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Special Issue Editorial

Technology to enhance learning: Problems and promises

Today we are living in an information and knowledge-based society that was brought about by the extensive technological advancements of the past several decades (Mandl, Reinmann-Rothmeier, & Gräsel, 1998; Eickelmann, 2010). This has resulted in new challenges and responsibilities for schools and the education system, as well as for the role and understanding of teaching and learning (Anderson, 2008). The challenges of information and communication technology (ICT) for education have therefore been studied in educational research for more than 40 years, and since the beginning of research in this field, the possibilities for ICT in educational practice have been a recurring theme (Voogt & Knezek, 2008). One well-accepted conclusion is that ICT as such does not support learning if it is not well-integrated into relevant learning scenarios (Lai, 2008). When studying the question of what such learning scenarios might look like, the focus has been on areas such as: *multimodality* of content, *interactivity* between the learner and the medium, as well as *interconnectedness* in terms of using web-based networks for communication, cooperation, and the provision and distribution of knowledge (e.g. Schulz-Zander & Tulodziecki, 2007).

The implementation of ICT for enhancing learning has proven to be rather challenging. There is an extensive body of literature documenting the effects of ICT use on learning and competence acquisition that finds no or only small effects on students' learning and highlights that further research has to focus on conditions for ICT use for enhancing and developing learning and on the learning process itself (for an overview see Eickelmann & Schulz-Zander, 2008) and on the assessment of learning outcomes (Erstad, 2008). There are still few studies which investigate these topics and address the teaching and learning processes and their conditional factors in detail and with a focus on the potential for ICT to enhance learning.

This special issue of the Journal for Educational Research Online (JERO) addresses research on the learning processes and the conditional factors of ICT implementation to enhance learning by giving insights into various research studies and new theoretical approaches. With this in mind, the issue intends to reduce the lack of research-based knowledge in this field. This special issue sheds light on new

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aspects of technology enhanced learning by pointing out problems and suggesting promises of new ways of learning and new approaches of educational research. The authors of this issue examine new developments in learning and teaching in light of recent technological innovation and their implementation in schools and higher education. On the basis of empirical findings and theoretical conceptions, this issue provides research results and explanations to assist with the choice of effective ways of teaching as well as creating an appropriate environment for learning for the next generation.

Taken together, the articles included cover cultural and socio-cultural determinants and student variables, as subject specific approaches, research towards context factors and processes within the contextual and organizational setting of learning with digital media and also encourage researchers to re-define theoretical approaches to e-learning in contrast to traditional learning.

Zhu focuses in her study on cultural and socio-cultural determinants of students as conditional factors for ICT use in teaching and learning. The study investigates cultural differences in online collaborative learning on the basis of the theory of Rovai (2002) assuming that from a socio-cultural view of learning, all knowledge is socially mediated and the cultural background of learners helps us to understand how they profit from computer-based learning (McLoughlin & Oliver, 2000). In this context, *Zhu's* study focuses on three key issues in relation to student perceptions of the cultural environment, preferences for online collaborative learning, satisfaction with the online learning environment, and their online performance and academic achievement. The study includes first year students in China and Belgium using a parallel e-learning environment. The results show that culture plays an important role with regard to attitudes towards learning in computer-supported collaborative learning, participation and social processes such as competition between students and also the cognitive development of learners through social interaction and discourses. The study indicates that from a socio-cultural view, knowledge may be socially mediated also in new forms of computer-based learning, especially in student-oriented learning scenarios. Furthermore, the perception of the learning setting and the role within the learning group differed between the countries. Moreover, the absence of synchronous teacher-student interaction has been more a problem for Chinese students who were more used to instructor-centered learning.

Herheim and *Krumsvik* take a subject specific approach of examining the potential of ICT to enhance learning, answering the need identified by Overdijk and Diggelen (2009): The authors have conducted research into computer support for student-student interaction and for discussions in the classroom. They also document a study which investigated secondary school students' face to face verbal communication during computer use in mathematic lessons in Norway. Their study uses a two-step design-based research approach which consists of a descriptive-analytic phase and an intervention phase. Their contribution in this JERO issue focuses on

the results of the first part of their study and identifies communication patterns of students working in pairs in computer-assisted mathematic instruction by using observation measures, especially video-analysis. The observations include communication among the students, the ‘communication’ between students and the computer, and the interaction with the teacher. The study identifies new insights into the use of ICT tools in mathematics as a gateway to subject matter discussions and knowledge development.

Gewerc and *Montero* present a study based on case-analyses focusing on change processes in innovation projects with ICT in schools in Spain. Their approach focuses on the influence of the socio-political and economic context of ICT use for enhancing learning which affects all schools (Tondeur, Van Keer, van Braak, & Valcke, 2008; Montero & Gewerc, 2010). Starting from this perspective, they combine the questions of the influence of the context factors with factors on the school level such as professional development processes and organizational culture. By means of a collaborative action research design they explore (1) the influence of the education administration policies on such school innovations, (2) the role of professional development measures, and (3) the role and change of organizational culture in schools during innovation processes. By way of example, the study shows that including teachers in the research teams made a significant contribution towards the research process, the professional development of the teachers and the in-depth university researchers’ insight into school practice. It reveals that innovations with ICT in schools are a multi-dimensional research field comprising political, institutional and personal factors.

Eickelmann examines supporting and hindering factors of sustainable and long-term implementation of ICT in schools in the light of school development theory (Eickelmann, 2010). The author provides the concept and the results of a study based on a longitudinal case study approach investigating schools which had formerly stood at the focus of the IEA-Study SITES M2 (Second Information Technology in Education Study, Module 2; Kozma, 2003) in Germany. With her contribution the author presents different empirically developed instruments regarding ICT implementation in schools such as scales to observe ICT-related teacher cooperation, satisfaction with ICT-support, an instrument to measure the sustainability of ICT implementation in schools and a set of factors which turned out to be most useful to provide a basis for classifying teachers with regard to their individual obstacles concerning the implementation of ICT into their lessons.

Andrews provides an expanded theoretical review of the field of technology-enhanced learning and contributes a theoretical essay to this issue. In his approach the author redefines the view of the research field by discussing the reciprocal and co-evolutionary relationship between technology and learning by addressing the over-arching question whether e-learning requires a new theory of learning (see also Haythornthwaite & Andrews, 2011). This discussion demonstrates that this

question requires a holistic view of e-learning and the relevance of social implications of e-learning and their transformative effect. E-learning in this approach puts forth a new theory of learning by redefining the psycho-social construct, the epistemologically informed practice and the multimodal social semiotic process.

This special issue topic mirrors the interdisciplinary and international approach of JERO. It is partly based on a symposium held at the European Conference on Educational Research in Vienna in 2009. Thanks therefore must go to Dr. Karl Steffens (University of Cologne) who organized this symposium and thereby provided a starting point and the scope for this issue.

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