UNIVERSITY OF COPENHAGEN
DEPARTMENT OF SCIENCE EDUCATION

The Department of Science Education announces the public defense of the PhD-dissertation

Teaching for Modelling Competence

Expanding the scientific basis for bridging the gap between teachers' practices and political intentions in the realization of a modelling-oriented science curriculum in Danish lower secondary school

by Sanne Schnell Nielsen

The defense takes place on Thursday the 20th of June 2019 12:00-15:00 at the Auditorium of Geological Museum (access through main entrance, go to first floor). Geologisk Museum, Øster Voldgade 5, 1350 København K.

Abstract:

Danish lower secondary science education was reformed with a new curriculum commencing in the school year 2015-2016. The new curriculum led to substantial changes in how teachers should address models, modelling and scientific inquiry in their teaching. The purpose of this Ph.D. study is to analyse the alignment between the intentions and arguments for integrating models and modelling into science education, on the one hand, and teachers' practices and rationales for integrating models and modelling into their teaching practice, on the other.

First, this study analysed the new and the previous curriculum in aiming to explore the challenges and possibilities of the curriculum as an enabler of teaching for modelling competence. Second, a theoretical competence-oriented modelling framework was outlined. This framework describes what kind of knowledge and practice related to models and modelling that needs to be integrated into teaching to accomplish a competence-oriented approach in this regard. Third, teachers' practices of, rationales behind, and perceived possibilities for realizing the intentions of the reformed curriculum were investigated using a mixed-method approach.

Data for this empirical part of the study was generated by means of a questionnaire survey (n = 246) and audio recordings of teachers' talk-in-interaction (n = 6; in three pairs) during two kinds of session: (a) reflections on their existing practices framed as explorative semi-structured interviews, and (b) discussions about their future teaching framed as workshops. In addition, the descriptions of the teaching activities, learning goals and rubrics developed during the workshops were collected. The competence-oriented modelling framework was used as the backdrop for the analysis of the empirical data.

The analysis of the curriculum identified significant challenges in the format and content with regard to supporting teachers' interpretation, understanding and transformation of the intentions into a teaching for modelling competence. The analysis of the empirical data suggested that teachers have a positive attitude towards the modelling emphasis in the new curriculum, and that models play an important and valued role in their teaching. The findings also suggested that teachers' practice and rationales for integrating models and modelling into their teaching are characterized by a product-oriented approach that is not well aligned with a competence-oriented teaching.

The study not only indicates a gap in the alignment between curricular intentions and theory on teaching for modelling competence on the one hand, and teachers' practice and rationales on the other, but it also suggests that to narrow this gap, efforts are needed on both sides. The study provides multiple ideas for improving the alignment, based on opportunities and challenges on each side.

Assessment Committee:

Associate Professor Henriette Tolstrup Holmegaard (Chair, Department of Science Education, University of Copenhagen)

Professor Berit Bungum (Norwegian University of Science and Technology)

Docent Birgitte Lund Nielsen (Via University College)

Supervisor:

Associate Professor, Jan Alexis Nielsen (Department of Science Education, University of Copenhagen

Co-supervisor:

Docent Mia Husted (University College Copenhagen)

The defense is followed by a reception hosted by the Department of Science Education. The reception takes place at the old Observatory, Øster Voldgade 3 (inside the Botanical Garden).