Educational Innovation and Learning Analytics

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New Learning and Teaching Practices

Educational Innovation – A multilevel Approach

Some theory ...
... and some examples

Living Labs for Evidence-based Education
New Learning and Teaching Practices
Estonian Lifelong Learning Strategy

- “A change in the approach to learning”
  - learning how to learn
  - learning how to solve problems
  - collaborative learning
  - creativity
  - entrepreneurship

- “Improving the Access to a Digital Infrastructure for Learning”
  - Contributing to a Digital Turn in Education
What are these New Teaching and Learning Practices?

Collaborative, creative, problem-based learning

Why?
- Meaningful and social activity in formal education
- Societal problems require innovation and creativity
- Faster reaction and appropriation of innovation
- Jobs change quickly, it is not enough to learn once and then built on it a lifetime

Why not?
- There is no “one-size fits all” pedagogy
Example: Vocational Training in the Construction Industry

- Trainers Collaborate on Creating Learning Resources
- Embedding Learning into Workplaces
- Apprentices contribute to Learning Resources
- Extending Learning to the Companies
Educational Innovation – A Multilevel Approach
Let’s have a look at the Innovation Process

Policy

School

Teacher

Learning Environment

Student Learning

School

Teacher

Learning Environment

Student Learning
Institutional Change and Innovation

New Learning Environments and Practices

Teachers and Trainers: Facilitators of Learning

Learner Interaction and Cognition

Digital transformation
Co-design and Living Labs

Problem-based, collaborative, creative learning
Learning Design and orchestration

Teacher Professional Learning and Professionalisation

Technology-mediated Social Learning Distributed Cognition
Some Theory ...
How to measure Teaching and Learning Practices

Behaviors, attitudes, personal theories ...
... all part of it, but it is more complex

- the object of activity
- tool-mediated
- embedded in a culture

Fessl, Pata et al. (2016)
Tools have an intentionality

Villemand, 1910: À l'École, Bibliothèque national de France
http://expositions.bnf.fr/utopie/grand/3_95b1.htm
Why digital tools and artefacts?

- Opens up collaboration across time and space
- Malleable representation, circulating reference (Latour), inscription of meaning (Verbert), reification (Wenger)
- Opens up possibilities of change
- Tracing of practices and activities, leaving digital traces ("Learning Analytics")
... and some Examples
Examples

- Institutional Change and Innovation
  - co-design for digital transformation
  - measuring innovation adoption in schools

- New Learning Environments and Practices
  - game-based learning
  - collaborative learning
  - mobile technology for learning outside the classroom
  - creating and sharing learning designs

- Teachers and Trainers: Facilitators of Learning
  - professional learning and professionalisation

- Learner Interaction and Cognition
  - coupling of individual and collective knowledge
New Learning Environments, Tools and Practices

Games and Practices of Using Games in Schools

Energy saving simulator
http://www.tlu.ee/~raxsade/ecohouse/

Mobile tools for out of classroom learning
https://confer.zone/

Creating and Sharing Learning Designs

http://leplanner.net

Collaborative Environments for knowledge building
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Co-Designing Innovative Practices

- Contextual Inquiry
- Co Creation
- Experimentation
- Evaluation

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http://www.samsungdigipoore.ee
Learnmix: Practices of Using Textbooks in Schools

- **Rapid Ethnography**
  - 5 schools, 16 lessons, grades 4-12

- **Questions**
  - Digital artefacts and their use in the classroom
  - Pedagogical scenarios, knowledge building

- **Findings**
  - Digital artefacts merely replace traditional tools (like blackboard)
  - No innovative knowledge building scenarios
Learnmix: Practices of Using Textbooks in Schools

- **Outcome**
  - taxonomy for co-authorship levels of artifacts (consume, annotate, manipulate, submit, expand, remix, create)
  - develop innovative 5 learning scenarios, in which learner is given a role of being an active digital artefact creator/designer
Creative Classroom: Co-designing new practices

Electronic Course Planning Environment LePlanner (leplanner.net)
Measuring Innovation Adoption in Schools

- **Digital Mirror**
- evaluates
  - Digital infrastructure;
  - Pedagogical innovation
  - Systemic change management and leadership
- Peer-review process

Tracing activities with an artefact-actor network ...
... and feeding it back to learners and teachers
How is learning happening in these environments?

- Focus in the Cognitive Sciences has long been on the mind as an autonomous information processor.
- How can cognition be modeled as being coupled with our social and material environment?
Coupling of individual and collective learning

Collective Distributed Cognition

Enculturation of patterns

Stabilization of Cultural pattern

Aggregation to form Cultural Pattern

Artefact-mediated Feedback

Individual Sensemaking and Pattern formation

Individual stabilization to form personal pattern

Personal pattern

Epistemic Distributed Cognition

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Using a Wiki for a collaborative writing task

- Essay writing task in dyads over 3 months in two different universities (49 students)
- Two prompting conditions to induce different cognitive strategies
  - Assimilation prompts: provide examples,
  - Akkommodation prompts: restructure, compare
- Co-Evolution Model: Mutual influence of cognitive and social processes (Cress & Kimmerle, 2008; Ley, Schweiger, & Seitlinger, 2011)
- Dependent Measures
  - Externalization: Wiki edits
  - Internalization: Concept Maps and Association Test

Results: Externalization Measures

- While the overall number of words in essays is same in both groups, accommodation group has higher number of edits

- Accommodation prompts lead to higher number of accommodative edits
Results: Concept Maps and Association Test

- Internalization takes places as shown by increasing number of nodes in Concept Map

- Prompts lead to differences in cognitive structures as indicated by the association test
Living Labs for Evidence-based Education
Collecting evidence for an educational Innovation

Using Concept Maps for Collaborative Learning in Science Education

Learning Gain?

Learning Gain?

Learning Gain?

... scaffolding the activity

... age of the students

... subject taught

... prior knowledge

...
A Living Lab for Educational Innovation

Teachers become change agents in their schools

Teachers run distributed study in their classrooms

Community of researchers and teachers co-design intervention and research process

Researcher collect evidence on educational innovation
Scaling up research and innovation

- Teachers in community become local ambassadors
- Possibility to run large-scale educational research studies
- Enabled by learning analytics that trace real-time practices and effects
Different types of Living Labs

- Utilizer-driven, e.g. through companies to improve their products
- Enabler-driven, e.g. through policy initiatives
- User-driven, e.g. through citizens and communities
- Provider-driven: e.g. research-driven

Wrapping up

- Learning and teaching is happening in activity systems where individuals are tightly coupled with their social and material environment.
- Technology brings an opportunity ...
  - to trace new learning practices
  - to instigate innovation in education
- ... if Learning Analytics recognizes the complexities of learning.
- Educational Innovation is a systemic process that spans several levels of analysis.
- Living Labs can scale innovation and research.
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