, PG level as well as to research scholars.

- To enable the students to learn at their own pace, and to arouse their curiosity.

- To provide a complete Learning Management System that includes web-resources, video-lectures, animated demonstrations and self evaluation.
Types of Virtual Labs

- Measurement Based
- Remote Triggered
- Modeling / Simulation Based

CLOSER TO REALITY
SCALABILITY
Participating Institutes

IIT Delhi
IIT Bombay
IIT Kanpur
IIT Kharagpur
IIT Madras
IIT Roorkee
IIT Guwahati
IIIT Hyderabad
Amrita University
Dayalbagh University
NIT Karnataka
COE Pune
Broad Areas for Virtual Labs

- Electronics and Communication Engineering
- Computer Science and Engineering
- Electrical Engineering
- Mechanical Engineering
- Civil Engineering
- Chemical Engineering
- Biomedical and Biotechnology Engineering
- Chemical Sciences
- Physical Sciences

All areas of Science and Engineering are covered
One common website to access all Virtual Labs

Website: www.vlab.co.in
Creating Digital-Learning Environment for Design in India - ‘e-kalpa’:

- National Mission in Education through ICT

Slides by Prof. Ravi Poovaiah, IIT Bombay
### 4 Key Themes:

<table>
<thead>
<tr>
<th>‘e-kalpa’ Focus Areas</th>
<th>Achievements so far:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Digital online content for learning Design with distance e-Learning programs on Design</td>
<td>Setting up of the webspace ‘Dsource.in’ for access to content along with studio with equipment and support staff at each of the partner Institutes</td>
</tr>
<tr>
<td>2. Social networking for Higher Learning with collaborative Learning Space for Design for Synchronous and Asynchronous Interaction</td>
<td>Experimenting with the webspace ‘Dsquare.in’ for access to content along with studio and support staff at each of the partner Institutes</td>
</tr>
<tr>
<td>3. Digital Design Resource Database including the craft sector</td>
<td>Documentation of resources in terms of process, methodology, case studios to create content undertaken at the partner Institutes</td>
</tr>
<tr>
<td>4. Design inputs for products of National Mission in Education through ICT</td>
<td>Support is being to other initiatives of NMICT – Jellow, Sakshat website + Identity, logo, naming, etc.</td>
</tr>
</tbody>
</table>
## Deliverables:

<table>
<thead>
<tr>
<th>Expected Deliverables for the Project</th>
<th>Completed till now Feb 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Design Courses</td>
<td>40 Courses</td>
</tr>
<tr>
<td>ii. Full resource documentation of fine examples of Design, crafts and arts + Workshops with Experts</td>
<td>40 Topics</td>
</tr>
<tr>
<td>iii. Video Lectures of eminent designers</td>
<td>25 Lectures</td>
</tr>
<tr>
<td>iv. Case Studies of good design projects by professions and students</td>
<td>70 Case Studies</td>
</tr>
<tr>
<td>v. Documentation of design process from around the country each in 12 images x12 words</td>
<td>150 topics</td>
</tr>
</tbody>
</table>

- i. Design Courses: 40 Courses
- ii. Full resource documentation of fine examples of Design, crafts and arts + Workshops with Experts: 50 topics
- iii. Video Lectures of eminent designers: 25 lectures
- iv. Case Studies of good design projects by professions and students: 70 Case Studies
- v. Documentation of design process from around the country each in 12 images x12 words: 200 topics
1. Digital online content for learning Design:

www.dsource.in

(enabled for tablets)

Aakash    |    iPad2

Galaxy
most recent
Design Course on
Character Design for Animation
Character Design for Animation
by
Professor Poonam Joshi & Vaidehi Pandharipande
Industrial Design Centre (IDC), IIT Bombay

Design Course on
Design of Signage
Design of Signage
by
Professor Poonam Joshi
Industrial Design Centre (IDC), IIT Bombay

Design Course on
Experience Design
Experience Design
by
Prof. Shishir Mehta
NID R&BD campus, Bangalore

Design Course on
Design Drawing and Representation
Design Drawing and Representation
by
Jishnu Ghosh

Design Course on
Calligraphy
Calligraphy
by
Prof. K. Joshi
Industrial Design Centre, IIT Bombay

Design Course on
Elements of 3D Design
Towards Design of Objects
by
Prof. Reema Mukherji Punekar
Department of Design, IIT Guwahati

Design Course on
Product Drawing
Representation of Objects
by
Prof. R. K. Ramachandran
Industrial Design Centre, IIT Bombay

most seen
Design Course on
Ceramic
The craft of pot making
by
Sakshi Gambhir
Industrial Design Centre (IDC), IIT Bombay

Design Resource
Galleries
12 x 12 or more for artists
Several Contributors
Open Design Resource Bank for India
most recent
Design Resource Galleries
Gangaiconcholapuram
Chola architecture
by
Ms Sanjukta Das
Industrial Design Centre (IDC), IIT Bombay

Design Resource Galleries
Darasuram Chola architecture
Airavatesvar Temple
by
Ms Sanjukta Das
Industrial Design Centre (IDC), IIT Bombay

Design Resource Galleries
Summer camp
Making of an board
by
Ms Chitra Govind
Industrial Design Centre (IDC), IIT Bombay

Design Resource Galleries
Red Fort New Delhi
by
Ms Chitra Govind
Industrial Design Centre (IDC), IIT Bombay

Design Resource Galleries
Making of sculpture
by
Ms Chitra Govind
Industrial Design Centre (IDC), IIT Bombay

most seen
Design Resource Galleries
Classic Logos of India
by
Nancy Nadi, Ph.D student and Prof. Ravindra Poonaval
Industrial Design Centre, IIT Bombay

Design Resource Galleries
Magic Mascots of India
by
Nancy Nadi, Ph.D student and Prof. Ravindra Poonaval
Industrial Design Centre, IIT Bombay

Design Resource Galleries
Erstwhile Logos Of India
by
Nancy Nadi, Ph.D student and Prof. Ravindra Poonaval
Industrial Design Centre, IIT Bombay

Design Resource Galleries
Logos representing India
by
Nancy Nadi, Ph.D student and Prof. Ravindra Poonaval
Industrial Design Centre, IIT Bombay

Design Resource Galleries
Jall Patterns
by
Nancy Nadi, Ph.D student and Prof. Ravindra Poonaval
Industrial Design Centre, IIT Bombay

Design Resource Galleries
Submit Design Case Studies

Character Design for Animation

by
Professor Khem Bahadur
Industrial Design Centre (IDC), IIT Bombay

Attributes and proportions

Expressions

Model sheet

Galleries
12 x 12 en bref by bare
Several Contributors
Open Design Resource Bank for India
Course on
Visual Syntactics - Tessellations
Understanding Visual Language
by
Revi Popoviah

Tessellations:

Slide show:
Design Resources on

Bell metal crafts of Sarthebari

The Craft of Utensils

by

Professor Ravi Mokashi Punekar, Manojitoulo Kirat and Tanima Das

Department of Design, IIT Guwahati

Bell Metal Crafts:

Process of making bell metal bowls and other items

Bell metal as a craft has survived for ages, yet there seems to be very little transition in the method of preparing bell metal items so far as Sarthebari is concerned. The craftsmen who are also referred to as the Kharar or Gija still resort to the age old tools required for burning and shaping the metal.

![Image of craftsmanship process]
Design Course on

Design of Signage

by

Professor Ravi Posavala
IDC, IIT Bombay

Hospital Symbols:

The graphic symbols were developed as part of a signage system for the various facilities in a public hospital environment.
Content

• Pedagogy and organization for individual Universities and autonomous Institutions

• Prof. Anup K. Ray, CET, IIT Kharagpur
Technology Tools

- Free and open source Learning Management systems (Moodle, Brahaspati (IIT Kanpur))
- Free and open source video and audio recording and editing tools
- Free Webspace on social networking sites or educational networking sites--Classle in India,
- Free Webspace on clouds --Google with its coursebuilder, Sakshat website in India for hosting, IGNOU's learning content management sites
• Google Course Builder, one of the latest and free source for organizing course contents under a suitably defined pedagogical framework. Free cloud space provided and continuously being updated.

• NPTEL online certification programme (Feb 2014-July 2014) used this in the pilot phase soon.

• The next launch of a certificate course in September by IIT Kanpur and IIT Madras (Currently on).
Strategies for and challenges in effective e-learning

- Continued access, easy and just-in-time
- Set up social, peer-to-peer and faculty assisted networks and study groups
- Encourage interactions and dialogues among learners
- Collect continuous, course-specific feedback
- Devise strategies for incorporating user feedback in the development process
Strategies for and challenges in effective e-learning

- Bring in partners from industry and research organizations
- Continuously upgrade the programme contents and move downward towards school education
- Setup online and offline exams and certification as value add-on, to enhance employability in core industries
Technology Enhanced Learning

- Promote critical thinking
- Visualization and visualizability of concepts
- Demonstration and hands-on experience
- Building competitiveness, and think out-of-the-box at an early age.

Integration of teaching and learning in synchronization with the environment of the child/student/adult/all-time learners

- Mass education and lack of physical infrastructure and teachers
- Building a Nation to its fullest capacity— a nation as large as India, with one sixth of the world’s population

Solve all the problems of education in India and obtain solutions for everyone in the world!
Thank you