Institutionen för pedagogik, kommunikation och lärande

Handling socio-scientific controversy: Students' reasoning through digital inquiry

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AKADEMISK AVHANDLING

som med tillstånd av utbildningsvetenskapliga fakulteten vid
Göteborgs universitet för vinnande av doktorsexamen i
pedagogik framläggs till offentlig granskning

Fredagen den 8 mars 2019, kl.13:00
Göteborgs universitet, Pedagogen, Lokal: BE 036
Fakultetsopponent: Docent Jan Alexis Nielsen, Københavns Universitet

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Abstract

The ambition of this dissertation is to develop knowledge of students' reasoning and digital inquiry about socio-scientific controversies (SSCs) in science education contexts. Motivating this research is the vast access to information on SSCs that have become readily available to us through network-based digital media and the challenge of selecting, analyzing and evaluating claims from various disciplines and perspectives. The dissertation is grounded in sociocultural and dialogical perspectives which imply that students' reasoning is investigated as being embedded in activity and shaped by the framings, demands, and traditions constituted through practice. The overarching research questions concern how student reasoning is 1) contingent on institutional, social and material contexts, 2) mediated by mapping tools developed within Science and Technology Studies (STS) when SSCs found online are investigated, and 3) the kinds of communicative competences displayed when students investigate SSCs digitally. Empirical material was collected in two different educational institutions. At a technical university, data collection was focused on group work on genetically modified (GM) food in an introductory biotechnology course (study I). At a science program in an upper secondary school, the focus was on group work on handling SSCs (hydraulic fracturing, GMO, HPV vaccine) by using digital mapping tools (study II, III, IV). The data comprises several ethnographic sources including video-recordings, field notes, documents, as well as artefacts produced by students. The findings are presented in four studies: Study I reports on how students came to understand how to articulate an appropriate argument in a techno-scientific community exhibiting the features of biotechnological discourse, a community-specific use of language that legitimates the epistemic and moral authority of science and marginalizes GMO opponents. Study II reports on how students recirculate a message from a scientific study that has been widely spread online that claims that GMO causes cancer in rats. It shows how such 'appeals to science' gained their meaning and rhetorical power as a discursive resource intrinsic to different Communicative Activity Types (CATs). Study III reports on how students' unfolding discourses on SSCs can be fruitfully analyzed by using dialogical theories. The findings illuminate how students discursively manage the multivocality and multimodality inherent in SSI online and reveal a set of discursive means that the students use to handle the many perspectives involved when communicating about an issue. Study IV reports on how a digital network visualization tool together with other mediational means such as a task provided by teachers, supports students when analysing data found online. The analysis shows how tool-mediated activity provides means for students to work out what is relevant and useful in a corpus of online data, categorizing online material in terms of criteria such as institutional status, trustworthiness, and position of a controversy. Overall, this dissertation points to the importance of learning not only to make what appears to be well-founded knowledge claims by appealing to science, but also the need to understand how science is used rhetorically in different contexts in order to develop appropriate contextualized responses to complex issues in a pluralist, democratic society in the Internet age.