Pedagogy for Effective Use of ICT in Engineering Education

Jan 5 – Jan 31, 2015
IIT BOMBAY

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At the end of this session, participant will be able to

- Identify a list of digital tools that are useful for students inside and outside class
- Apply a Digital Taxonomy to map learning outcomes to use of prescribed digital tools.
Scenario – CLASSROOM A

- Teaching Style – Stand and Deliver (Instructional)
- Learning Style – Auditory, Read/Write
- Student Involvement – Passive (Information Acquisition – Told about content and processes)
- Technology Use – Literacy (Learning about technology) or Augmentative (Teaching with Technology)
Scenario – CLASSROOM B

- Teaching Style – Project and Problem based, (Constructionist)
- Learning Style – Multiple Learning Styles and Multiple Intelligences
- Student Involvement – Active (Construct Content, Develop and evaluate process)
- Technology Use – Transformative (Learning through Technology)
Question: Recall the characteristics of Classroom A and Classroom B. According to you, which classroom is more useful for student learning?

1. Classroom A
2. Classroom B
3. Both are equally good.

Participants: Vote on your option within your centre
RCC: Convey the majority option via A-View Poll
Instruction to RCC
Make 2 groups A and B

Instruction to Participants
Those in group A should list points why Classroom A is better. Those in group B should list points why Classroom B is better.

Instruction to RCC
Convey 2 main points in favour of both classroom A and B
- Through A-View Chat
Limitations of Classroom A

- Teacher Centric
- Content-Oriented
- Assessment Focused
- Predominantly Lower-order Thinking
- Time-tabled Learning + Homework
Benefits of Classroom B

- Student Centric
- Learning Focus – Process oriented with embedded content
- Higher order Thinking Skills
- Anywhere anytime Learning through transformative use of technology
Switching FROM

Classroom A (Traditional) → Classroom B (21st Century Classroom)

Switching TO

21st Century Teaching → Students using digital tools
21st Century Learner

- Multiple multimedia sources
- Parallel processing & Multi tasking
- Picture, Video & Sound >>>> Text
- “Network” ed with many
- Comfortable in Virtual and Real spaces
- Learning is relevant, instantly useful and fun
Digital Learning Tools

- Technologies that support 21st century Learning
- Support Processes and actions with technologies
- Contain cognitive elements as well as methods and tooling
- Facilitate creation, communication and collaboration within and outside classroom
Recall Revised Bloom’s Taxonomy

HIGHER ORDER THINKING SKILLS
- CREATING
- EVALUATING
- ANALYZING
- APPLYING
- UNDERSTANDING
- REMEMBERING

LOWER ORDER THINKING SKILLS
DIGITAL Bloom’s Taxonomy

**HIGHER ORDER LEARNING ACTIVITY**
- CREATING
- EVALUATING
- ANALYZING
- APPLYING
- UNDERSTANDING
- REMEMBERING

**LOWER ORDER LEARNING ACTIVITY**
# DIGITAL Bloom’s Taxonomy

<table>
<thead>
<tr>
<th>Higher Order Thinking Skill</th>
<th>Learning Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating</td>
<td>Designing, constructing, planning, producing, inventing, devising, making</td>
</tr>
<tr>
<td>Evaluating</td>
<td>Checking, hypothesizing, critiquing, experimenting, judging, testing, detecting, monitoring</td>
</tr>
<tr>
<td>Analyzing</td>
<td>Comparing, organizing, deconstructing, attributing, outlining, finding, structuring, integrating</td>
</tr>
<tr>
<td>Applying</td>
<td>Implementing, carrying out, using, executing</td>
</tr>
<tr>
<td>Understanding</td>
<td>Interpreting, summarizing, inferring, paraphrasing, classifying, comparing, explaining, exemplifying</td>
</tr>
<tr>
<td>Remembering</td>
<td>Recognizing, listing, describing, identifying, retrieving, naming, locating, finding</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lower Order Thinking Skill</th>
<th>Learning Activity</th>
</tr>
</thead>
</table>
REMEMBERING

Source: http://www.imagequiz.co.uk/quizzes/33001
REMEMBERING

Technology Tool – Labelled Image

Learning Activity – Listing/Identifying parts

Source: http://www.imagequiz.co.uk/quizzes/33001
Match Learning activity at Remember Level in Digital Bloom’s Taxonomy and its Technology Tool

1. Powerpoint  A. Searching
2. OneNote  B. Bullet Pointing
3. Delicious  C. Notetaking
4. Google  D. Bookmarking
Match Learning activity at Remember Level in Digital Bloom’s Taxonomy and its Technology Tool

1. Powerpoint
2. OneNote
3. Delicious
4. Google

B. Bullet Pointing
C. Notetaking
D. Bookmarking
A. Searching
<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Technology Tools and Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Remembering:</strong></td>
<td>• <strong>Bullet Pointing</strong>: Powerpoint, mindmap, flashcards, glossary</td>
</tr>
<tr>
<td>Bullet pointing</td>
<td>• <strong>Highlighting</strong>: Word Processor, PDF document</td>
</tr>
<tr>
<td>Highlighting</td>
<td>• <strong>Bookmarking</strong>: Diigo, Delicious, Citeulike</td>
</tr>
<tr>
<td>Bookmarking</td>
<td>• <strong>Searching</strong>: Google, Bing, Yahoo, meta searches (Dogpile, WebCrawler)</td>
</tr>
<tr>
<td>Searching</td>
<td>• <strong>Note-taking</strong>: Evernote, Google Keep, Quip, OneNote, Springpad, Simplenote</td>
</tr>
</tbody>
</table>
UNDERSTANDING

Remember the video
UNDERSTANDING

Technology Tool – Video

Learning Activity – Explaining Content
<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Technology Tools and Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding</td>
<td>Advanced searches: Google (boolean searches)</td>
</tr>
<tr>
<td></td>
<td><strong>Blogging:</strong> Blogger, WordPress. Tumblr</td>
</tr>
<tr>
<td></td>
<td><strong>Commenting:</strong> Twitter, MSWord, noticeboards, forums, threaded discussions</td>
</tr>
<tr>
<td></td>
<td><strong>Annotating:</strong> Adobe Acrobat Reader, Zotero, Mendeley, Ink2Go</td>
</tr>
<tr>
<td></td>
<td><strong>Subscribing:</strong> RSS feeds, News Aggregators (Bloglines)</td>
</tr>
</tbody>
</table>
ACTIVITY  
TIME: 30 seconds

You saw examples of Technology tool and Learning activity at Understanding level.

Given the following learning activities, think of tools that you know can facilitate understanding level

1. Summarizing
2. Classifying,
3. Comparing

RCC – Share 2 tools for each purpose from your centre
APPLYING
APPLYING

Technology Tool – Excel

Learning Activity – Calculation and Representation

E.g.: Give an excel sheet to student having pre-written formulas. Student enters data into it to see the analysis and representations.
1. Think Individually about a technology tool that you can use in the course at applying level learning activity (1 minute)
2. Share with a peer your tool and learning activity and get their feedback
<table>
<thead>
<tr>
<th>Learning Outcome</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Applying</strong></td>
<td></td>
</tr>
<tr>
<td>Running Loading Operating</td>
<td>Running, Loading, Operating: Installing programs, operating systems</td>
</tr>
<tr>
<td>Playing</td>
<td>Playing: Visualisations, simulations, Second Life</td>
</tr>
<tr>
<td>Hacking</td>
<td>Hacking: Armitage, Wifite, Social Engineering Toolkit</td>
</tr>
<tr>
<td>Uploading</td>
<td>Uploading and Sharing: Google Drive, DropBox, SugarSync</td>
</tr>
<tr>
<td>Sharing</td>
<td><strong>Editing</strong>: MSWord, PhotoShop, Pixlr, LibreOffice Writer</td>
</tr>
<tr>
<td>Editing</td>
<td></td>
</tr>
</tbody>
</table>
ANALYZING
ANALYZING

Technology Tool – PhET Simulation Games
Learning Activity – Finding and Integrating
<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Technology Tools and Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analyzing</strong></td>
<td>Mashing: Google Maps, Google Earth Surveying: Google Forms, Survey Monkey Linking: Databases (MySQL, Access, Base), Spreadsheets (Excel, Calc), CMap Tagging: Evernotes, Tabbles Reverse engineering: Boomerang, Jad, OllyDbg</td>
</tr>
</tbody>
</table>
1. Think Individually about a technology tool that you can use in the course at analyzing level learning activity (1 minute)
THINK-PAIR-SHARE

1. Think Individually about a technology tool that you can use in the course at analyzing level learning activity (1 minute)

2. Pair with a neighbour and share your choice of tool and description about learning activity (3 minute)
THINK-PAIR-SHAKE

1. Think Individually about a technology tool that you can use in the course at analyzing level learning activity (1 minute)
2. Pair with a neighbour and share your choice of tool and description about learning activity (3 minute)
3. Share it within your remote centre

RCC- Shares 2 answers via A-View Chat
EVALUATING

Introduction
The challenges we face as we move into the planning cycle are significant, but we are confident that we will be able to keep the strong growth path we’ve established over the last nine months. Now is not the time to rest on laurels – rather it is the time to...
EVALUATING

Technology Tool – MS Word

Learning Activity – Reviewing

E.g.: Reviewing an assignment report
<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Technology Tools and Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Evaluating</strong></td>
<td><strong>Commenting and Posting</strong>: Blogspot, Facebook, Moodle forum</td>
</tr>
<tr>
<td></td>
<td><strong>Reviewing</strong>: MSWord, Review Board, Collaborator</td>
</tr>
<tr>
<td></td>
<td><strong>Moderating</strong>: Moodle forum</td>
</tr>
<tr>
<td></td>
<td><strong>Networking</strong>: Email list, LinkedIn, Facebook</td>
</tr>
<tr>
<td></td>
<td><strong>Refactoring</strong>: Eclipse, SharpDevelop, CodeRush</td>
</tr>
<tr>
<td></td>
<td><strong>Testing</strong>: Wireshark, Snort, Metasploit</td>
</tr>
</tbody>
</table>
CREATING

T10KT Repository

This repository contains the resources created by teachers within the T10KT Pedagogy workshop going to be conducted from Jan 5 - Jan 31, 2015. The course is a blended course, in the sense that there are both synchronous and asynchronous sessions, spread over 4 weeks and conducted in 4 phases. The first and third phases are Synchronous Remote sessions conducted through A-View and the other two sessions are asynchronous conducted through Moodle. There were a total of 10.

IMPORTANT - REGARDING FILE UPLOADS
As this is a normal wiki, there is a limit to file upload size. Do not upload any files to this wiki, unless specifically asked.

HELPFUL PAGES AND RESOURCES FOR BASIC WIKI EDITING
Here are a list of helpful pages and videos which will help you complete the initial set of tasks that were given.

- Basic Wiki Editing - Wikispaces Help Page
- We have created a set of short videos for doing various tasks in one of our team member’s home page. You need to have flash plugins enabled to watch the videos in browser. Alternately you can watch related videos in youtube by regular search.

**Project Pages**
The T10KT Repository project is an activity aimed at creating a content repository of workshop activity. The table contains the details of the institutions who participated in this workshop and the number of registered participants from each institution. By clicking on the institution you can view more details about the institution and their participants. The project space of each institution can be seen by clicking on the Project button on the right hand column next to this page (Below Wiki Home). Select the institution from the list under the QEEE Repository project in it.

<table>
<thead>
<tr>
<th>Institution</th>
<th>Coordinator</th>
<th>Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1235-Drl. Mahalingam College of Technology</td>
<td>Rset ltb</td>
<td>18</td>
</tr>
<tr>
<td>Bhagwan Parsuram Institute of Technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don Bosco College of Engineering and Technology, Guwahati, Assam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBET Group of Institutions, Tiruchirapalli, Tamilnadu</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

https://etrepository.wikispaces.com/T10KT+Repository
CREATING

Technology Tool – Wiki

Learning Activity – Portfolio Creation
<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Technology Tools and Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Creating</strong></td>
<td></td>
</tr>
<tr>
<td>Programming</td>
<td><strong>Programming</strong>: Scratch, Alice, Visual Studio, Lego Mindstorm</td>
</tr>
<tr>
<td>Filming</td>
<td><strong>Filming &amp; Animating</strong>: Movie maker, Animoto, Pencil</td>
</tr>
<tr>
<td>Animating</td>
<td><strong>Blogging &amp; Wikis</strong>: Blogger, Moodle wikis, Wikispaces</td>
</tr>
<tr>
<td>Blogging</td>
<td><strong>Publishing</strong>: Word, OO Writer, Mixbook, Portfoliobox</td>
</tr>
<tr>
<td>Wiki-ing</td>
<td><strong>Videocast, Podcast</strong>: VoiceThread, Skype, Elluminate</td>
</tr>
<tr>
<td>Publishing</td>
<td><strong>Modeling</strong>: Sketchup, Blender</td>
</tr>
<tr>
<td>Video casting</td>
<td></td>
</tr>
<tr>
<td>Podcasting</td>
<td></td>
</tr>
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<td>Modeling</td>
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THINK-PAIR-SHARE

1. Think Individually about a technology tool that you can use in the course at creating level learning activity (1 minute)
THINK-PAIR-SHARE

1. Think Individually about a technology tool that you can use in the course at creating level learning activity (1 minute)

2. Pair with a neighbour and share your choice of tool and description about learning activity (3 minute)
ACTIVITY

TIME: 5 minutes

THINK-PAIR-SHARE

1. Think Individually about a technology tool that you can use in the course at analyzing level learning activity (1 minute)

2. Pair with a neighbour and share your choice of tool and description about learning activity (3 minute)

3. Share it within your remote centre

RCC- Shares 2 answers via A-View Chat
RECOMMENDATIONS

- Tie the use of the tool to specific learning content and outcome.
- Give students an opportunity to first gain exposure to the tool before the assignment.
- Provide help manuals and tutorials on using the tool.
- Provide mechanisms for students to get feedback from peers, teaching assistants, and lecturer.
SUMMARY

- Digital tools are useful for students to use in and out of class to create, communicate, and collaborate.

- Bloom’s Revised Digital Taxonomy allows us to map learning outcomes to the use of digital tools.