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The Physics Education Research Group
Uppsala

John Airey
Uppsala Physics Education Research Group
Department of Physics and Astronomy
Undergraduate teaching and learning in physics
Overview

• Who am I?
• Who are the Uppsala PER Group?
• Research project about creating physics teachers
My background

- Physics degree.
- Trained as physics teacher UK (11-18).
- Re-trained to teach English.
- PhD: Language in physics.

Research interests

- Representations
  - Social semiotics
- Disciplinary cultures
• Reader in Physics (Docent) Uppsala University

• Senior Lecturer in Science Education (Lektor) Stockholm University
Physics at Uppsala
In the USA 86 physics departments have Physics Education Research (PER) divisions.
In the USA 86 physics departments have Physics Education Research (PER) divisions.
In the USA 86 physics departments have Physics Education Research (PER) divisions.

2000 government money to create a Chair Professor at Uppsala
Division of Physics Education Research
Division of Physics Education Research

• Chair Professor of Physics Education
  Cedric Linder
Division of Physics Education Research

- Chair Professor of Physics Education
  Cedric Linder

- 1 Reader
- 1 Post-doc
- 3 Lecturers
- 7 PhD students
- 1 Research assistant
We work with discipline-based education research
Discipline-based Education Research

“investigates learning and teaching in a discipline using a range of methods with deep grounding in the discipline’s priorities, worldview, knowledge and practices.

Long-term goal: “to understand the nature of expertise in a discipline”.

US National Research Council (2012, p 9)
Understanding physical phenomena
How do students understand physical phenomena and how can learning experiences be constructed to facilitate such understanding?
Three Research Themes

Understanding physical phenomena
How do students understand physical phenomena and how can learning experiences be constructed to facilitate such understanding?

Representation in physics
How can the different resources we use in physics be coordinated in order to improve the teaching and learning of physics?
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How do students understand physical phenomena and how can learning experiences be constructed to facilitate such understanding?

Representation in physics
How can the different resources we use in physics be coordinated in order to improve the teaching and learning of physics?

Social identity and the culture of physics
How does the culture of physics affect the possibilities for student learning?
Research project

Building a professional identity: A comparative study of physics teacher training in four countries
Building a professional identity: A comparative study of physics teacher training in four countries

- Four-year research project
- Swedish Research Council
- Runs until end of 2020
Motivation

Towards the end of 2013 newspaper headlines
Towards the end of 2013 newspaper headlines

Sverige sämst i klassen

PUBLICERAD 2013-12-03

Sveriges skola har blivit generellt sämre på alla områden, enligt Pisaundersökningen som offentliggörs på tisdagen. Inget annat land har försämrats mer sedan förra undersökningen 2009.
Motivation

In early 2014 a second article in *Dagens Nyheter* compared Finland and Sweden’s results on PISA. Suggested the main explanatory factor could be how teachers were valued by society. Gave me the idea for a research proposal. Look at four countries with different PISA science scores.
Motivation

Four countries:

Singapore: highest PISA scores
Finland: highest PISA scores in Europe
England: good baseline
Sweden:
OECD TALIS

Teaching and Learning International Survey administered by OECD

Asked the question:
OECD TALIS

Do you believe that the teaching profession is valued in your country?
OECD TALIS

Singapore: 70%
Finland: 59%
England: 32%
Sweden:
Singapore: 70%
Finland: 59%
England: 32%
Sweden: 5%
Project partners

Singapore: National Institute of Education
Finland: Åbo Akademi
England: University of Cambridge
Sweden: Uppsala/Stockholm
In four countries where the societal status of the teaching profession differs widely:

1. What discourse models are enacted in the educational environments trainee physics teachers meet?

2. What are the potential affordances and constraints of these discourse models for the constitution of physics teacher professional identities?
Research Questions

In four countries where the societal status of the teaching profession differs widely:

3. In what ways do perceptions of the status assigned by society to the teaching profession potentially affect this professional identity building?

4. What are the potential consequences of the answers to the above questions for the view of science communicated to pupils in school?
Data collection

Parallel data collection in all four countries

9 interviews with teacher educators in
  3 physics department
  3 education department
  3 school

Followed up by 6 interviews with trainee physics teachers going through this system
The Team
The Team

Johanna Larsson
The Team

Johanna Larsson  James de Winter
The Team

Johanna Larsson  James de Winter  Lotta Jons
YEO Jennifer

**Profile**

Jennifer joined NSSE/NIE in 2007 as a lecturer and was appointed Assistant Professor in 2011. Prior to joining NIE, Jennifer taught physics and English in Victoria School for eight years. She was the subject head of audio and visual department and then of physics. As she embarked on the Master of Arts in instructional design and technologies and Ph.D, she assisted in various research projects related to the use of technologies in teaching and learning.

Jennifer's research interest is in understanding how people learn science, and designing learning environments to support students' science learning. Her earlier work looked at students' sense-making in problem-based learning, knowledge building environments, and computer-supported collaborative learning. For her PhD study, completed in 2009, she redesigned problem-based learning (PBL) to incorporate knowledge creation principles to better support students' meaning-making in physics. In research grant (OER13/08 JY), she designed a visualization-based learning environment for high school learning of electromagnetic induction. Her current research focuses on how students produce explanation in science, in particular the role of representations in mediating the process of thinking and reasoning. Her work has been published in International Journal of Science Education, Instructional Science, Asia-Pacific Education Researcher and Cultural Studies of Science Education. She is also an Associate Editor of the journal, Learning: Research and Practice.

**Academic Background**

- **Ph.D 2009** (Nanyang Technological University)
- **MA(IDT) 2003** (Nanyang Technological University)
- **PGDE (Sec) 1992** (Nanyang Technological University)
- **BSc 1991** (National University of Singapore)

**Professional Organisations**

- European Science Education Research Association

**Designation**

Assistant Professor

**Department**

Natural Sciences & Science Education (NSSE)

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**Research Interests**

role of representations
Thanks for listening!