

The role of online communities in science teachers' continuous professional development

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Abstract: We report on the creation of online teacher communities within the framework of the PROFILES project, aiming at teachers' professional development in inquiry-based science education. It was anticipated that teachers would form active communities of practice to support the integration of inquiry and new technologies into their lessons. An exploratory approach was used to trace the local needs of the teachers and to identify the role of the online communities to support continuous professional development.

Aims

In many nations around the world, science curricula are currently undergoing reforms, focusing on the adoption of inquiry-based methods to increase students' understanding of science. Such curriculum reforms require teachers to be well-informed about inquiry, therefore rendering the professional development of in-service science teachers as an issue of paramount importance. New technologies can enable the flourishing of communities of practice by creating online environments, where teachers can synchronously and asynchronously exchange ideas and reflect on their professional practice (Riverin & Stacey, 2008). Researchers (e.g. Guldberg & Mackness, 2009) caution that the greatest challenges with these online communities relate to the establishment and sustainment of the communities.

This study reports on the initial stages of establishing online communities to engage science teachers in what Desimone (2009) has called "embedded professional development"; the latter can be briefly described as linking professional development discussions and reflections to an authentic task, closely related to teachers' practice. In this case, the authentic task was to co-design and enact a technology-enhanced learning unit following the PROFILES three key components (student motivation, inquiry learning, and decision-making). At the same time, we examined ways to increase teacher ownership of the professional development process. This poster presents some preliminary results and discusses challenges and implications of this effort.

Methodology

Context, Participants, and Tools

The work reported in this paper is situated within a four year European project (PROFILES). The aim of the project is to support science teachers in adopting inquiry-based learning by being involved in active teacher networks. In the local implementation of the effort teachers were asked to collaboratively design an inquiry-based teaching module that integrated new technologies. Thirty-eight (n=38) in-service science teachers at one of the PROFILES countries were involved in this study, forming five online communities organized around their specialization (Primary Education, Chemistry, Upper & Lower Physics, Biology). The Moodle online platform was used to support the online activity of these five communities and was customized to scaffold teachers as designers and learners. Taking into account that inquiry is a complex teaching approach that is difficult to be framed in specific learning and teaching sequences, a scaffolding scheme, presented in the form of design questions, was incorporated into the platform to guide the teachers' design process. Following a hybrid model for the delivery of professional development, several face to face meetings were also scheduled which focused on discussing the content of teachers' design, and the progress of the subsequent classroom enactments of the designed curricula.

Data collection

Data were collected via a questionnaire, semi-structured telephone interviews from the 38 participating teachers, and an analysis of teachers' participation in the online environment created on Moodle. A "Teachers' Needs Questionnaire", administered at the beginning of the project, aimed to assess (a) teachers' confidence in science teaching and (b) teachers' professional development (PD) needs on ten different dimensions (namely: "Nature of Science", "Scientific and Technological Literacy", "Inquiry-based Science Education", "Classroom Learning Environment", "Student Motivation", "Assessment", "Learning Theories", "Technology Integration", "New Curricula", "Self-Reflection"). The internal consistency of the questionnaire items was assessed using Cronbach's alpha. Telephone interviews with all participants two weeks after the project started focused on

reported obstacles for online participation; teachers' participation on Moodle and in the local teacher network was also examined.

Results

The questionnaire subscale mean scores for teacher confidence and teacher professional development needs were above the midpoint of the 5-point response scale. This suggests that while, overall, the participants were confident in their abilities to teach science they also indicated that they could benefit from professional development based on the 10 dimensions assessed by the instrument. Compared to their confidence levels for each dimension, professional development was desired in all dimensions, with the exception of the "Nature of Science" dimension for which teachers felt they needed less support. Results pointed to "inquiry-based science education", "reformed curricula", and "technology integration" as the top three areas of need for additional professional development. These results contributed directly to the design of the continuous professional development program, and confirmed the initial ideas behind the offering of these professional development opportunities.

The analysis of teachers' contributions to the online community indicated a slow and reluctant acceptance of the virtual space as a space for collaborative design. Not all teachers equally engaged in online discussions about the authentic design task. The phone interviews queried the extent of teachers' involvement in the online communities created to foster the development of a community of practice. The analysis of the phone interviews (n=38) provided insights into the obstacles individual teachers faced and guided the next steps in organizing appropriate support for professional development, with the goal of promoting teacher ownership of the professional development process. More specifically, according to the phone interviews, four aspects of challenges to participating in the online community were identified: lack of basic familiarity with the technology used, teachers' busy professional, after-school schedule, insufficient leadership within each of the groups formed, and insecurity about inquiry skills and knowledge which influenced their motivation to participate in the online community. These results concur with results reported elsewhere in the literature (e.g. Guldberg & Mackness, 2009). These problems were addressed through targeted actions to overcome the self-identified barriers for each individual teacher. Progress was made, and teacher teams gradually begun to use the online community for exchanging design suggestions and discussing their experiences from classroom enactment. However, the online community was mostly used as a peripheral but supportive mechanism that helped hold together the design process, spread over the busy lives of the participating teachers. Building on existing local networks, which were primarily reinforced through synchronous, face to face meetings, some of which through a web-based video conferencing system, the online teacher communities served a role that was identified by Schlager and Fusco (2003), that of supporting a developing local community of practice. These results reinforce the understanding of professional development as a process of developing local capacity, and suggest that tools should be used to provide targeted, individualized support for teachers to participate in the developing communities of practice at both the online and offline level (Lock, 2006).

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