Improvement of Inquiry in a Complex Technology-Enhanced Learning Environment

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Outline

- Inquiry learning
- SCY learning environment
- Research questions
- Methods
- Results and discussion

Inquiry learning

- An educational strategy in which students follow methods and practices similar to those of professional scientists in order to construct knowledge (Chang, Sung, & Lee, 2003; Keselman, 2003).

- A process of discovering new causal relations by formulating hypotheses and testing them by conducting experiments and/or making observations (Pedaste, Mäeots, Leijen, & Sarapuu, 2012).

- IL is more effective in comparison with "traditional" learning approaches, such as direct instruction or open discovery (Alafieri et al., 2011; Carolan et al., 2014; d'Angelo et al., 2014; Furtak et al., 2012).

Inquiry framework

- Three types of processes:
  - meta-processes: performed for planning and activating regulative and transformative inquiry processes in a coherent way
  - transformative processes for improving inquiry skills
  - regulative processes focused on controlling and supporting specific transformative processes

  (Mäeots & Pedaste, 2014, Hulshof & de Jong, 2006)

SCY environment

- Inquiry learning environment for learning science and technology

- Developed by 12 partners – collaborative work of researchers, technical developers and practitioners

- Project coordinated by Prof Ton de Jong from the University of Twente

Learning in SCY-Lab

- Product-oriented learning
- ELO – Emerging Learning Objects
- Missions
- Learning Activity Spaces – ELOs, tools, guidelines, scaffolds (e.g. reflection tasks)

http://www.scy-net.eu/

DDSTE2014
Corfu May 29th-31st
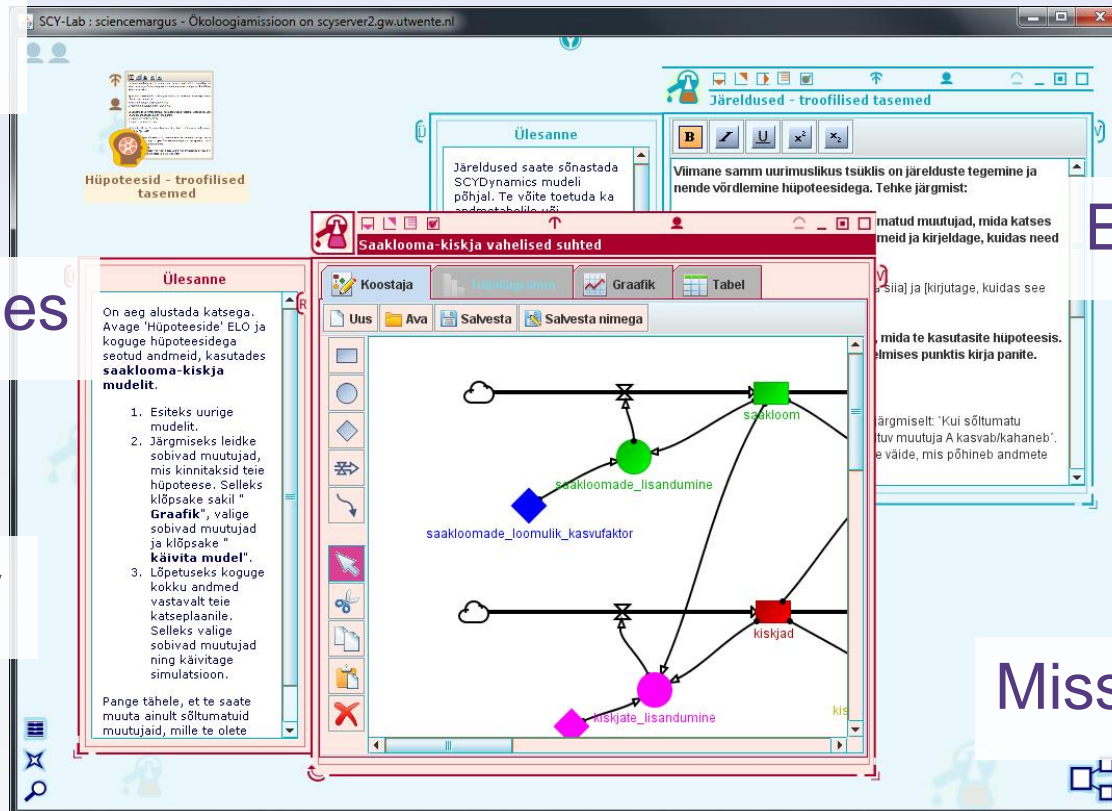
Buddies

ELOs

Guidelines

Repository

Mission map

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SCY ECO mission

- Four sub-missions
  - nutrients and primary production, <u>the role of light in ecosystems</u>, relationships between trophic levels, pH and aquatic ecosystems

- Three learning activities
  - creating a hypothesis, making inferences, formulating the problem solution

Pedaste, M., de Jong, T., Sarapuu, T., Piksööt, J., van Joolingen, W. R., & Giemza, A. (2013). Investigating ecosystems as a blended learning experience. Science, 340(6140), 1537–1538.

Research questions

- Is there an improvement in students' general inquiry knowledge, transformative inquiry skills, and domain-related knowledge in using the SCY ECO mission?

- How are the skills and the knowledge of the inquiry model related with each other?

Methods

- Four classes in four schools in Estonia

- Fifty-four students (aged 14–18 years)

- Pre- and post-questionnaire assessing their general inquiry knowledge, transformative inquiry skills, and domain-related knowledge, and describing students' reflection

- Students' reflection was guided in the learning environment by five supportive questions

Results and discussion

- Level of students' general inquiry knowledge (GIK), transformative inquiry skills (TIS), and domain-related knowledge (DRK)

|	Initial level	Post-level	t	p
GIK	78%	87%	−6.6	<0.01
TIS	53%	67%	−8.3	<0.01
DRK	33%	44%	−6.4	<0.01

Results and discussion

- Most of the students were rather positive towards reflection

- Regarded analysis of the learning process as an important activity to ensure successful learning

- Analysed their process of completing the questionnaire

- They considered doing a number of things differently the next time when performing inquiry

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Results and discussion

A synthesis of empirical data and theoretical model of inquiry; GIK – general inquiry knowledge, RIS – regulative inquiry skills, TIS – transformative inquiry skills, DRK – domain-related knowledge
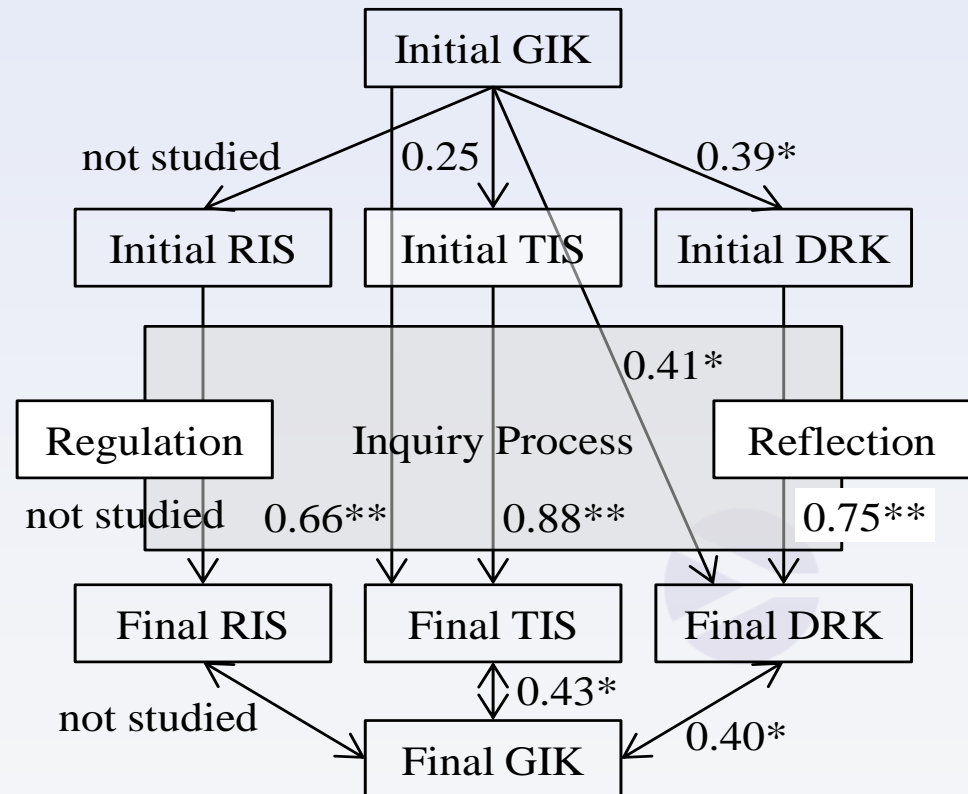
Conclusions

- GIK is needed to <u>activate</u> inquiry processes by integrating initial regulative and transformative inquiry skills and domain-related knowledge

- Inquiry processes are <u>supported</u> by activities of regulation and reflection. TIS and DRK <u>improve</u> as a result of inquiry

- Improved skills and knowledge help students to <u>revise</u> their GIK, and this revision is important to ensure <u>additional improvement</u> of their final knowledge and skills

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THANK YOU!

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