Educational Innovation and Learning Analytics

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Overview

New Learning and Teaching Practices

Educational Innovation – A multilevel Approach

Some theory ...
... and some examples

Living Labs for Evidence-based Education

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New Learning Practices

New Learning and Teaching Practices

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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*

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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 liftetime*
- *Why not?*
  - *There is no “one-size fits all” pedagogy*

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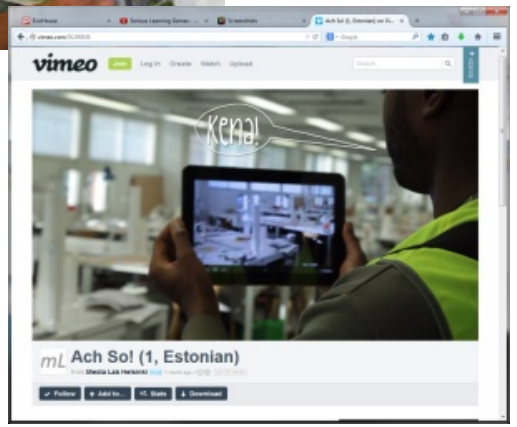
Example: Vocational Training in the Construction Industry

Trainers Collaborate on Creating Learning Resources

Embedding Learning into Workplaces

Extending Learning to the Companies

Apprentices contribute to Learning Resources



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Educa-tional Innovation

Educational Innovation – A Multilevel Approach

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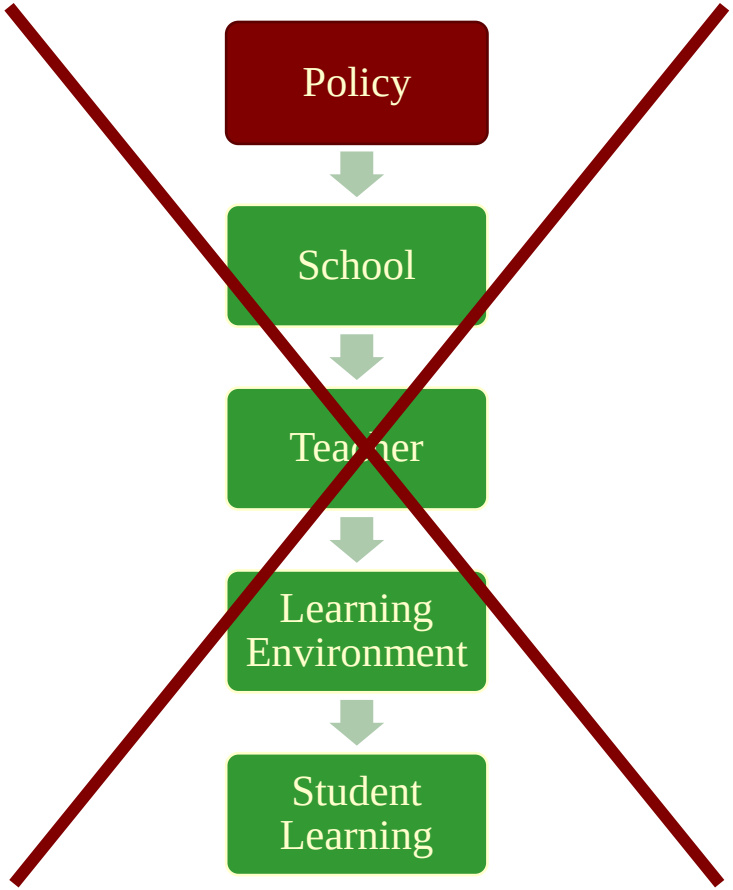
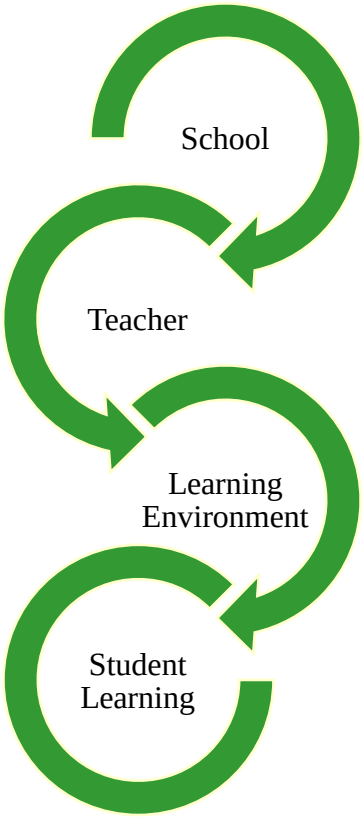
Let's have a look at the Innovation Process





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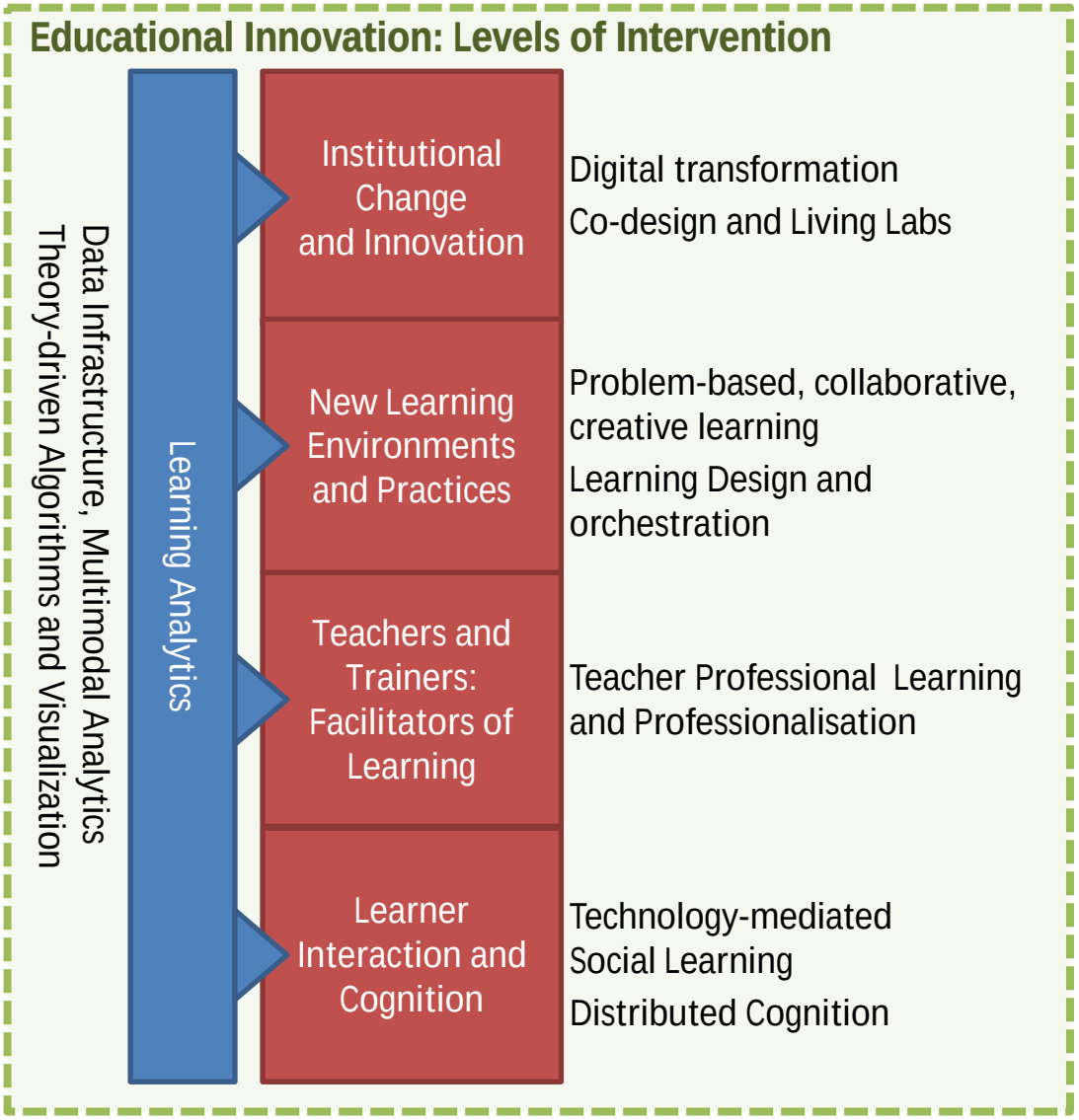
Adressing Educational Innovation



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Theory

Some Theory ...

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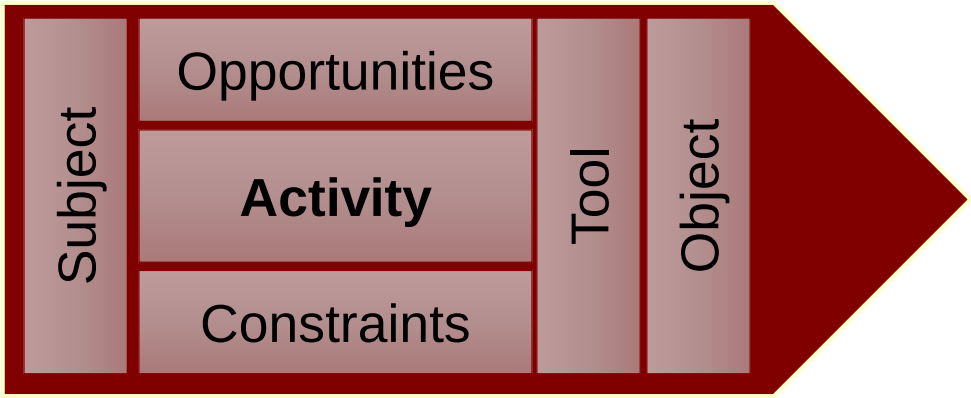
How to measure Teaching and Learning Practices

Behaviors, attitudes, personal theories ...

... all part of it, but it is more complex

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



- *Tight coupling with our social and material environment serving an object of activity*

Fessl, Pata et al. (2016)

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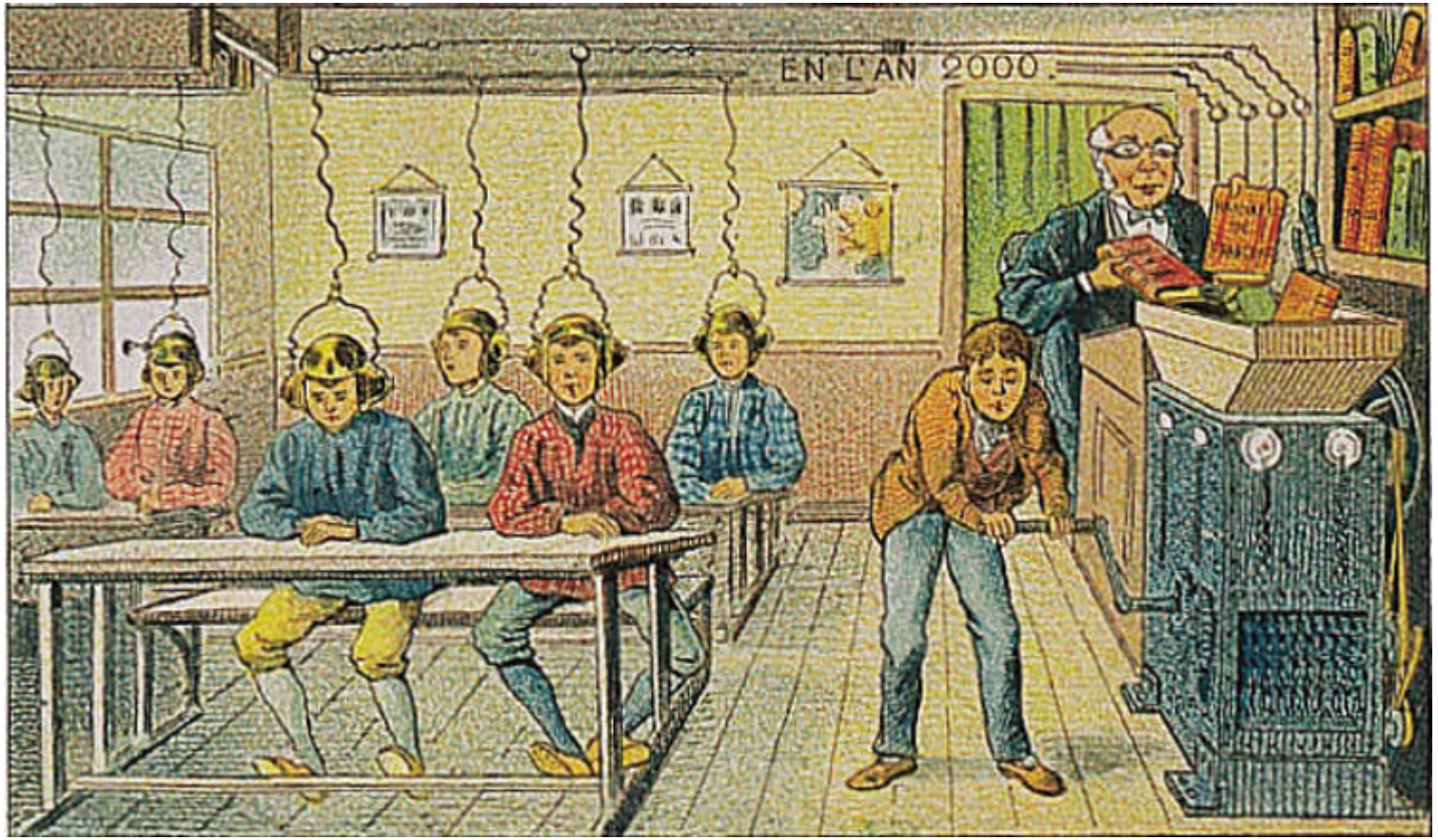
Tools have an intentionality



Villemard, 1910: À l' École, Bibliotèque national de France
http://expositions.bnf.fr/utopie/grand/3_95b1.htm

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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”)*

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Examples

... and some Examples

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Examples

- *tracing learning in artefact actor networks*

- *co-design for digital transformation*
- *measuring innovation adoption in schools*
- *game-based learning*
- *collaborative learning*
- *mobile technology for learning outside the classroom*
- *creating and sharing learning designs*
- *professional learning and professionalisation*
- *coupling of individual and collective knowledge*

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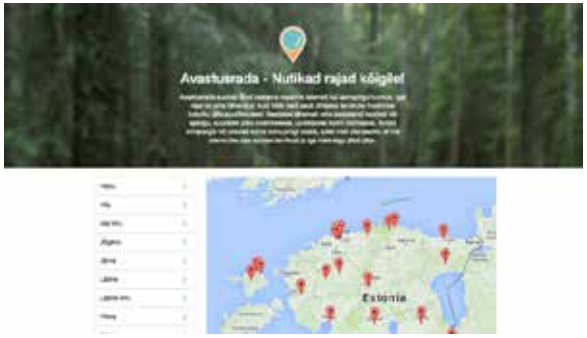
New Learning Environments, Tools and Practices

Games and Practices of Using Games in Schools

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

Mobile tools for out of classroom learning



http://avastusrada.ee

https://confer.zone/

Creating and Sharing Learning Designs

http://leplanner.net

Collaborative Environments for knowledge building

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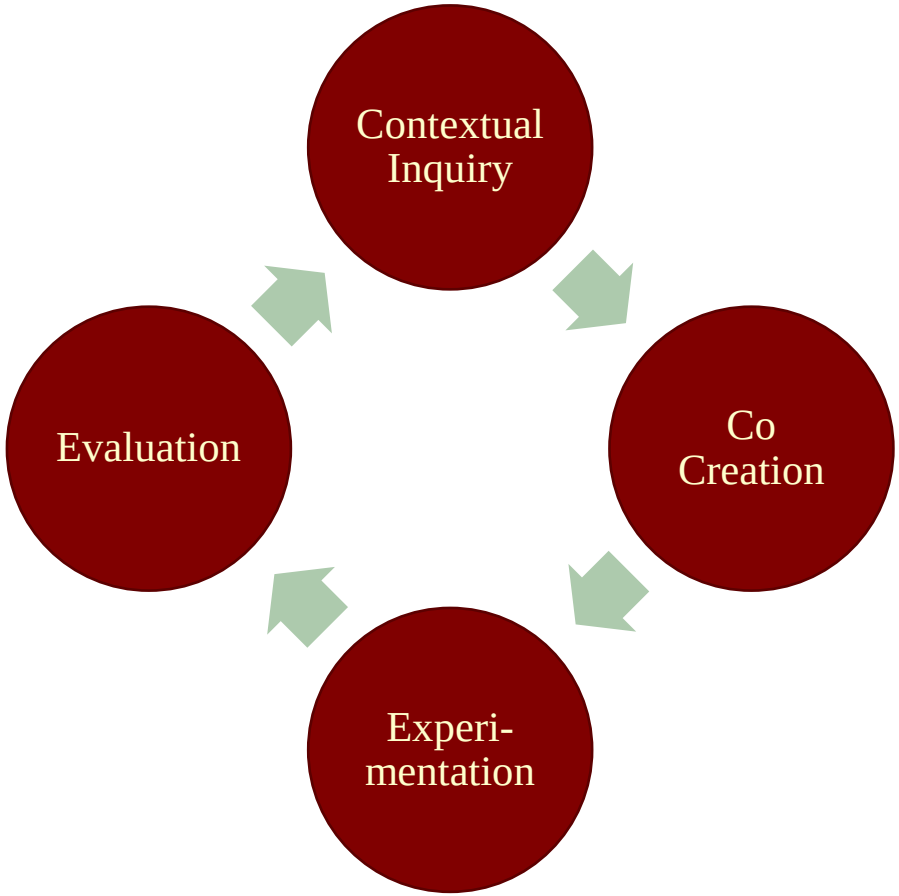
Co-Designing Innovative Practices



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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*

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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*

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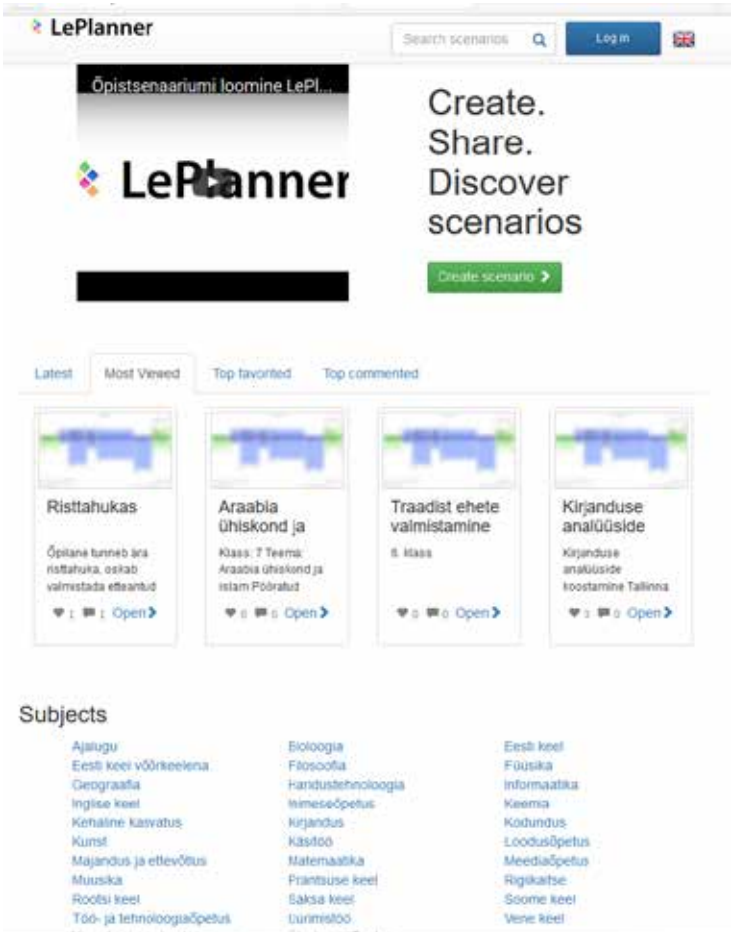
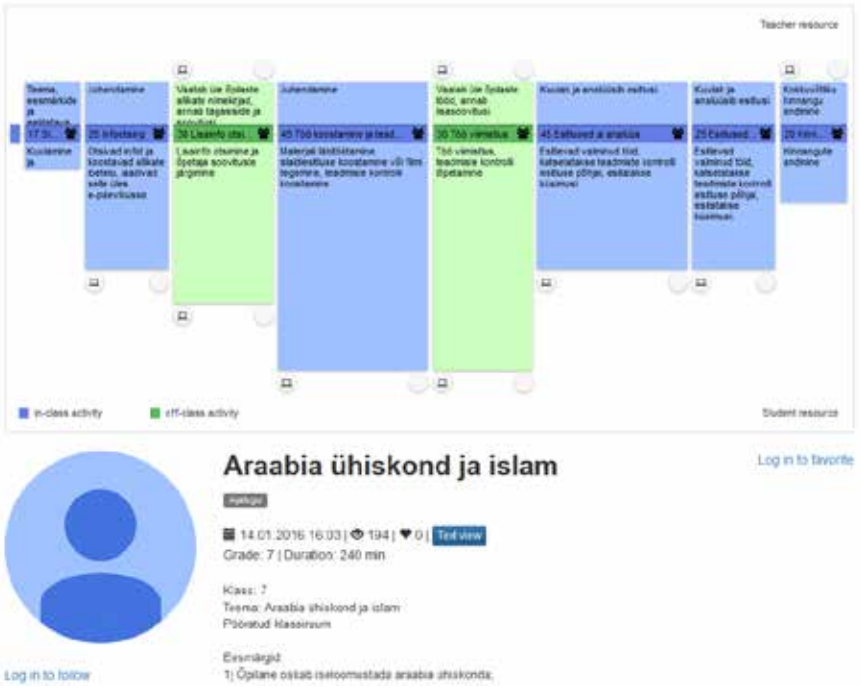
Creative Classroom: Co-designing new practices

Electronic Course Planning Environment LePlanner (leplanner.net)





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Measuring Innovation Adoption in Schools

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

M.Fullan (2013) Stratosphere: Integrating Technology, Pedagogy and Change Knowledge

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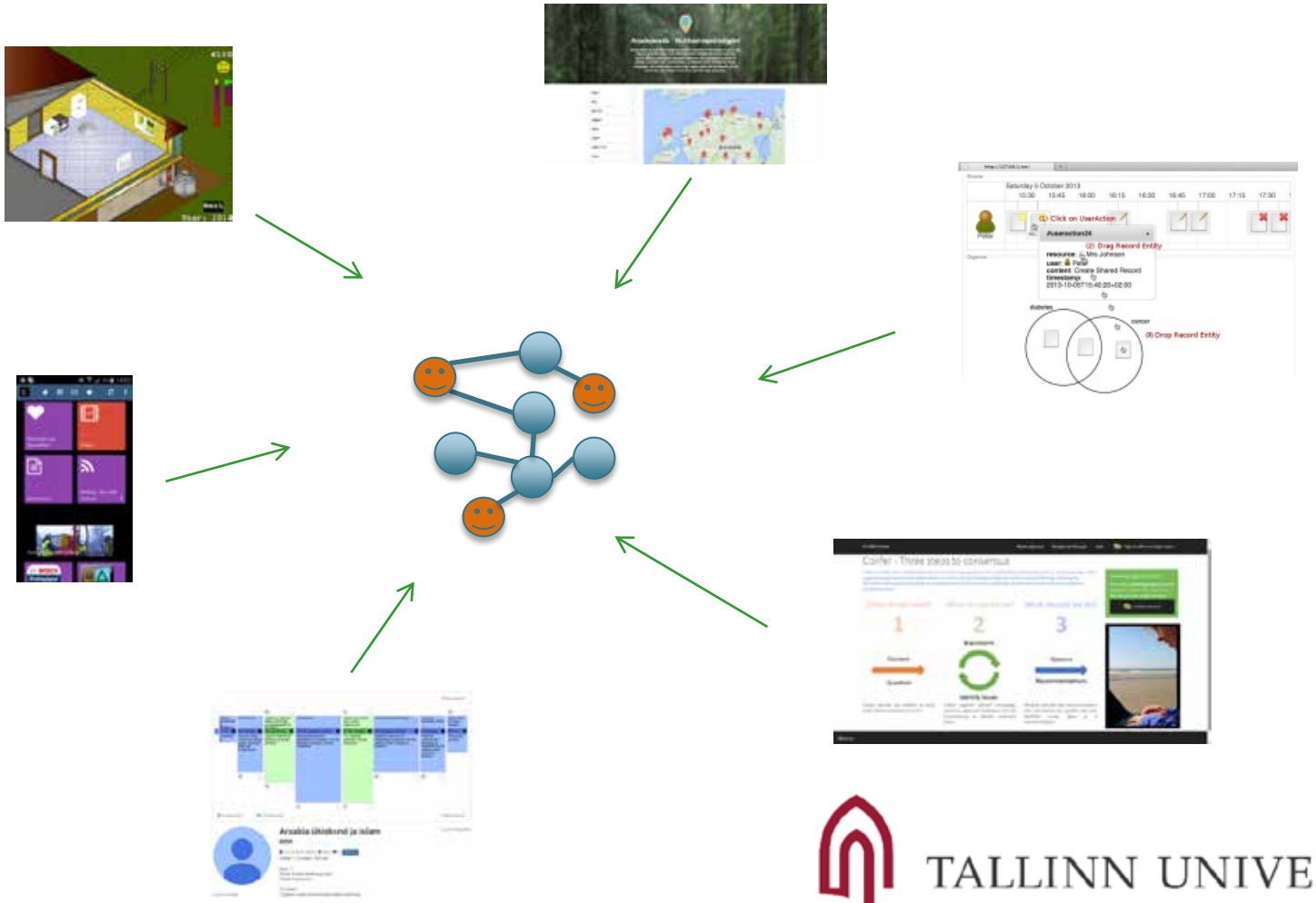
Tracing activities with an artefact-actor network ...



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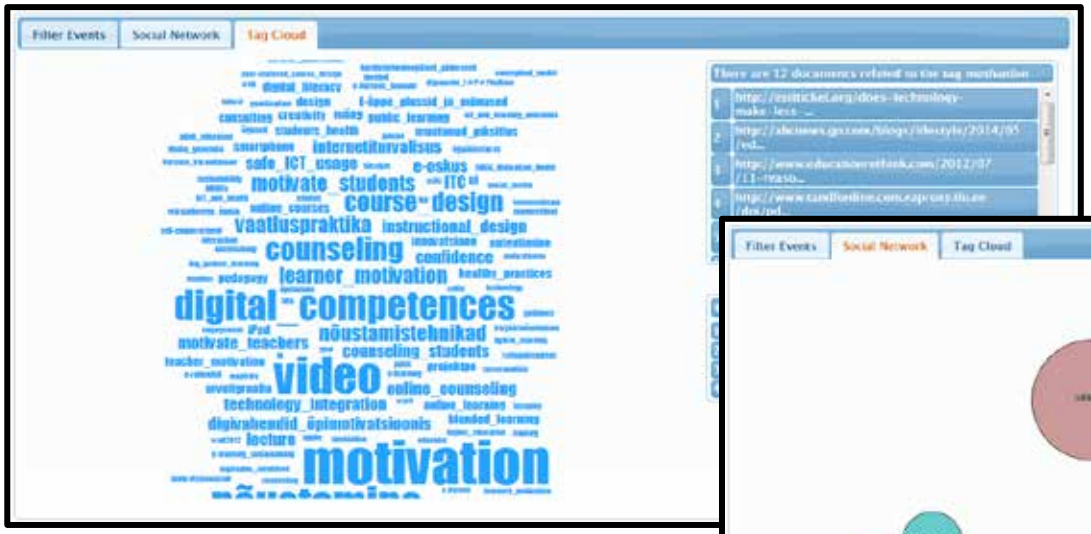
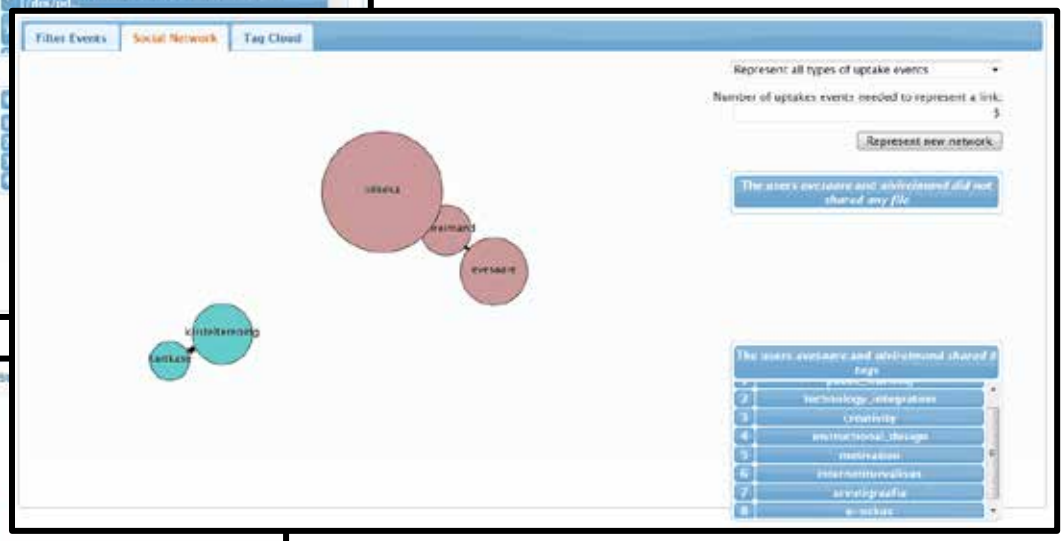
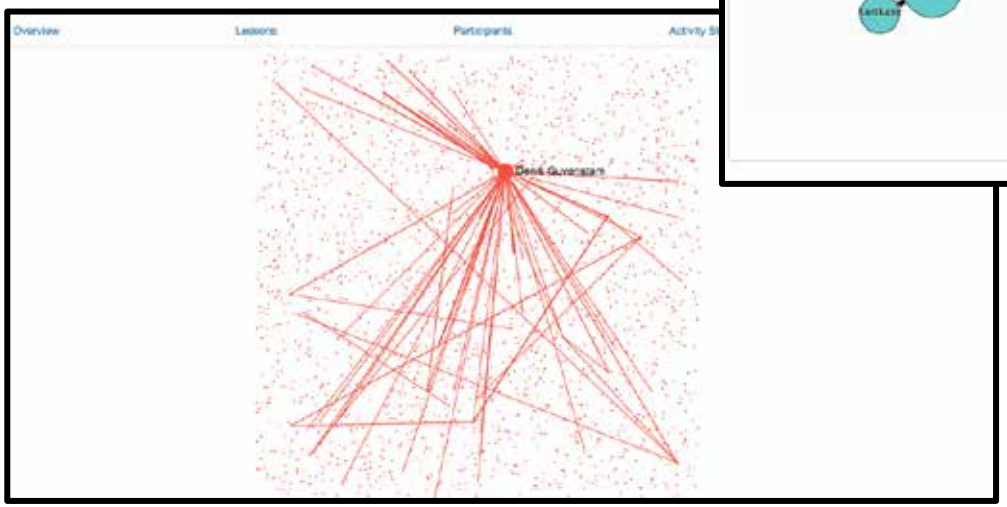
Ruiz-Calleja, Dennerlein, Kowald, Theiler, Lex & Ley (2016). The Social Semantic Server as an infrastructure for theoretically- grounded Workplace Learning Analytics, Submitted to IEEE Transactions on Learning Technologies.

... and feeding it back to learners and teachers







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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?*

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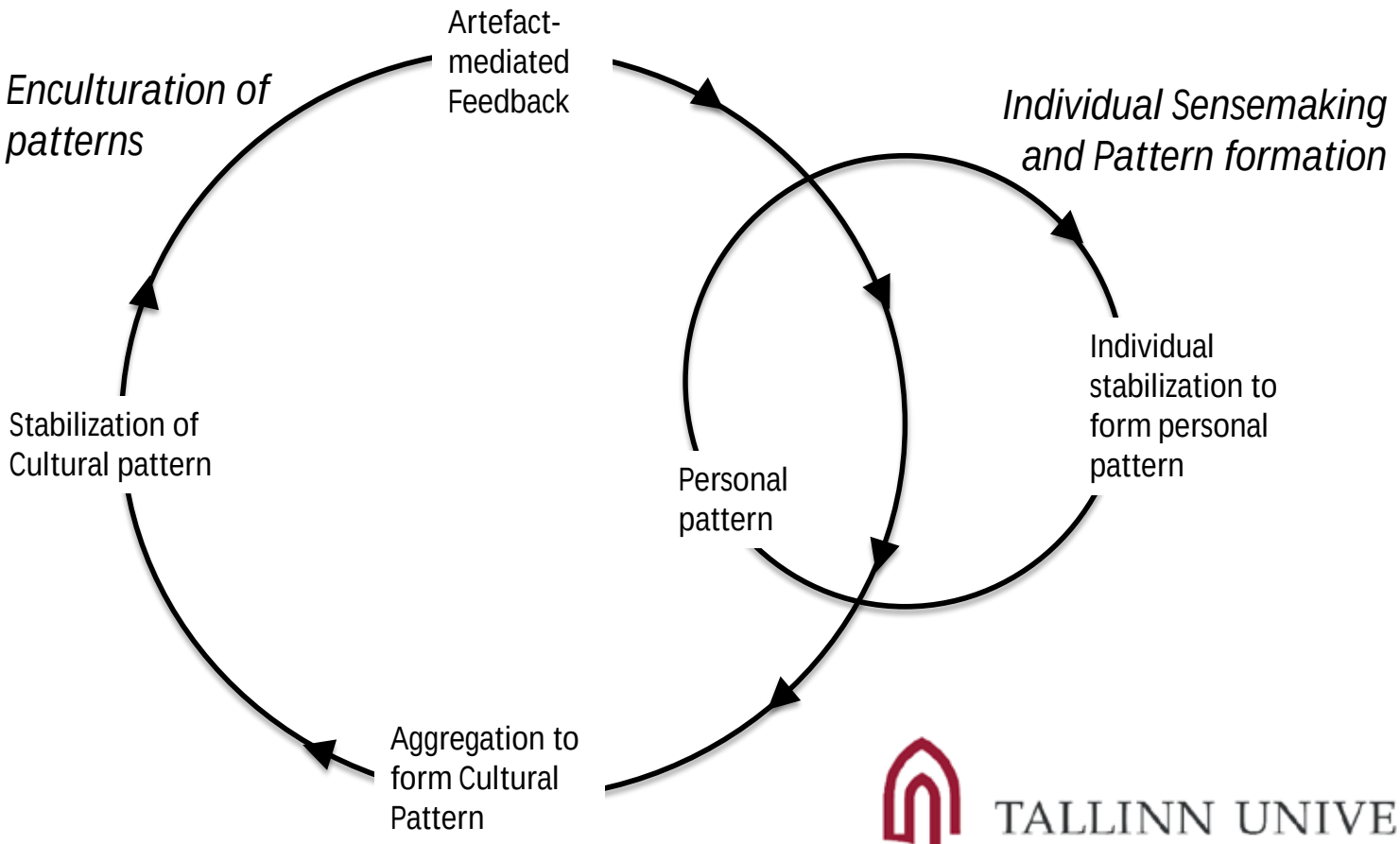
Coupling of individual and collective learning

Collective Distributed Cognition

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*

Kump, B., Moskaliuk, J., Dennerlein, S., & Ley, T. (2013). Tracing knowledge co-evolution in a realistic course setting: A wiki-based field experiment. ***Computers & Education***, *69*, 60–70.

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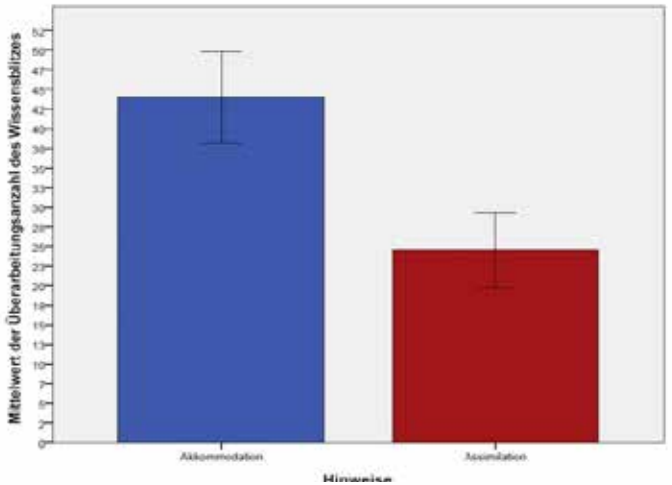
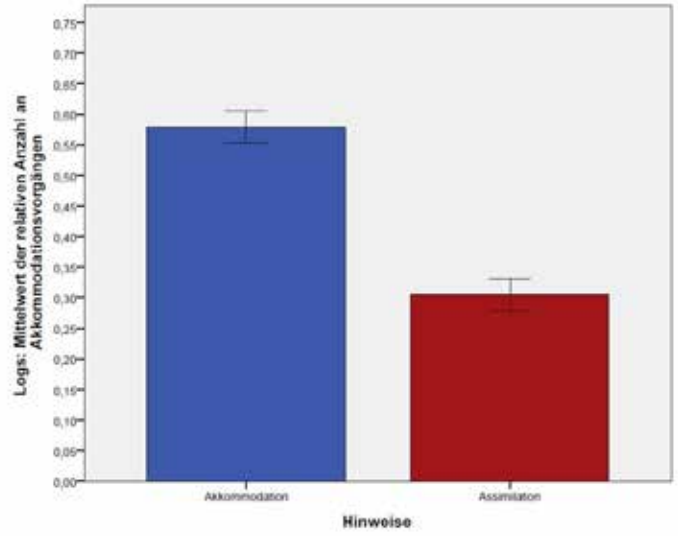
Results: Externalization Measures

- *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***





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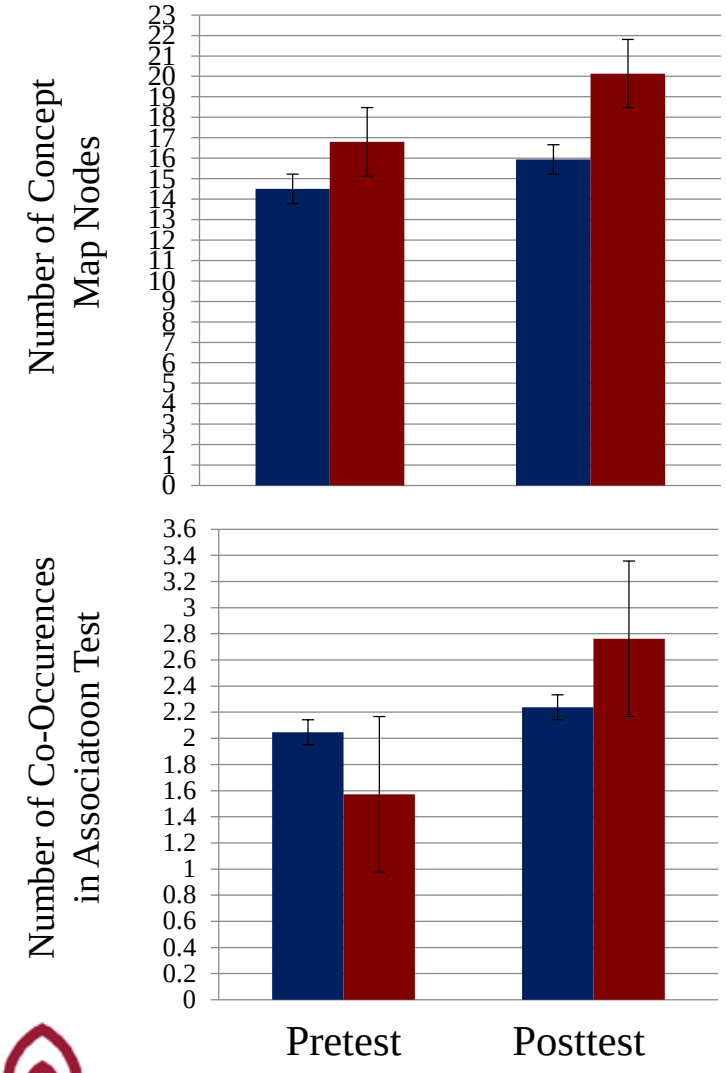
Results: Concept Maps and Association Test

- *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*



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Living Labs

Living Labs for Evidence-based Education

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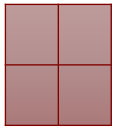
Collecting evidence for an educational Innovation

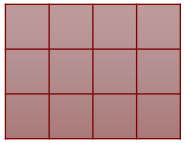
Using Concept Maps for Collaborative Learning in Science Education

 → Learning Gain?

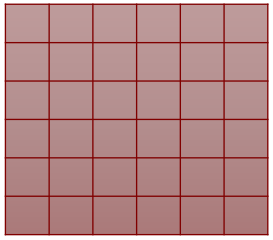
... scaffolding the activity

 → Learning Gain?

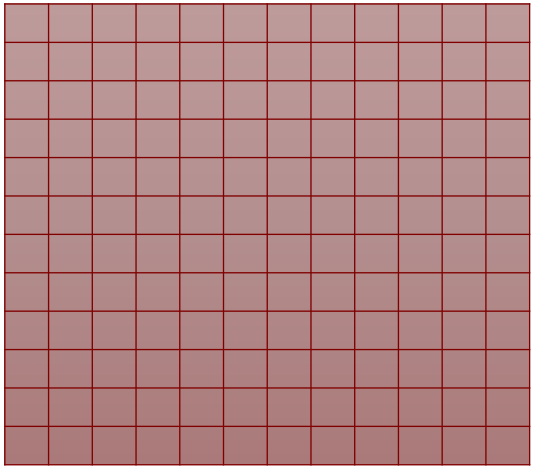
... age of the students

 → Learning Gain?

... subject taught

 → Learning Gain?

... prior knowledge



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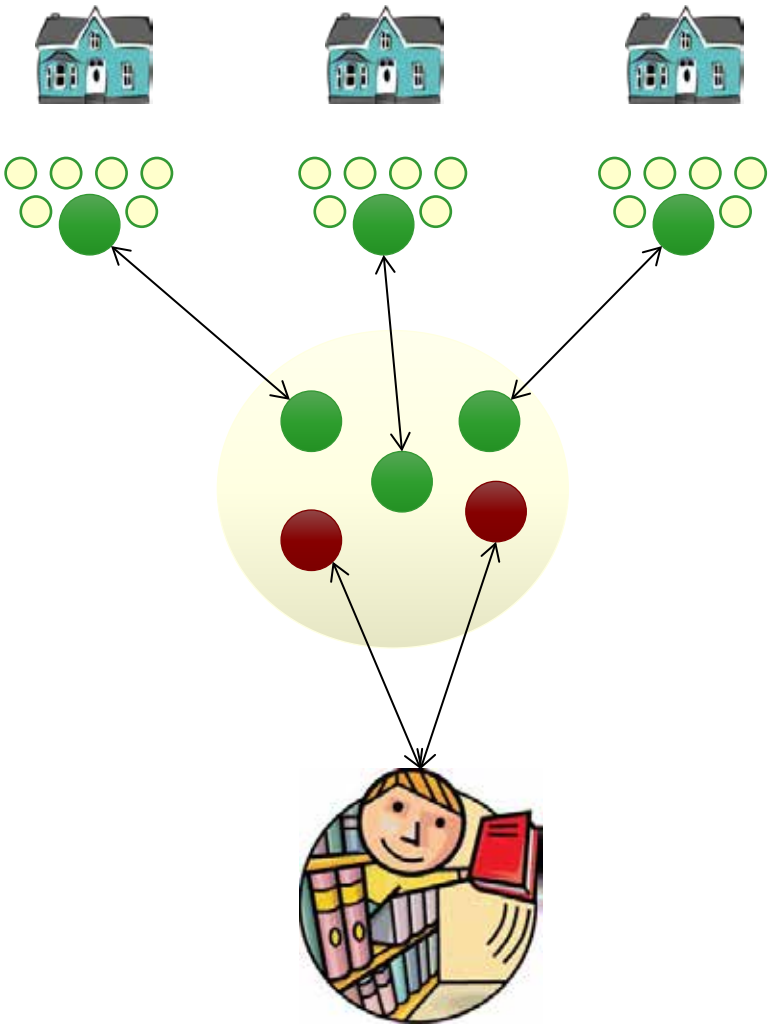
A Living Lab for Educational Innovation



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

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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*

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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*

Leminen, S., Westerlund, M., & Nyström, A. G. (2012). Living Labs as open-innovation networks. *Technology Innovation Management Review*, *2*(9).

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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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