

TEACHER DILEMMAS WHILE WORKING WITH COMPLEX AND CONTROVERSIAL SOCIO-SCIENTIFIC ISSUES – COMPARISON BETWEEN DIFFERENT CULTURAL CONTEXTS

Christian Rydberg¹, Clas Olander¹ and Jesper Sjöström¹

¹Malmö University, Malmö, Sweden

This study has followed groups of teachers within an Erasmus + partnership, in which the teachers have conducted a reflexive and interdisciplinary teaching about complex controversial issues (CCI), including socio-scientific issues (SSI) (students aged 12-16 years). The overall research design is inspired by models where researchers and practitioners cooperate and share responsibility and iterative systematic investigations have been done. With the support of a didactic model the teachers created interdisciplinary arenas in their respective context. Through focus groups and participant observation, the study aims to describe the appearance of various didactic dilemmas that teachers encountered in the dilemmatic space this form of teaching is framed in. Preliminary results show didactic dilemmas anchored both at macro level, concerning different types of curriculum goals and politics and religion, as well as didactical dilemmas at micro level and at levels in between. For example, about student controlled activities versus teacher controlled and about the teacher's level of objectivity and neutrality. With an approach of comparative didactics, a special focus is put on exploring the essence of the Swedish teachers' didactic dilemmas in the dilemmatic space, in order to highlight some aspects of the "taken for granted" in their teaching.

Keywords: complex controversial issues (CCI), including socio-scientific issues (SSI), didactic dilemmas

INTRODUCTION

In this study, we have followed groups of teachers who have conducted a reflexive and interdisciplinary teaching about complex and controversial social issues in line with Sjöström and Eilks' (2016) Vision III for an eco-reflexive science education (Sjöström, Eilks & Zuin 2016). In this the teaching is *Bildung*-oriented and holistic, ethical and political aspects of science are put in the foreground. An important objective is to give all students the opportunity to develop as independent political subjects, by given them chances to both challenge the existing of view in society, examine their own stance on societal issues as well as enable them to take their own position (Hasslöf & Malmberg, 2015).

In the process of testing this, for the teachers, new form of teaching this meant that they were faced with various didactic dilemmas. These were to some degree handled by conscious choice and actions, but teachers also acted with unreflected and routinized operations. The study aims to examine the didactic dilemmas that emerge and analyse their essence.

THEORETICAL FRAMEWORK

With a starting point to view the concept of *didactics* as professional science of teaching (Seel, 1999), the overall research design inspired by models where researchers and practitioners cooperate and jointly make iterative and systematic investigations. With the support of a common didactic model (Ingerman & Wickman, 2015) the teams of teacher at each school created interdisciplinary arenas for reflexive teaching about various complex and controversial issues.

The study aims adopt an activity theory perspective on the collective and complex activity systems of the schools' in order to examine how participants' actions and operations in this form of education, are influenced and affected by both internal and external factors. Different didactic contradictions and dilemmas that occur in the complexity of everyday teaching may be viewed as obstacles for successful teaching and learning, but by identifying these dilemmas and then discuss them among the teachers, this may instead be a starting point for a permanent transformation and spark for school development. This can be done by considering this form of teaching as a dilemmatic space (Honig, 1994; Fransson & Grannäs, 2013) in which the dilemmas are ever-present. The dilemmas are the result of social constructions based on the currents, and

former, structure of the society but the dilemmatic space is constantly in a dynamic process where everyday positions and negotiations both redefine the dilemmas and the actors.

RESEARCH METHODS

The study was done in the form of a didactic modelling project and five European lower secondary schools (in five countries) were studied when they were working together within an EU-funded Erasmus + partnership. The teams of teacher worked over a two-year period and with the help of the didactic model they designed their own teaching set up, based on their own school context. In order to support the teachers, the didactic model didn't just include a common student tasks, it also included a theoretical framework on how the teachers could implement an inquiry-based approach of this reflexive and interdisciplinary teaching. This framework was based on methodological models from Bybee et al (2006) and Presley et al (2013), and inspiration and ideas were also provided from Ekborg et al (2012) and Zeidler and Kahn (2014), concerning teaching about controversial and socio-scientific issues.

Teachers and students worked on different controversial sustainability issues containing both scientific, technical and social science content, as well as socio-political and ethical aspects. The student task was inspired by Storyline method (Bell, 2008) in which the students were placed in a scenario where they landed on an imaginary, and newly colonized, planet named PromethEUs (Rydberg, 2015). On this imaginary planet, students would together create a new society, which meant that the issues were mainly at structural level. A companion meaning (Östman 1995; Roberts & Östman 1998) of the teaching was that students would gain insight into the fact that political decisions on complex issues like these - with both scientific, social, economic, political and ethical aspects - is not about "right or wrong". Rather, these are dilemmas where it's about weighing the advantages against the disadvantages and this process try to make reasonable and acceptable decisions.

The work at the schools was done in three cycles, where each of these ended with a transnational meeting with both teachers and students. In conjunction with these data collection was done, primarily by focus group interviews. Furthermore, during the third cycle, when schools were working on issues related to the use of robots and biotechnology in the future, participant observation was carried out. This collective and multiple case study (Goddard, 2009; Stake, 2013) has had a flexible research design and during the process of the study, the research questions have emerged

First the didactic dilemmas that participants at the five schools experienced in the work with a reflexive teaching were studied. These descriptions then created a basis for a comparative analysis where "taken for granted" in the teaching was made visible when both researchers and teachers studied the similarities and differences of the teaching in the various socio-cultural contexts. Comparative didactics like this can contribute to more accurate description of the teaching and thereby is new knowledge generated (Almqvist 2015). The focus in this part of the study is on how the Swedish participants' didactic choices and actions could be mirrored against others. Based on variation of different positions on a selection of the didactic dilemmas, in-depth focus groups with the Swedish teachers was conducted.

PRELIMINARY RESULTS

The study is ongoing, which obviously means that the results are preliminary. In the data from the international focus groups, 18 different didactic dilemmas have been identified. These have then been analysed and grouped. Some of the dilemmas that have been identified have an emphasis on a macro level in terms of contradictions between primary working toward the educational goals in the curriculum or putting more emphasis on the social and democratic goals. This could also link to dilemmas related to assessment, national tests and teacher autonomy. At the macro level some teachers also experienced didactic dilemmas that can be related to the prevailing political forces in the country or to religious values in society. Furthermore, dilemmas on intermediate levels were described, which among other things has to do with the teachers working interdisciplinary and how to organize this. Dilemmas also arose at the micro level, that is in the classroom teaching. For example, whether the fact-finding primarily should be done by letting the students work individually using their computers, or if the teacher would present relevant facts and information about the issues through more traditional methods. Other didactic dilemmas were concerning if

the teacher should choose a whole class approach versus group work when discussing the controversial issues as well as about the teacher's objectivity and neutrality during these discussions.

This is followed up with a second stage of analysis, examining a selection of the didactic dilemmas from a Swedish point of view of. The focus of this analysis is primarily on the aforementioned didactic dilemmas at the micro level. This will be done using data from the in-depth focus group interview with the Swedish teachers, but also using empirical data from the Erasmus+ partnership. This aims to describe the essence of these didactic dilemmas, both in terms of underlying causes, as well as possible consequences, according to various positions in the dilemmatic space of this form of teaching.

PRELIMINARY DISCUSSION

When it comes to carrying out an interdisciplinary and reflexive teaching with discussions about complex and controversial issues the teacher needs to move beyond the traditional teacher role. In an altered form of teaching with a partly new motive, the teacher need to be aware that previously taken for granted and operationalized actions might not be valid anymore. The teachers have to renegotiating their positions in the various didactic dilemmas that the everyday teaching constantly offer. This study wants to highlight the dilemmatic space of this form of teaching and deepen some key didactic dilemmas that arise.

The study may also provide a basis for a discussion tool with the aim to provide support for teachers in order to develop their shared procedural knowledge (Rolf, 2006). This can also contribute to developing the individual teacher action competence and expand the teacher's repertoire of strategies for dealing with the didactic dilemmas as this teaching holds.

REFERENCES

- Almqvist, J. (2015). Teaching traditions and learning in physical education and science education: A double symposium at ECER 2015. In *ECER, September 8-11, 2015 in Budapest*.
- Bybee, R. W., Taylor, J. A., Gardner, A., Van Scotter, P., Powell, J. C., Westbrook, A., & Landes, N. (2006). The BSCS 5E instructional model: Origins and effectiveness. *Colorado Springs, CO: BSCS*, 5, 88-98.
- Ekborg, M., Ideland, M., Lindahl, B., Malmberg, C., Ottander, C., & Rosberg, M. (2012). *Samhällsfrågor i det naturvetenskapliga klassrummet*. Gleerups.
- Fransson, G., & Grannäs, J. (2013). Dilemmatic spaces in educational contexts—towards a conceptual framework for dilemmas in teachers' work. *Teachers and Teaching*, 19(1), 4-17.
- Goddard, J. T. (2009). Collective Case Study. In Mills, A. J., Durepos, G., & Wiebe, E. (Ed.), *Encyclopedia of case study research (Vol. 2)*. Sage Publications.
- Hasslöf, H., & Malmberg, C. (2015). Critical thinking as room for subjectification in Education for Sustainable Development. *Environmental Education Research*, 21(2), 239-255.
- Honig, B. (1994). Difference, dilemmas, and the politics of home. *Social Research*, 563-597.
- Ingerman, Å. & Wickman, P.-O. (2015). Towards a teachers' professional discipline: Shared responsibility for didactic models in research and practice. In Burnard, P., Apelgren, B.-M. & Cabaroglu, N. (Ed.), *Transformative Teacher Research: Theory and Practice for the C21st (167-179)*. Rotterdam: Sense Publishers
- Östman, L. (1995). *Socialisation och mening: No-utbildning som politiskt och miljömoraliskt problem*. Uppsala: Univ.; Stockholm: Almqvist & Wiksell International.
- Presley, M. L., Sickel, A. J., Muslu, N., Merle-Johnson, D., Witzig, S. B., Izci, K., & Sadler, T. D. (2013). A Framework for Socio-scientific Issues Based Education. *Science Educator*, 22(1), 26.
- Roberts, D. A., & Östman, L. (1998). *Problems of meaning in science curriculum*. New York; London: Teachers College Press.
- Rolf, B. (2006). Tre kunskapsmodeller. In Bronäs A., & Selander, S. (Ed.), *Verklighet, verklighet: Teori och praktik i lärarutbildning*. 74-98. Stockholm: Nordstedts Akademiska förlag.
- Rydberg, C (2015). Life on PromethEUs handbook. Retrieved from https://issuu.com/rgcn/docs/prometheus_handbook
- Seel, H. (1999). Didaktik as the Professional Science of the Teachers. *TNTEE Publications*, 2(1), 85-93.
- Sjöström, J., & Eilks, I. (2017). Reconsidering different visions of scientific literacy and science education based on the concept of Bildung. In Y. J. Dori, Z. Mevarech, & D. Baker (Ed), *Cognition, Metacognition, and culture in STEM Education*. Dordrecht: Springer (in press).
- Sjöström, J., Eilks, I., & Zuin, V. G. (2016). Towards Eco-reflexive Science Education. *Science & Education*, 25(3-4), 321-341.

Stake, R. E. (2013). *Multiple case study analysis*. Guilford Press.

Zeidler, D. L., & Kahn, S. (2014). *It's debatable. Using Socio-scientific Issues to Develop Scientific Literacy*.
Arlington, VA: National Science Teachers Association.