Searching for disruptive pedagogies: Matching pedagogies to the technologies

John G Hedberg
• e-learning requires:
  • A rethinking of learning activities
  • Exploration of how interactions are managed and facilitated
  • Choice of the right tool for the pedagogical task
• and for widespread implementation
  • Disruptive innovations and pedagogies!
• The extent to which a student gains the same pedagogical benefit from a printout of your Web resources as from the resources themselves is the extent to which you have done nothing of pedagogical value by using the Web.  (Fraser, 1999)
What is happening now?

• ATN Universities survey of 20,000 students and 800 staff
  • provide a description of the use of e-learning;
  • determine the impact of the use of e-learning;
  • provide information to assist in the further development of programs to support the use of e-learning.

How teachers use e-learning

- Provide access to materials
- Make unit announcements
- Provide links to web resources
- Send emails
- Post community announcements
- Use discussion forums for moderated, optional discussions
- Provide unmoderated discussion board
- Access course statistics
- Conduct student self-assessments
- Send assessment feedback
- Collect student assessments
- Conduct surveys
- Provide group areas
- Use discussion board for assessable activities
- Conduct graded tests
- Run online debates, roleplays etc
- Use real time chat

Information presentation

Group interactions

ATN N=1094
What is the student experience?

• Access
  • Access content
  • Easy to access material
• Personal benefits
  • Saves students money
  • Complete tasks at convenient times
  • Juggle studies
• Disadvantages
  • Time commitment
  • Inadequate computer skills

• Learning connections
  • Discuss ideas
  • Stay connected to other students
  • Gauge progress on discussion board
  • See other students’ questions
  • Ask an uncomfortable question
  • Stay connected to teaching staff
• A new technological innovation that displaces an existing dominant technology (Clayton Christensen, 2003)
Disruptive innovations

• The decline of Aristotelian dialogue with the rise of textbooks.
• Ramus and his “method” in the 1500s

Textbooks and representation of ideas

From Birth to Rubble
Components of the 1,350-foot World Trade Center towers:

- 200,000 tons of steel
- 426,000 cubic yards of concrete
- 560,000 square feet of glass window area
- 239 elevators

Steel assemblies hoisted during construction in May 1969.

Some pieces of the exterior wall remained intact after the collapse.

*By 9/11, non-cancer-related electrocution had taken into account a psychic treatment.
• In every kind of knowledge-based, progressive organization, new knowledge and new directions are forged through dialogue. The dialogue in Knowledge Age organizations is not principally concerned with narrative, exposition, argument, and persuasion (the stand-bys of traditional rhetoric) but with solving problems and developing new ideas. (Bereiter & Scardamalia, 2005)
Sustaining innovations

• The obverse of disruptive innovations
Sustaining innovations
Sustaining innovations
Using what the technology affords!

- Technology has enabled visual and aural information display within software
- Prevailing educational theory is based more on situativity and cognition, and is problem-focused
- Technology supports constructivist philosophical orientation
- Increased recognition of social collaboration as part of learning
- Computer-Mediated Communication allows collaboration breaking the nexus of time and location
- Increasing modularisation of individual elements that are retrieved from databases and employed in varied contexts
• Teachers see ICT as tools for understanding the world
• Students in an IT literate society communicate in multiple modes of representation
• Low student-to-computer ratio
• High bandwidth access in the classroom and from home
• Specialized tools and projects for all subjects
• New learner mobile tools — Origami project
Five interconnected themes for routine use of ICT

- Teachers and students as knowledge producers
- Learning as a process of investigation and doing
- Development of learning communities
- Sharing of educational resources
- Assessment as authentic performance
Themes for learning with ICTs

- Emerging Technology Tools
  - Mobile / ubiquitous computing
  - Simulations and modeling/visualizations
  - Formative assessment tools
- Interactive Learning Environments
  - E-learning environments
  - Collaborative learning environments
- Effectiveness of use in ICTs
  - Models of teaching/instructional strategies
  - Role of teacher change – facilitator
  - Enhancing ICTs for learning engagement
<table>
<thead>
<tr>
<th>Outcome</th>
<th>Interactive Activity</th>
<th>Digital Asset</th>
<th>Support</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create</td>
<td>Diagram/Map</td>
<td>Drawing</td>
<td>FAQ</td>
<td>Self-test/Quiz</td>
</tr>
<tr>
<td>Evaluate</td>
<td>Journal</td>
<td>Photograph</td>
<td>Contextual help</td>
<td>Essay/Report</td>
</tr>
<tr>
<td>Synthesize</td>
<td>Tutorial</td>
<td>Diagram/Map</td>
<td>Links to checklists</td>
<td>Journal</td>
</tr>
<tr>
<td>Analyze</td>
<td>Case study</td>
<td>Map</td>
<td>Self checking</td>
<td>Prognosis</td>
</tr>
<tr>
<td>Apply</td>
<td>Presentation</td>
<td>Text</td>
<td>Collaboration</td>
<td>Hypothesis</td>
</tr>
<tr>
<td>Understand</td>
<td>Game</td>
<td>Simulation</td>
<td>with others</td>
<td>Classification</td>
</tr>
<tr>
<td>Recall</td>
<td>WebQuest</td>
<td>Animation</td>
<td>Links to further</td>
<td>Plan</td>
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<td></td>
<td>Experiment</td>
<td>Video Clip</td>
<td>resources</td>
<td>Visual representation</td>
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<tr>
<td></td>
<td>Role playing</td>
<td>Audio Clip</td>
<td></td>
<td>Game</td>
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<td></td>
<td>Troubleshooting</td>
<td>Musical score</td>
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<td>Simulation</td>
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<td>Diagnosis</td>
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<td>Presentation</td>
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<td>Composing</td>
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Searching for disruptive pedagogical innovations …
Example practices & tools

- Games as a learning strategy
- Learning objects
- Digital Repositories
- Creative uses of the technologies (building on multiple modalities and multi-literacies!)
- Social networks and the internet
- Communities of learners and communities of practice
- Open source software and the "open commons"
Quest Atlantis — 3D MUVE

The people of Atlantis face the threat of their civilization slowly being destroyed. In this dynamic environment that serves as both a game and learning environment, students can participate in two components: The Legend and the 3D Space.

The Legend: A three-dimensional interactive story that provides a series of challenges. To complete these challenges, students must learn and apply knowledge. This component is open to students of all ages and can be used to supplement various learning levels.

The 3D Space: A virtual world that contains a series of locations that students can visit. These locations are designed to focus on specific domains of knowledge. Through the 3D Space, students can share their experiences and knowledge with their peers.

Today's youth learn in different ways. The Quest Atlantis Council seeks to support their learning in this new and dynamic environment.
Quest Atlantis — 3D MUVE

Questing

In Quest Atlantis, the central activity is to go "QUESTING!" Members do this by travelling through virtual villages and worlds in which they locate and complete quests. These quests create opportunities for members to learn and grow in a variety of fun and exciting ways, at the same time providing useful information for the citizens of Atlantis. Below is a screenshot from the 3D version of Quest Atlantis showing a scene from a village (which is contained inside the World) on the left and the homepage for the Quester on the right.
Learning Objects?

• “Any digital resource that can be reused to support learning.” (Wiley, 2002)

• But essentially digital resources (assets) and learning activities
Reuse attributes

✓ isolating digital assets from activities?
✓ level of granularity?
✓ particular teacher dependency?
✓ design reusability?
✓ identifying key attributes?
✓ generic templates or shells?
✓ transferability to other domains?
Digital Asset Use

- INFORMATION OBJECT
- ACTIVITY
- LEARNING ARTEFACT
  - KNOWLEDGE OBJECT
  - CONVERSATION SUPPORT
  - THINKING SCAFFOLDS

Digital Asset Use
Content object options

- Information display
  - Matrix display eg choosing columns to match
  - Swapping representation mode eg data to graph
  - Hierarchy eg organisational chart
  - Process eg flowchart
- Conceptual models
  - Presenting models of real world phenomena
  - Manipulating parameters to “see” relationships
- Contextual representation
  - Data linked to context
  - Collect evidence from context
• Digital asset with feedback
• Designed for small screen display

Set up your circuit
Designing for small screens

Set up your circuit
Object for multi-modal representation
Supporting Students Digital Literacies
Scientific representations

- different media/modes provide different meanings and different types of information

• Illustrate period leading to empathy
• Showing sequence and duration

Historical time

Internet Domain Name System Timeline
• Meanings conveyed in many different forms
• Alternate ways of showing ideas
Learners multi-modal responses
Media tools …

- Increasing the ways in which tools can be used
- Instant movies
- Converting between representational forms
- Rethinking the visual and interactive forms to create new interactions with content
  (cf Amazon vs traditional bookstores)
Thinking cannot be separated from doing
Thinking and solving problems are uniquely affected by context
Cognitive and physical activity use artefacts that are to hand as tools
Contexts usually contain other people
  Social nature of learning
“The map is not the territory”
Understanding is interpretation
LAMS — reusable pedagogical objects
Turning learning management systems on their head ...
Learning Management Systems (LMS)

- allow instructor to organize resources in a predetermined structure which prescribes a fixed learning strategy.

Digital Repositories

- allow users to take control of their choice of resources, choosing ways of representing and using resources, creating new resources and even developing their own learning strategies.

G-portal
G-portal project

- digital repository that affords multimodal representations
- hosting digital assets, that students can use it to solve an authentic problem based on real world resources.
- allows students to explore the information, process the information, solve the problem posed and perhaps even form new attitudes and reflections of their role in the natural environment
• G-portal provides more than just a spatial context for accessing Geographic information
• G-portal provides for conversion of information between representational forms
PBL with Digital Libraries

What's new at DLESE
- DLESE 2005 Annual Meeting - check out speaker presentations, meeting photos, Daily DLESE meeting newsletter
- JCCL 2005 report available in July-August 2005 D-Lib Magazine
- Funding opportunity: DLESE Evaluation Service offers MiniGrant Program
- New resources & reviews
- Review DLESE resources

Resource of interest

The space shuttle Discovery successfully lifted off on July 26th, NASA’s Return to Flight Website offers up-to-date information and images from the mission. The Ultimate Field Trip offers an astronaut’s view of Earth, providing a journal and images taken on previous missions from the Space Shuttle and the International Space Station. Students can learn about the historical impact of space exploration in Scholastic’s Challenge the Space Odyssey activity which includes a timeline of initial efforts to explore worlds beyond our own.

http://www.dlese.org/dds/index.jsp

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• Tools should support the cognitive operations of social tasks
• Tools should support community easily and enable compare and contrast and other strategies which support students to understand why their responses ‘fit’ the learning task.
Establishing social networks

Compiled Messages

Message no. 5
Posted by John Hedberg (CFLDEV4) on Thursday, August 1
Subject: Educational Issues and IT: What they are and what should be

Educational Issues and IT: What they are and what should be

Message no. 9[Branch from no. 5]
Posted by John Hedberg (CFLDEV4) on Tuesday, September
Subject: Re: Educational Issues and IT: What they are and what should be

Another comment about the problems with using technology

Message no. 11[Branch from no. 9]
Posted by John Hedberg (CFLDEV4) on Tuesday, September
Subject: Re: Educational Issues and IT: What they are and what should be

This is a sub point to the first

Message no. 12[Branch from no. 11]
Posted by John Hedberg (CFLDEV4) on Tuesday, September

Digital Resource
by Choo Kian Tse - Wednesday, 25 August 2004, 10:54 PM

Raymond,

You got a valid point here. Wiley had also defined your points stated are valid. We need to limit to some extent what will be considered LO according to LTSC's definition.

Please do go over to Foo Keong's newly created thread and copy all your discussions here over to the new thread.

Sorry for all the mess created. My apology.

Re: An Ideal Definition ???
by Raymond Wong - Wednesday, 25 August 2004, 03:29 PM

But what is the definition of digital resources? The help to "limit the scope" does it? Resources could be animations to java applets to text files to powerpoints.

Re: An Ideal Definition ???
by Michael J - Wednesday, 25 August 2004, 12:28 PM

If we accept their (McGreal & Roberts, 2001) definition:

For a definition to be useful, it has to limit the scope...
Exploring other tools for collaborative learning
Mobile devices may be one step backwards

- Lack of good visual materials on PDA and phones
- Mobility is great but is it used well in learning tasks
- Decline in attention spans!
- Decline in length of articles with web dissemination (was 5000 now 1000 words)
Mobility, social learning and geographical ideas

• How do students help each other explore and navigate unfamiliar environments
• What is the nature and quality of non-mediated, real-time, text-based debate between students, and how they might use multimedia recorded in situ to augment their views
• How students transpose their conceptions of locations into two-dimensional representations, and how these transpositions can be successfully communicated to their peers
• Pairs of Grade 9 students from a secondary school in Singapore
• Each given a camera-phone
• Asked to do two tasks in the field
  • An orienteering task (to familiarize students with a given neighbourhood)
  • A task involving debating an issue of relevance to the geography of the same neighbourhood
• Followed by peer critique session & presentation
Active authentic socially negotiated tasks
# Orienteering skills

<table>
<thead>
<tr>
<th>Time</th>
<th>Leading team</th>
<th>Following team</th>
</tr>
</thead>
<tbody>
<tr>
<td>1518</td>
<td>Take a pic can</td>
<td>Where is the sign board?</td>
</tr>
<tr>
<td>1518</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1518</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1521</td>
<td></td>
<td>Outside the pet shop den where to go</td>
</tr>
<tr>
<td>1524</td>
<td>Go to the all breed pet then take a pic</td>
<td></td>
</tr>
</tbody>
</table>
## Preparing arguments

<table>
<thead>
<tr>
<th>Time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1557</td>
<td>There are many markets, banks, shopping centres, provision shops, coffee shops, mini markets, a community centre, bus stops, and citizen corners, with upgrading on HDB.</td>
</tr>
<tr>
<td>1601</td>
<td>Senior citizen corner provides a place for elders to gather. Fitness corner and swimming pool allow residents to exercise to stay healthy. Community club allows different races to build relationships.</td>
</tr>
<tr>
<td>1605</td>
<td>There are many food stalls, making it easy for people to find a place to eat. Here we also have dry and wet markets.</td>
</tr>
<tr>
<td>1606</td>
<td>There are lots of wet markets, bus stops, banks, recreation shopping centres.</td>
</tr>
<tr>
<td>1608</td>
<td>Lots of markets, banks, shopping centres, provision shops, coffee shops, mini markets, a community centre, bus stops, citizen corners, playgrounds, upgrading on HDB.</td>
</tr>
</tbody>
</table>

Here has a lot of clinics provide for people to use...

We can find many food stalls therefore people can find a place to eat very easy. Here we also dry and wet markets.
## Activity types

<table>
<thead>
<tr>
<th>Rule focus</th>
<th>Logical Problems</th>
<th>Practice strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Algorithmic problems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Story Problems</td>
<td></td>
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<tr>
<td></td>
<td>Rule-using problems</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Incident focus</th>
<th>Scenarios</th>
<th>Linking ideas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Decision making</td>
<td></td>
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<tr>
<td></td>
<td>Case study tasks</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategy focus</th>
<th>Troubleshooting</th>
<th>Generating new strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diagnosis solution problems</td>
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<tr>
<td></td>
<td>Strategic performance tasks</td>
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<td></td>
<td>Design tasks</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Role focus</th>
<th>Dilemmas</th>
<th>Multiple perspectives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Social dilemmas</td>
<td></td>
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</tbody>
</table>
• To be engaged is to be enticed into interacting
• The more attentive the learner is to the task, the more complete the engagement
• Our goal is to “crank up” the engagement continuum
Comparing continuums

The Engagement Continuum

- Passive Interest
- Dynamic Interaction
- Flow

Engaged Learning Continuum

- Transfer
- Translate
- Transcend
Engaged learning continuum

- **Transfer**
  - Transfer conventional instructional tools, strategies, communication and delivery to a technology-enhanced learning environment

- **Translate**
  - Redefine and shift conventional instructional tools, strategies, communication, and delivery to the technology-enhanced learning environment

- **Transcend**
  - Go beyond conventional instructional tools, strategies, communication, and delivery to invent new paradigms for teaching and learning
### Searching for the disruptive!

#### Generative
- Write a script then use iMovie to create a narrative documentary

#### Representational (transduction)
- Using Excel to convert numbers & to show relationships

#### Presentational
- Using PowerPoint in a lecture
- Presentational
- Student Use

<table>
<thead>
<tr>
<th></th>
<th>Teacher use</th>
<th>Student Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentational</td>
<td></td>
<td></td>
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<tr>
<td>Generative</td>
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<td>Representational (transduction)</td>
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</table>
## Searching for the disruptive!

<table>
<thead>
<tr>
<th></th>
<th>Teacher use</th>
<th>Student Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentational</td>
<td>Using PowerPoint in a lecture</td>
<td>Using PowerPoint to report back</td>
</tr>
<tr>
<td>Generative</td>
<td>Using an outliner to generate a text structure</td>
<td>Building a game using web pages</td>
</tr>
<tr>
<td>Representational (transduction)</td>
<td>Using Excel to convert numbers &amp; to show relationships</td>
<td>Write a script then use iMovie to create a narrative documentary</td>
</tr>
</tbody>
</table>
### e-learning possibilities

<table>
<thead>
<tr>
<th>Engagement</th>
<th>Passive Interest</th>
<th>Dynamic Interaction</th>
<th>Flow state</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-Learning</td>
<td>Transfer</td>
<td>Translate</td>
<td>Transcend</td>
</tr>
<tr>
<td>Applications</td>
<td>• Online lecture notes</td>
<td>• Web resources</td>
<td>• Dynamic knowledge collection</td>
</tr>
<tr>
<td></td>
<td>• PPT presentations</td>
<td>• Learning objects</td>
<td>• Problem-based gaming</td>
</tr>
<tr>
<td></td>
<td>• e-Reserves</td>
<td>• Media databases</td>
<td>• Interactive presentations</td>
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<td></td>
<td></td>
<td>• Multimedia</td>
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<td></td>
<td></td>
<td>presentations</td>
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<tr>
<td></td>
<td></td>
<td>• Interactive e-texts</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>• Weblogs</td>
<td></td>
</tr>
<tr>
<td>Learning outcomes</td>
<td>• Computer literacy</td>
<td>• Visual literacy</td>
<td>• WIKIs</td>
</tr>
<tr>
<td></td>
<td>• Comprehension</td>
<td>• Customized learning</td>
<td>• Problem-solving</td>
</tr>
<tr>
<td></td>
<td>• Convenience and accessibility</td>
<td>• Critical thinking</td>
<td>• Reflection</td>
</tr>
<tr>
<td></td>
<td>• Time management</td>
<td>• Alternative learning strategies</td>
<td>• Contextual learning</td>
</tr>
<tr>
<td></td>
<td>• Convenient access to information</td>
<td>• Information analysis</td>
<td>• Community building</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Teamwork</td>
<td>• Social networks</td>
</tr>
</tbody>
</table>
Next steps for disruptive pedagogies

- Recognise students’ time poverty
  - Use the affordances of blended learning and appropriate technologies to help them cope with this
- Increase integration of activities and learning strategies that support integration
- Use portfolios to indicate learning journey
- Facilitate student benchmarking of work (against other students) and support networks and relationships
- Rethinking learning activities such that technology is integral to understanding not an “add-on”
- Changing assessment to focus on using concepts in problem solving (rather than recall of information)
• John G Hedberg  
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