UiT

THE ARCTIC UNIVERSITY OF NORWAY

Educational technology (EdTech): some history, research designs and models.

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"Education will become the centre of the knowledge society, and the school its key institution." *Peter Drucker*

History:

- 5000 years with written language
- 500 years with book printing
- 180 years with stamps
- 80 years with computers
- Ca. 30 years with web

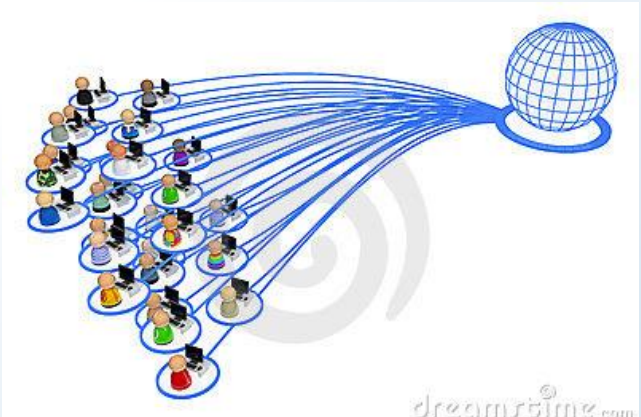
1840

History:

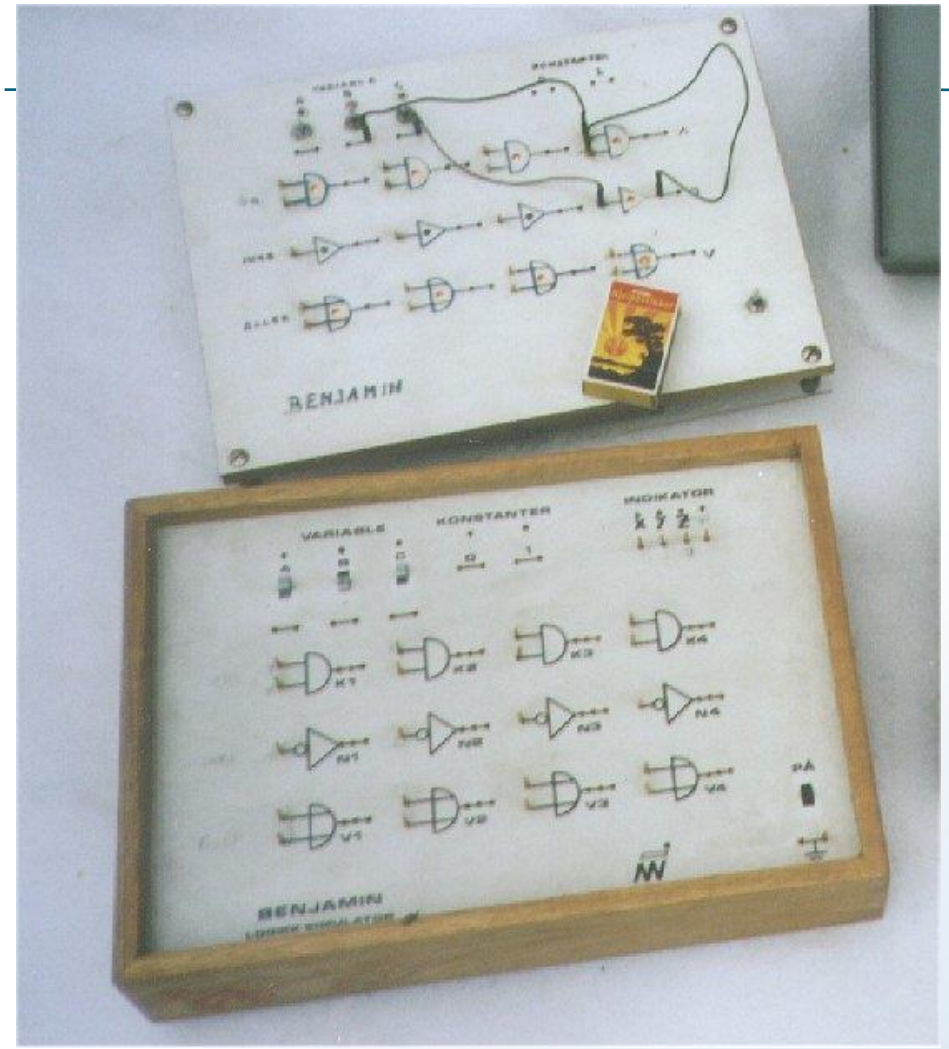
- **The 10 Commandments:** **100 words**
- **The Norwegian Constitution:** **5000 words**
- **Regulations for trade with caramels in the European Union:** **20.000 words**

Important technologies

- Electricity, ca. 1895/96…
- Telephone, ca. 1920(central), 1960 (direct).
- Radio, ca. 1930
- TV, ca. 1960
- Internet, 1992



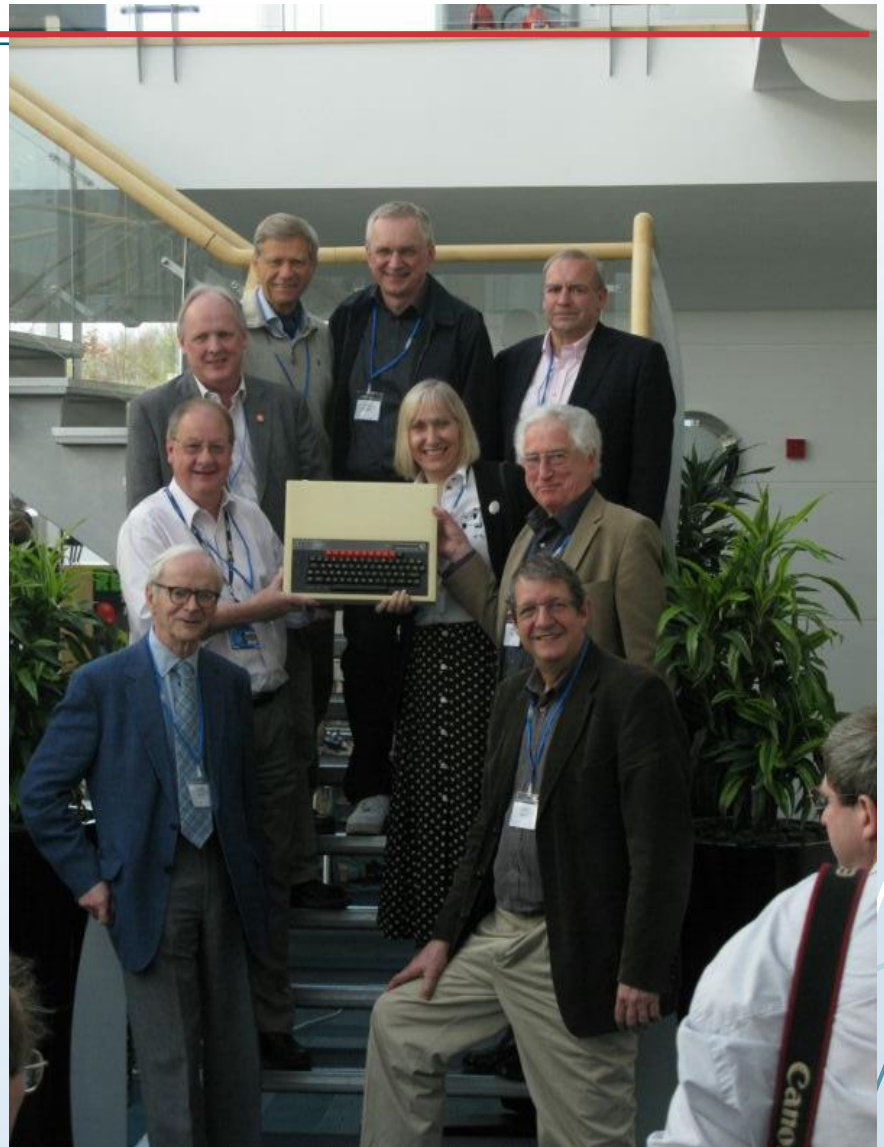
Benjamin: The logic simulator for education (1970)



- Digital
- Binary (0/1)
- Price NOK 500
- 400 copies
- Presented at a OECD seminar in Paris 1970

1982: BBC-computer

- Made for schools:
  The BBC Computer Literacy Project
- Price 235 £ and above
- 32 Kbyte memory
- More than 1.5 mill sold
- Photo from 30-years jubilee in 2012!



Steve Jobs

"The computer is the most remarkable tool we've ever come up with. It's the equivalent of a **bicycle for our minds.**"

Photography: Digital state of the art Anno 1990….

The educational epochs of digitization

1. **Skinner-epoch** (Before **Mac/PC**)
   Learning machines and programmed learning.
2. **Piaget-epoch** (From **Mac/PC** to **Web**) Semi-concrete, visual learning.
3. **Rousseau-epoch** (after **Web**) The students had to find their way. Learn by experience and discovery … Exploratory learning.
4. **Vygotsky-epoch**. Learning a social process. Technology-enhanced learning.

(Ref. Minken and Stenseth, 1998)

Technology-enhanced learning.

The term ‘technology-enhanced learning’ emphasizes how technology adds value to learning by:

- Connectivity to information and to others
- 24/7 access to learning resources
- Greater choice over the time, place and pace of study
- Alternative modes of study: distance, blended work-based, partially or wholly campus-based
- More active learning by means of interactive technologies and multimedia resources
- Knowledge-sharing and co-authoring across multiple locations
- Rapid feedback on formative assessments
- Participation in “communities” of knowledge, inquiry and learning

Self-evident benefits of ICT

- the power of multimedia
- interactivity
- possibilities for multiple representations
- possibilities to simulate real phenomena
- world wide access to information
- tools for synchronous and asynchronous communication

How real are these (technology-driven) benefits?

Desires for using ICT to improve learning: Theory-driven arguments

Technology as inspiration for advancement of some of theories and models of learning

- applications of constructivist epistemology
- new notions of collaborative learning
- progressive inquiry and knowledge building
- authentic and anchored learning
- from knowledge acquisition to participation metaphor of learning

BUT - Common for the research done by government commisoined agencies, is that…

- …the results reveals that there is a big **gap** between the policy and what is being done in practice.
- …the practicioners lack of digital litteracy is the main explanation for this gap…
- …it represents a one sided and mainly optimisic perspective on the digital development.

A mismatch between macro- and micro-level

Ref.: *ICT Monitor, 2009, 2011, 2014* by The Norwegian Agency for Digital Learning in Higher Education

Analysing the impact of ICT: methodological challenges

Why it is so difficult to measure the impact of ICT in education?

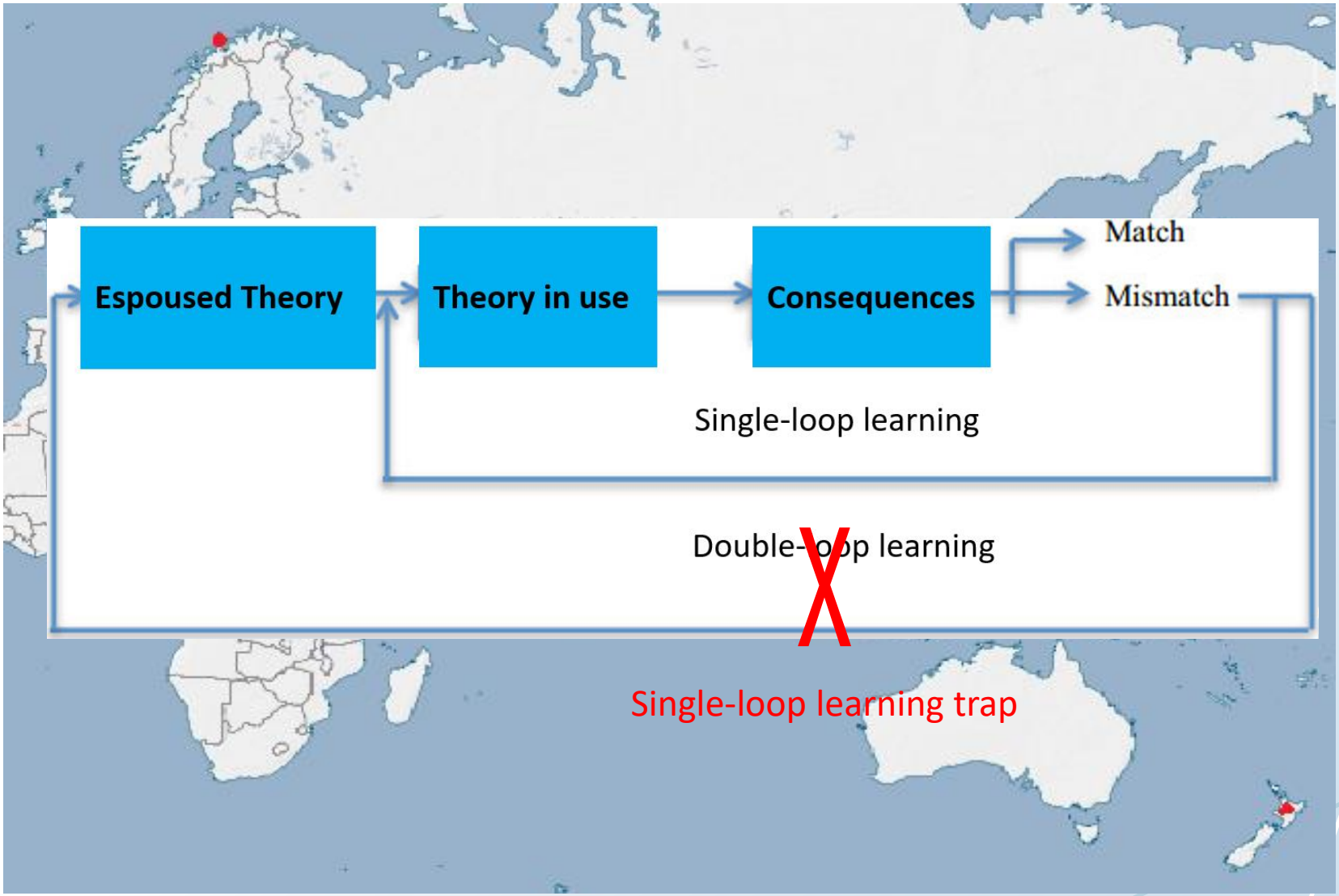
- Moving from ”traditional” to ICT environments: difficulties to define the ”independent variable” (systemic change)
- In innovative use of ICT also the learning aims change
- Experimental evidence is partly misleading (selected teachers, major investments etc.)
- A scaling up problem: why ”best practices” do not transfer
- Shortage of realistic models

In search for a bigger (agreed?) picture…

Technology integration in the pedagogical landscape is complicated. Understanding the complexity behind the observed gap is essential to be able to work towards diminishing the difference between intentions and practice:

- *How do **teacher educators** and **teacher students** perceive the professional use of digital tools?*
- *How does the policies related to digital technology in education affect the teacher educator and the culture among teacher educators in the workplace?*

The DigiCross model.
Based on *Theory of Action*, by Argyris and Schön (1978)



The DigiCross Survey: Staff and Students

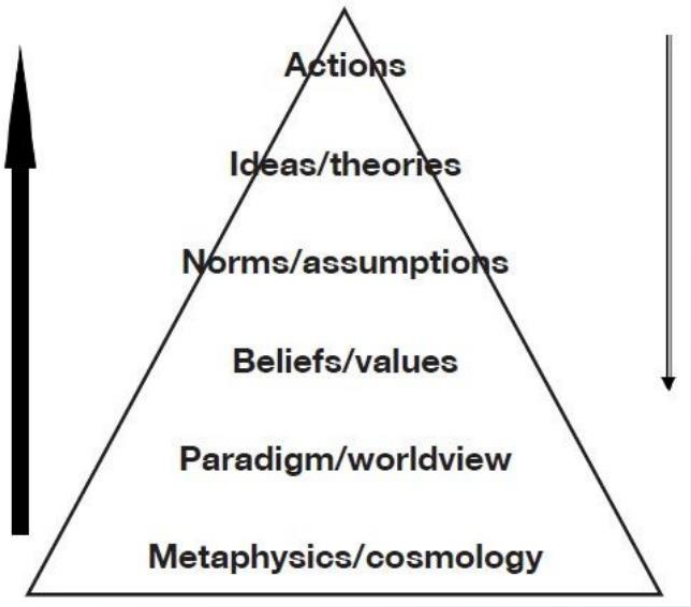
Questionnaire that contains three overall variables (constructs):

1. Level of **digital competence** (8 items)
    - Pedagogical/didactical-, subject-specific- and technological understanding.

2. **Attitudes** towards digital tools in educational contexst (8 items)
    - Motivation for use, attitudes towards digital tools in general, attitudes towards digital tools when teaching/at the workplace

3. The extent of **use** of digital tools (16 items)

The pyramid of hierarchical levels of knowing Sterling (2010)



Sterling, S. (2010). Transformative Learning and Sustainability: sketching the conceptual ground. *Learning and Teaching in Higher Education*, 5, p. 17-33.

New challange to our statistical analysis!!
Latent variables within our DigiCross data?

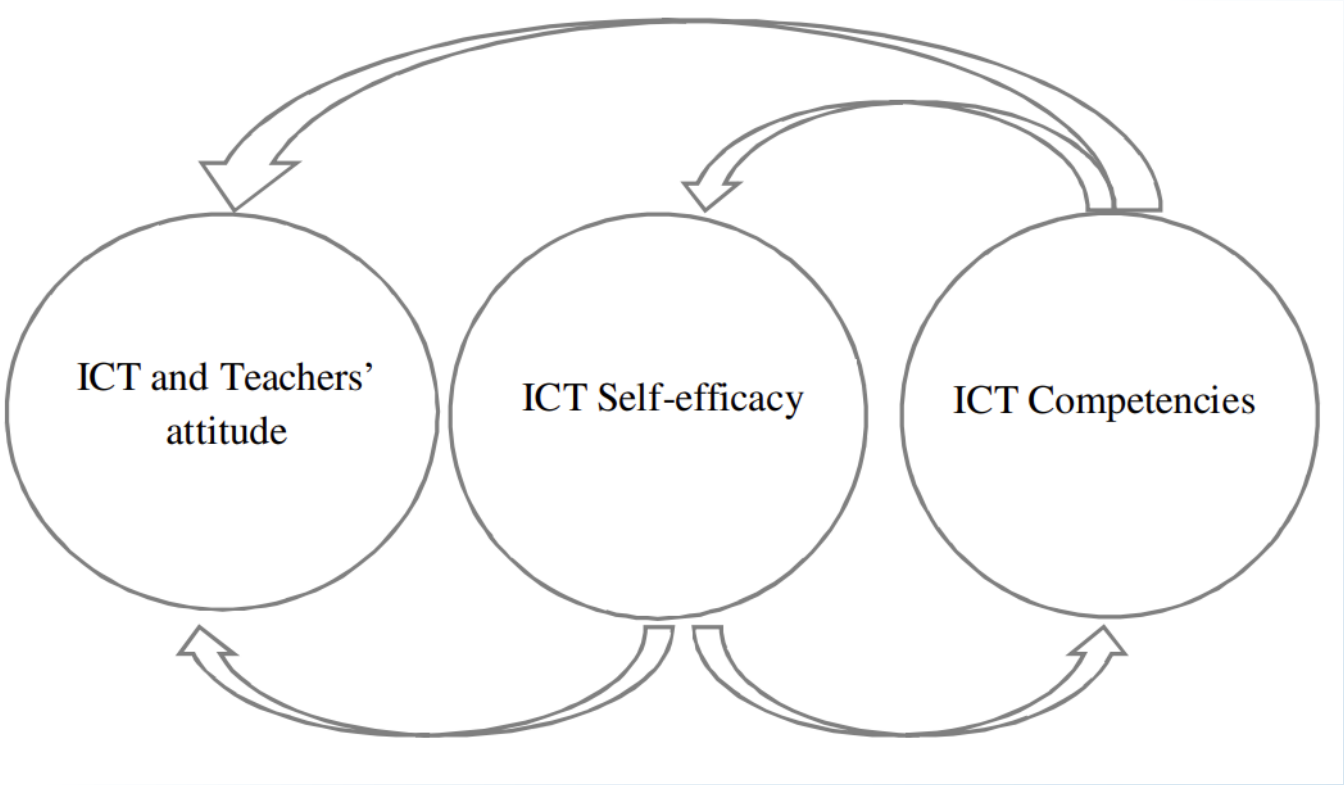
1. D**igital competence** (8 items)
    - General skills?
    - Specialized skills?

2. **Attitudes** (8 items)
    - Motivation purpose?
    - Content knowledge purpose?
    - Pedagogical attitudes?
    - Epistemic attitudes?

3. The **use**
    - Communication-oriented use?
    - Lesson structure-oriented use?
    - General use?
    - Spesialized use?

Factor analyses (PCA), and Cluster analyses in SPSS!

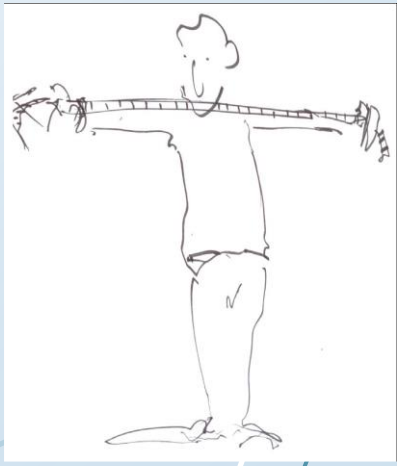
Relationships on ICT integration in education: Self-efficacy as the core pedagogical belief



Pischetola, M. (2022). Exploring the relationship between in-service teachers' beliefs and technology adoption in Brazilian primary schools. *International Journal of Technology and Design Education*. https://doi.org/10.1007/s10798-020-09610-0

Other questionares

- **TPACK** (Mishra & Koehler 2006). 28 items. Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers College Record, 108 (6), pp. 1017-1054, 10.1111/j.1467-9620.2006.00684.x
- **DigCompEdu** (Redecker, 2017) proposes 22 basic competences, organized into six areas, which educators should ideally acquire. DigCompEdu Framework proposes a progression model comprising six stages (Newcomer; Explorer; Integrator; Expert; Leader; Pioneer). 10.2760/159770 (online)
- **DIGIGLO** (Rafael Alarcón et al. 2020). Development and validation of the DIGIGLO, a tool for assessing the digital competence of educator. https://doi.org/10.1111/bjet.12919



How, why, and for what digital resources are used
Sundqvist et al. (2020)

- *Grade your **skills:** 1=novice, 6=expert*
  Digital Hardware/ digital platforms/ digital videoconferences/ digital creative software for exercises, tests, exams/ digital games, and quizzes/ digital media/ digital interactive teaching materials/ digital simulation/virtual software/ digital film-, photo-, sounds- and editing software/ digital special education software/ other digital software
- *Grade the following **purposes:** 1=strongly disagree– 6=strongly agree*
  contribute to the knowledge content/ contribute to individual adaptations/ make students reflect their learning/ prepare student for future works/ motivate students to learn more/ stimulate students' creativity/ strengthen students' role as democratic citizens/ facilitate student feed-back/ facilitate student interaction and communication/ I have no purpose with my use of ICT
- *How often do you **use for** 1=never – 6=to a high degree*
  lecture in classroom/ provide material for students/ repetition exercises/ homework tests/ exams/ feed-back on students writing/ feed-back on students' oral presentation/ student assessment/ individual conversation with student/ written communication with student/ student teamwork

Sundqvist et al. (2020) Finnish subject teachers' beliefs and use of information and communication technology in Home Economics. *Nordic Journal of Digital Literacy,* 15(3). https://doi.org/10.18261/issn.1891-943x-2020-03-06

New study: Machin learning analytics

- Big Data
- The data for the study were collected by a **web crawler,** an Internet bot that systematically browses the web operated by search engines for the purpose of Web indexing.
- Machine learning analyse how university instructors have incorporated digital competency into their courses.

Yang, TC. Assessment of the digital competencies of university instructors through use of the machine learning method. *SN Soc Sci* **3**, 25 (2023). https://doi.org/10.1007/s43545-023-00617-7

Summing up….

- Technology integration in the pedagogical landscape is complicated
- Research is still required in order to systematize knowledge about how to understand, measure and sustain ICT in education.
- The future is digital, but a didactics reflecting disciplinary diversity should set the terms for technology in education, not the other way around.
- The scaling up problem: why ”best practices” do not transfer?
- Why do some teachers more than others rethink their practice?
- Call for a bottom-up or horizontal approach that facilitates teacher educators' autonomy and ideas for new ways of doing things.
- One may envision a slow convergence toward consensus on ICT in the education system?