Exploring and Evaluating Computing Systems for Use in Learning Scenarios by Creating an E-Portfolio

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Open-Minded

Overview

- One semester course for CSE master's students (8 participants)
- **Learning goals:** recognizing and decomposing of computing systems, experience with setting up basic computing systems, discussing computing systems in CS at school
- **Structure:** class sessions (10 weeks) + individual project (5 weeks)
- **Scenario:** experiential learning, reflection tasks and e-portfolios

Practicing Experiential Learning

- Active participation encouraged in their own learning through reflective practice has become an established position [1]
- Encouragement of deeper understanding and the comprehension of one's own learning process [2,3]

Creating E-Portfolios

- Reflective, evidence-based process that combines reflection and documentation [4] suitable for teachers' education goals

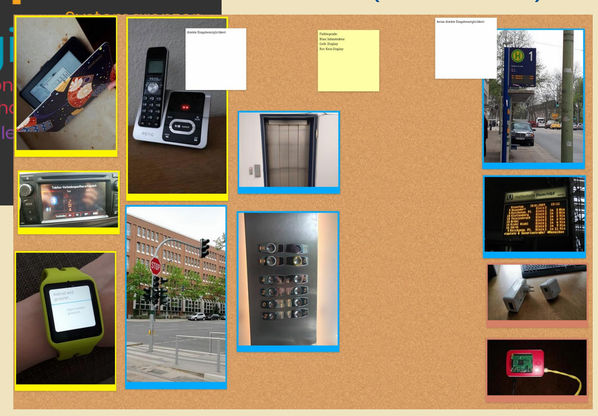
Sessions

Theoretical Foundations (4 sessions)

- **Assessment:** students' prior knowledge in word clouds
- **Sharing a knowledge base**: research of information on computing systems → also: starting point of **e-portfolio**
- **Recognizing computing systems**: by taking and collecting photos
- **Towards an analytic view:** classifying results on virtual pinboards
- **Sharpening the analytic view**: a model for three perspectives on computing systems is introduced [5]
- **Bringing together didactic theory and complex systems**:

→ Introduction of **smartlights**: demonstration and analysis (by use of ‚didactic reduction and reconstruction' [6])

collaboratively creating word cloud on computing systems (1st session)



finding clusters for computing systems in teams (3rd session)

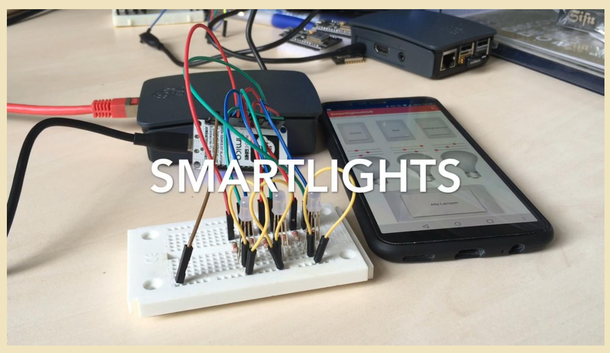
Experiential Learning (5 sessions)

„Especially when students learned about network layers in CS classes, we can now use this knowledge in projects asking for the theory behind."

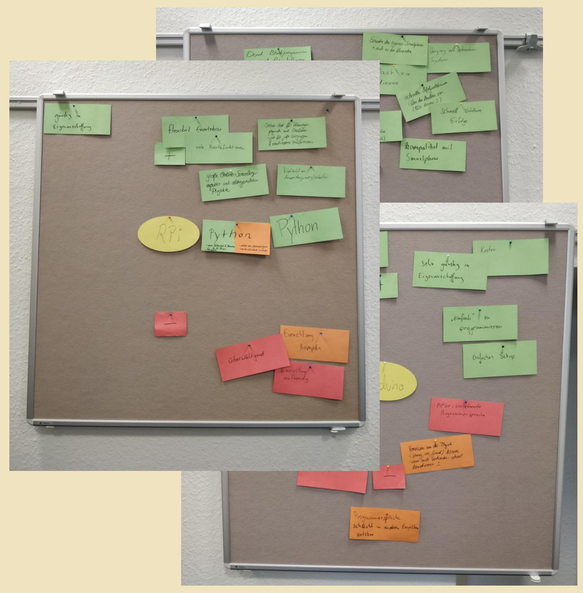
„My knowledge about networks helped me understand the setup and the processes of the example. It did not help me with the installation, though."

„Taking not into account my personal difficulties – I am convinced CS teachers should be able to build up a WAP."

„For me the App Inventor followed Snap and Scratch which I am familiar with. So I could successfully enhance my experiences."



arduino & app-setup for the ‚smartlights' project (QR-code for demo)

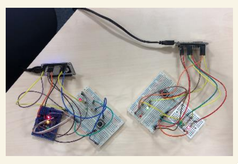


pros and cons of the systems (9th session)

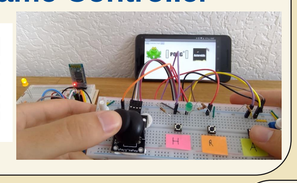
Development of Computing Systems for Learning Scenarios (5 sessions) & Presentation and Discussion (2 sessions)

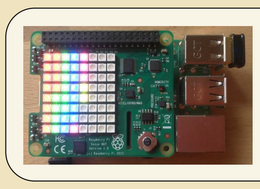
- **Individual projects:** students are free to choose upon interests
- **Going through a development process:** theory-based analysis, reconstruction of a simplified version, setup, implementation and rich documentation
- **Open collaborative lab sessions:** students discuss and help each other, learning follows individual steps and needs
- **Learning exercises**: creating a task for the course prepares for future teaching and shifts interest to students' needs
- **Presentation:** overview of the diversity and inspiration

Traffic Lights



Game Controller



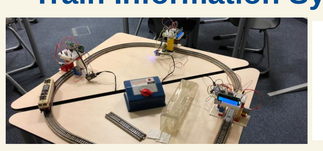


Time Tracker

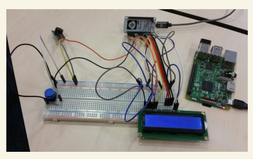
Key Card

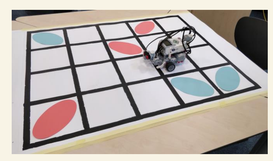
Results: Computing Systems for Learning Scenarios

Train Information System



Individualized Timer





Mars Rover

Weather Data

Global Summary

Design of the Class Sessions

- The experiential learning design proved to be motivating for the students
- Different prior knowledge requires therein both basic and challenging tasks

Results from Individual Work

- E-portfolios appear as creative personalized work but with overall high achievements
- Experiential learning has led to personal yet professional reflection

References

[1] David Clarke and Hilary Hollingsworth. 2002. Elaborating a Model of Teacher Professional Growth. Teaching and Teacher Education 18, 8 (2002), 947–67.

[2] Anne Brockbank and Ian McGill. 1998. Facilitating Reflective Learning in Higher Education. Taylor & Francis, 1900 Frost Rd.

[3] Marianne van Woerkom. 2010. Critical Reflection as a Rationalistic Ideal. Adult Education Quarterly 60, 4 (Aug. 2010), 339–356.

[4] John Zubizarreta and Barbara J. Millis. 2009. The Learning Portfolio: Reflective Practice for Improving Student Learning (2 edition ed.). Jossey-Bass, San Francisco.

[5] Peer Stechert. 2009. Fachdidaktische Diskussion von Informatiksystemen und der Kompetenzentwicklung im Informatikunterricht. Ph.D. Dissertation Universtiät Siegen. Universitätsverlag Potsdam.

[6] Ira Diethelm, Peter Hubwieser, and Robert Klaus. 2012. Students, teachers and phenomena: educational reconstruction for computer science education. In Proceedings of the 12th Koli Calling International Conference on Computing Education Research (Koli Calling '12). ACM, New York, NY, USA, 164-173.

CSE

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