Pedagogical theory for e-Learning Design: From ideals to reality?

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Menu

1. What is e-learning?
2. The role & evolution of technology
3. Educational principles – e-learning principles?
4. People?
5. E-learning and pedagogic change?
1. What is e-learning?
E-learning (widely defined):

- Digital education
- Technology-enhanced learning
- ICT in education
- Learning with technology
- Instructional technology
- Educational technology

... the **study** and **practice** of **facilitating learning and improving performance** by creating, using, and managing appropriate **technological processes and resources**. (AECT)
E-learning ..... Widely defined

- in distance teaching
- in mixed (blended) teaching
- in presence teaching

- in formal schools
- in formal workplace learning
- for informal learning

- Distance teaching
- Knowledge creation
- Online collaboration
- Online tutoring
- Automated assessment
- Online course management
- Electronic books
- Interactive multimedia
- Simulations and educational games
- Teleteaching through videos

... and much more
E-learning is many things (again). E-Learning «topics» are:

Cognitive tools for learning, computer-assisted language learning, computer-based assessment systems, computer-based training, computer-mediated communication, computer-supported collaborative learning, distributed learning environments, electronic performance support systems, interactive learning environments, interactive multimedia systems, interactive simulations and games, intelligent agents on the Internet, intelligent tutoring systems, microworlds, virtual reality based learning systems, MOOCs, ….
Use of technology in different domains:

Reality does not match potential:
... quality could be improved
... scope and richness could be expanded
The role & evolution of technology
E-learning = A history of hype cycles

The **Hype Cycle** is a branded graphical tool by Gartner Consulting for representing the maturity, adoption and social application of specific technologies.

- **Technology Trigger**
- **Trough of Disillusionment**
- **Slope of Enlightenment**
- **Plateau of Productivity**
- **Peak of Inflated Expectations**

Technology, not pedagogy, triggers new cycles (mostly). Technology is the driving force, even if we do not like it …

http://en.wikipedia.org/wiki/Hype_cycle

2 - 25 years
The technology hype curve in education (Hypecycle, 2014)

Interactive tool: https://hypecycle.umn.edu/
It is difficult to predict the future: Gartner etc. can be very wrong.

2009: Gartner’s education hype cycle: «Podcasts/Educational TV are dead»

But in 2014: Podcasts are central in (x)MOOCs!
E-learning - «Big inventions» about every 10 years

- New administrative structures are created,
- little communication between new and old structures
- New people enter the game, no understanding of basic principles

A huge diversity
Change is usually very slow, sometimes it appears to be fast.

The xMOOCs «tsunami» bundles other stuff…

- Open educational resources (OER)
- Educational broadcast (Edison ‘20)
- Educational TV
- Computer quizzing (automated assessment)
- Podcasts (iTunes)
- Teleteaching
- Khan academy (cool videos for kids)
- Rapid e-learning (short videos for grownups)
- Peer-to-peer assessment
- Collaborative learning
- Online communities
- cMOOCs (Downes & Siemens)

1920  2008  2012
Before following the latest hype:

- Ask if it is compatible with sound instructional design principles?
- ... with your ideals of teaching?
- Look at past achievements of similar technology
- Analyse what a new technology can do (affordances for different pedagogies)
Educational principles – e-learning principles ?
Are there first principles of good e-learning design? Is there an «e-learning theory»?
First question: what is good education? (M. David Merrill)

1. The demonstration principle
   • Learning is promoted when learners observe a demonstration

2. The application principle
   • Learning is promoted when learners apply the new knowledge

3. The activation principle
   • Learning is promoted when learners activate prior knowledge or experience

4. The integration principle:
   • Learning is promoted when learners integrate their new knowledge into their everyday world

5. The task-centered principle
   • Learning is promoted when learners engage in tasks that lead to something

http://mdavidmerrill.com/Papers/firstprinciplesbymerrill.pdf
Second question: what can e-education “add” to education?

Activities are supported by tools (incl. digitized resources). Some activities can lead to tangible “products”, which can be discussed, evaluated, reused, etc.

Products feed into activities

(Videos, online text, blog, wiki, file upload, links manager, albums, glossary tool, calendar, forum, IM, project mgmt, databases, professional software, …)
The e-learning challenge – make it better (1)

Find good strategies and tactics to improve quality while keeping costs stable.

Richness & quality

N participants

100’000

10000

1000

100

10

low

high

100’000 Videos

xMOOCs

Online textBooks

Distance E-learning with quizzes

Dist. elearning with activities & tutoring

Teacher-led E-learning with activities

Classroom learning

Blended learning

Find good strategies and tactics to improve quality while keeping costs stable.
The e-learning challenge – make it better (2)

Graph showing the relationship between Quality and the number of participants (N) with a focus on how increasing the number of participants affects the quality, indicated by the red arrow pointing upwards.
The bottom line from many meta studies:

- Quality is more important than type of design (good transmissive learning is better than bad constructivist).
- Ambitious strategies require “scripting” (who does what when with which resources).
- Most learners need (formal) challenge (informal self-guided learning cannot replace formal learning).
- Learners need guidance and feedback.
- E-learning is design for learning, enhanced with digital tools.
- Education is design for learning.
Adapt pedagogy to learning level / type

- Define learning objectives
- Adapt teaching strategy & tactics to objectives

Anderson & Krathwohl taxonomy
(picture from Wikipedia)
<table>
<thead>
<tr>
<th>Learning types</th>
<th>Ex. strategies</th>
<th>Ex. technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>I: know that</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-a Facts: recall, description, identification, etc.</td>
<td>Direct instruction, programmed instruction, mastery learning</td>
<td>Presentation of contents (texts, pictures, diagrams, multimedia animations) on various technical supports.</td>
</tr>
<tr>
<td>I-b Concepts: discrimination, categorization, discussion, etc.</td>
<td>Discovery learning, exploratory learning</td>
<td>The computer as a library, Writing/drawing software</td>
</tr>
<tr>
<td>II: know how</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II-a Reasoning and procedures: inferences, deductions, etc. + procedure application</td>
<td>Simulation, virtual laboratory, problems to solve</td>
<td>Various kinds of interaction that include quizzing software, CBT, Simulations, microworlds etc.</td>
</tr>
<tr>
<td>II-b Problem solving and production strategies: sub goaling + application of heuristics/methods</td>
<td>Case-based, inquiry-based, problem based learning</td>
<td>Various computer-mediated communication (CMC) tools such as email, forums, audio/video conferences, virtual environments, e-portfolios, etc.</td>
</tr>
<tr>
<td>III: knowing in action</td>
<td>III Situated action: strategies in complex and authentic situations</td>
<td>project-based learning</td>
</tr>
<tr>
<td>IV: Other</td>
<td>IV Other: e.g. motivation, emotion, reflection</td>
<td>ARCS, learning portfolios</td>
</tr>
</tbody>
</table>
Educational scenarios (learning designs)

Define

• who does what (tasks/activities) and when,
• using tools and resources

Scenarios = strategies & tactics made operational
9 events of instruction (Gagné)

1. **Gain attention** (ground the lesson, motivate)
   - Present a good problem, a new situation, use a multimedia advertisement, ask questions…

2. **Describe the goal** (frame the information, create expectancies)
   - State what will be accomplished, how knowledge can be used, give a demonstration,…

3. **Stimulate recall** of prior knowledge (help connecting)
   - … facts, rules, procedures or skills relevant to the current lesson …. 

4. **Present** the material to be learned
   - e.g. text, graphics, simulations, figures, pictures, sound, etc. Chunk information

5. **Provide guidance** for learning
   - Presentation of content is different from instructions on how to learn. Use of different channel (e.g. side-boxes)

6. **Elicit performance** "practice"
   - Practice skills or apply knowledge.

7. **Provide informative feedback**
   - Show correctness of the trainee's response, comment learner's behavior, ….

8. **Assess** performance, test if the lesson has been learned.
   - Also provide general progress information

9. **Enhance retention and transfer**
   - Provide additional practice. Put the learner in a transfer situation,…
Elicit questions
Experiment, observe, read.
Compose Q & A
Present / Discuss
Reframe

The crucial difference between current formulations of inquiry and the traditional "scientific method" is the explicit recognition that inquiry is cyclic and nonlinear.

Sandoval 2004p. 216

http://tecfa.unige.ch/perso/lombardf/publications/maastrich-14-16XI07/
Some strategies take time: Inquiry learning (Lombard, 2012)

It takes about 3 months before there is some deep learning!!

Epistemic complexity of wiki page versions during an investigation (2007)

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<th>Detailed descriptions</th>
<th>Simple explanations</th>
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</tbody>
</table>

Some strategies take time: Inquiry learning (Lombard, 2012)

It takes about 3 months before there is some deep learning!!

Progression de l'investigation : numéro de version et date (2007)
Tutoring structure and sentiment of presence

Learners must be tutored
• Break down learning activities into steps
• Assign clear roles to tutors

Learners must become part of a community. E.g. use:
• chat sessions,
• flipped classrooms
• knowledge co-construction activities
• sharable e-portfolios
• peer commenting/tutoring/evaluation

Failure rates:
• MOOCS: 95%
• Distance education with little tutoring: 60-70 %
• Distance education with tutoring and presence: 5-20 %
Good e-learning:

..... uses an appropriate pedagogical **strategy** aligned with goals, means and other constraints
..... creates **active** learning and **active** learners
..... Uses **technology to enhance** delivery, cognition, tutoring, collaboration, evaluation. etc

Good e-learning technology:

Supports educational **strategies and tactics** with appropriate tools
4. People?
Teachers should be trained in using technology for education

TPACK = be able to create technology enhanced teaching designs (that include use/teaching of domain technology too)

(Koehler & Mishra)

TK, TCK, TPK and TPACK is missing from teacher education

The TPACK framework (teacher development)
1% Rule: Only 1% of a community web site’s users are active

Variants: 1-9-90 rule or 90–9–1 principle: Within a community:
• 90% only view content,
• 9% edit content
• 1% actively create new content.

http://en.wikipedia.org/wiki/1%_rule_(Internet_culture)

Wikipedia statistics (feb 2014)
• 18 billion page views
• 500 million unique visitors each month.
• 22 million accounts
• ~70,000 active editors (0.01 %)
• ~7000 do half of the content (0.001 %)
Digital natives can:
• ... engage in digital conversation
• ... create simple digital objects (messages, videos, posts, ...)
• ... exchange digital objects

Digital natives cannot:
• ... use professional software
• ... participate in knowledge creation environments
• ... articulate or even follow scenarios

Internet skills are conversational

Full ICT and knowledge working skills must be taught (some of it can be enforced in formal education !)
People tend to use a techno-pedagogy if it is:

- Technology acceptance
- Available (it must work)
- Useful (effective)
- Usable
- Return on Investment (efficient)
5. E-learning and pedagogic change?
Innovation in schools?

- **Model 1:** Teachers read research and implement it in their classrooms: teachers neither have time nor skills
- **Model 2:** Summary guides: not explicit, not enough
- **Model 3:** General professional development: Long-term professional development for teachers can be effective. (Briars, 2001; Briars & Resnick, 2000).
- **Model 4:** The policy route: diagnosis of causes is speculative, uses not effective time scales, etc. (Dillon, 2003).
- **Model 5:** The long route: takes 25 years or more: productive dialectic between educational research and practice.
- **Model 6:** Design experiments: Work, but can’t be scaled

Time needed for school wide change= 25 years or more
Best unit for change is school … a system may need >100 years
E-learning offering the same quality as traditional teaching costs more! Therefore, try reducing costs:

- Use standards
- Automatize what can be
- Focus material production on difficult matters
- Reuse OER
- Use/repurpose domain tools, e.g. engineering software, online word processors, ….
- Have students contribute (materials, tutoring)
- Peer-tutoring / commenting

Some ideas ….
Conclusion

There is no universal e-learning implementation theory, but some principles that are supported by empirical evidence:

- **Goals and learning outcomes**

- **Pedagogic design principles & strategies**
  - Define

- **Implementation community (e.g. a school)**
  - Define
  - Constrain

- **Means**
  - Empower
  - Create
  - Define

- **Technology infrastructure**

- **Implement**

- **Teacher development**
Thank you for listening

Questions ?
Comments ?

http://edutechwiki.unige.ch/