Technologies and Practices for Constructing Knowledge in Online Environments:
Advancements in Learning

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Preface

Since more than a decade, technologies contribute to learning (Ertl, Winkler, & Mandl, 2007). There are different scenarios like for example computer supported collaborative learning (Koschmann, 1994; Strijbos, Kirschner, & Martens, 2005), mobile learning (e.g., Chen, Kao, & Sheu, 2003), and Web based trainings (Horton, 2000). Many of these learning scenarios apply the Internet for collaboration, information access, social networking, or just for keeping up to date. Furthermore, several learning scenarios are fully Internet based, which means that learners just use the Web for entering their learning opportunities from wherever they want. Such flexibility and adaptability of technology has led to a comprehensive application of computers for learning, going from pre-school to senior education. Technologies were further developed to become tools for learning and to facilitate specific learning styles, like e.g. inquiry learning (Quintana et al., 2004) or e-collaborative knowledge construction (Ertl, 2010).

However, it is not technology itself that provides the learning; it is also dependent on different environmental factors. Thus, a learning environment also comprises of teaching strategies, instructional methods, learning material and the technology (see also Mandl, & Reinmann-Rothmeier, 2001). Depending on the instructional design, a learning environment can provide more than just means for knowledge acquisition. DeCorte (2003) introduces the concept of powerful learning environments that relates to careful instructional design that enables learners an active knowledge construction and the development of applicable knowledge, which implies that learners are able to use the knowledge and skills acquired productively (see also Renkl, Mandl, & Gruber, 1996). One key to designing powerful learning environments is the implementation of situated learning scenarios (see Lave & Wenger, 1991) that facilitate learners' active knowledge construction. They apply authentic problems for the learners to work with—and also a social context for learning that allows multiple perspectives on the learning material. Such environments allow learners to construct their knowledge (e-) collaboratively (see Fischer, Bruhn, Gräsel, & Mandl, 2002) and to build a shared understanding of the learning material (see also Puntambekar, 2006). In general, e-collaborative knowledge construction (ECKC) can show different implementations to provide powerful learning environments (DeCorte, 2003). Theoretical foundations, insights into processes, and the issue of support mechanisms for ECKC are covered by Ertl (2010) "E-Collaborative Knowledge Construction: Learning from Computer-Supported and Virtual Environments" which complements this book. Here we focus on practices of and technologies for e-collaborative knowledge construction. The book provides particular insights in the issue of how technologies can bring advancements for learning. Thereby it offers practice examples that show how e-collaborative knowledge construction takes place in a learning environment and how technology supports learning in this environment. It further focuses on particular technologies and how they can be applied now and/or in the future for e-collaborative knowledge construction.

STRUCTURE OF THE BOOK

This book comprises three sections which take up the aspects of how technology can facilitate and provide advancements in e-collaborative knowledge construction. It starts with practice examples that give an impression about scenarios of e-collaborative knowledge construction and the technology applied in these scenarios. The middle section focuses on technologies that enable collaborative knowledge construction processes and shows how they can be framed to support ECKC. The book concludes with broader perspectives which set ECKC back in a cultural context. In the following, the sections and chapters are described more detailed.

Practice Examples for E-Collaborative Knowledge Construction

This first section illustrates technology application by good practice examples for e-collaborative knowledge construction. It shows how learning environments can provide advancements for learning and which particular role technology can take in these environments. It takes up good practices for different target groups like school children, university students, and senior learners. Authors provide insights into development of their learning environments and provide lessons learned during planning, implementing and running them.

Qiu focuses on content-specific knowledge construction. She describes an example in the domain of science education using a learning-by-doing approach. Students work in Qiu's environment collaboratively on a corrosion problem and execute several investigations to find a solution for it. This chapter provides particular insights in a learning environment and learners' options for actions within this environment.

Helling and Petter show e-collaborative knowledge construction in the context of a multi-week course. This course was dedicated to teachers of senior citizens and aimed at familiarizing them with special needs of elderly persons for learning in the ICT context. They describe their design rationale and the implementation in Moodle, evaluation results, lessons learned, and identify particular good practices.

Firpo, Kasemvilas, Ractham and Zhang use a community approach and describe the design and implementation process of a community for graduate students. They show which opportunities communities can offer to graduate students and also how they can stimulate collaboration. The authors deal with the issue of commitment to the community, which is essential to create a sense of community and to work productively. Concluding, the chapter reflects on implementation practices and lessons learned.

Technologies

As the examples have shown, all of the environments rely on information and communication technologies to support communication (e.g., by chat, videoconferencing, and discussion boards) and collaboration (e.g., by shared workspaces/whiteboards or collaborative authoring tools) to empower learners engaging in e-collaborative knowledge construction. Chapters in this section describe these technologies and—more important—how they can be applied in context of ECKC. This how relates to the issue that collaboration partners need more than just a technology for ECKC, they work with this technology in a particular setting to experience beneficial collaboration and knowledge gains. Thus, the technologies have to be integrated in environments for collaboration, which can provide further support, (e.g., by agents or other dedicate features).

Hatzipanagos, Basiel, and Fillery-Travis show the use of Web video conferencing for e-collaborative knowledge construction. They focus particularly on the context of work-based learning and provide two

case studies. These case studies demonstrate important issues of Web video conferencing, the advisor/candidate relationship, which deals with the provision of an appropriate setting for the videoconferencing session, and the need for clear organizational structures, which is demonstrated by a project called "Work Based Learning Wednesdays.". Based on both case studies, the authors show aspects to consider when applying Web video conferencing as mean for e-collaborative knowledge construction.

The chapter of Hu and Gollin describes a system for collaborative authoring. They explain how such a system can be used for collaborative case-solving and thesis work. The authors take up the issue of how far the individuals contribute to group work and present functionality for evaluating the collaboration partners' contributions with respect to different dimensions. Such features allow the assessment of the amount each partner worked on the collaborative output and also how much each partner contributed to the final collaborative outcome.

Cascera, D'Andrea, Ferri and Grifoni describe the technologies of discussion forms, whiteboards, audio/videoconferencing, newsgroups, and blogs in a comparative way and discuss how far each of them can enable virtual communities. This chapter gives an overview on the advantages and disadvantages of different kind of technologies for their application in the context of e-collaborative knowledge construction. The chapter introduces the approach of agents to support collaboration partners in virtual learning communities and to study their interaction.

Okita deepens the agent approach and deals with the issue of technological boundary objects. Such objects may be robots, avatars or other kind of agents. They can take part in knowledge construction processes by analyzing learners' behaviour and interaction in the environment and giving feedback to the learners. Okita distinguishes different kind of such objects with respect to their functionality, their realism and their application for learning environments. She presents results of three studies which show how children perceive robotic animals and how technological boundary objects can act as learning partners.

Outlook

The outlook section puts e-collaborative knowledge construction in a broader context and discusses critically educational, and cultural perspectives. Chapters in this section describe possible developments of e-collaborative knowledge construction in future and driving and hindering forces.

Lakkala, Ilomäki, and Kosonen conclude begin this section by presenting a framework for the evaluation of e-collaborative knowledge construction. They consider the pedagogical design of learning environments as the building of appropriate infrastructures and propose a technical, a social, an epistemological and a cognitive dimension as dimensions for analysis. They exemplify the application of their framework by evaluating three different course designs which comprise of question-driven knowledge creation through wikiWiki, a qualitative methods seminar, and a collaborative course design for engineering students.

Olaniran, Olaniran, and Edgell take an intercultural perspective on e-collaborative knowledge construction. They show some challenges for knowledge construction and manifest them by the example of blogs. They further discuss collaboration partners' underlying cultural dispositions towards collaboration and learning and discuss how far they may have an impact on e-collaborative knowledge construction—particularly in an inter-cultural context.

The chapter of by Zuzeviciute and Butrime takes a socio-cultural perspective on e-collaborative knowledge construction. It identifies how far information and communication technologies penetrate society and culture and discusses the effects of this penetration with respect to e-collaboration and e-learning. It shows further how far e-learning can be considered as socio-cultural system.

CONCLUSION

This book provided provides different practice examples for learning environments, tools, and also for technologies. Comparing these technologies, one may ask about the best technology for a particular learning scenario, like is it better to use discussion boards or videoconferencing for a particular task. Cascera et al., for example, contrasted different technologies by analyzing their advantages and disadvantages. Such contrasts can be a starting point of considerations about instructional design to resolve the issue about what technology to take for a particular scenario. Mandl, Ertl, and Kopp (2007) made the case by contrasting a learning environment that used asynchronous communication with a learning environment that used a synchronous one. They discussed that the focus of instructional design should guide the decision about what technology to choose (see also Clark, 1994). Asynchronous discussion can encourage learners to reflect about a problem by themselves and then build a shared understanding based on their reflection, which has the advantage that learners are able to also discuss about differences within their reflections. In contrast, a synchronous discussion can facilitate learners to get to a shared solution to a problem by intense exchange and collaboration. Thus, using one technology may focus learners more on a shared reflection while using the other may focused rather on developing a shared solution (see Mandl et al. 2007). Thus, technology provides just one infrastructure for learning, which has to be complemented by other infrastructures. This aspect is elaborated by the chapter of Lakkala who raised the issue about providing different infrastructures for technology enhanced knowledge construction.

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