Educational practice has been changing in recent years, with the integration of e-learning and now m-learning in teaching in schools and higher education. The use of Web 2.0 technologies for teaching and learning has been described by Stephen Downes as “e-Learning 2.0”. Using the catchphrase, “The user is the content”, he argues that a new approach to student participation in learning has developed around the incorporation of the Internet into education.

As a consequence of this social revolution, there is agreement among the experts that education has to be rethought. It is expected that learning as well as teaching will take place by using a range of devices in diverse environments. Traditional face-to-face teaching, otherwise known as “chalk and talk,” is thought to be on the way out.

But to what extent do these expectations reflect reality, or predict developments that are likely come about in the near future? What will happen if technology is increasingly integrated into educational settings? What is our role/stance in this process, and what challenges do we face? These key questions need to be answered in order to establish what the education of tomorrow should be like.

However, predicting the future is always difficult, especially when anticipating change in the context of the educational system. Educational processes involve a high degree of complexity. It is therefore not the simplest of tasks to use digital media and technology to bring about a change in learning style, and it is even more difficult to make assumptions about the future.

With this in mind, the articles in this book reflect the breadth of the topic of the incorporation of technology into educational processes. They aim to trace the different discussions in different topics, from primary and secondary school to Higher Education, from Second Life to wiki technology, from physical education to cultural learning.

We have, as far as possible, organized the articles into the following main topic areas:

- Teacher and Learner
- Context of learning
- Learning Approaches
- Learning Technologies

Some articles cannot easily be allocated to a single topic, as they address different aspects, and cross the boundaries of each main topic. There are also articles that are closely linked to each other. This is shown in Figure 1 by means of intersecting circles to indicate that the article concepts overlap.

The main question implied in the book title is: “How can we predict the nature of future technologies and their implications for educational settings?”

There are different ways to go about this, such as using Gardner’s Hype Cycle, or conducting a review of the literature.
Figure 1.
Sandra Schaffert and Christina Schwalbe take a meta-view of the book title and in their article they describe two different ways to obtain data about the future of media technology: the Delphi method and the scenario techniques. They focus strongly on a cultural studies perspective. What role does the adoption of new media play in educational systems like schools and universities? Besides the change in the way communication takes place and the way knowledge is managed, media adoption mostly depends on the changing roles of learners and teachers.

**LEARNER AND TEACHERS**

In different publications about the learner of the future, it is assumed that they will need more and different competencies than today’s learners (Oblinger, 2005; Prensky).

In his article, Rolf Schulmeister analyses the connection between students, Internet, eLearning and Web 2.0. Based on a previous article about the myth of the “net generation” (Schulmeister, 2008), he examines the use of the Internet, E-Learning and Web 2.0 Tools of 2098 German-speaking students. How do they use the Internet and Web 2.0 Tools as well as the e-learning materials provided by their university? The results of this study are depressing to most of the “Net-Gen-Prayers”: most students cannot be referred to as part of the net generation, as they do not use the internet, Web 2.0 or e-learning tools particularly often and are not sophisticated users. Care therefore has to be taken not to assume that all children, young people and students are members of the “net generation”.

The need for today’s children to be media literate is evident. As Bennett (2008) and Lorenzo and Dziuban (2006) found out, these children, who are often called the net generation, are very smart in their use of new technology, but they are not very sophisticated in terms of media literacy, and do not obtain high scores in judging and reasoning.

Teaching media literacy is therefore a task for teacher in schools all over the world. Silke Weiss focuses on this in her article. She asks how the media literacy and media skills of secondary school teachers can be improved in order to prepare them for the next generation of learners.

Sue Fenley analyses navigation and visualization techniques in e Learning material and Internet research. How do learners navigate through learning material and the Internet? The results of this analysis can help learners to learn more as they navigate through learning materials and can assist teachers in planning teaching materials.

**CONTEXT OF LEARNING**

The context of learning is an important subject of discussion. In which environment does learning take place? Two articles address the context and the framework of learning with digital media.

Learning in the 21st century, especially with technology, is often intercultural learning. Technology has facilitated the opportunity to learn in a virtual setting, with other people, often in other countries, who are members of a different culture. What does this mean for the learning process involving technology? Sandra Reitz describes a learning scenario in which learners from six different countries learned together about Human Rights Education. It is not the topic of the course that is important. It is the exposure to the differences in perspective of the other learners, especially when technology is used.

Jane Holland addresses service learning, a learning form which is becoming increasingly popular at universities. By integrating service learning at universities, academic learning and social responsibility
are linked. Often a range of key competencies is acquired in such settings, from project management to media literacy. In the early days, service learning was mainly supported by e-mail technology. Today it is possible to integrate many technologies to support service learning: from Word to Photoshop to the point of web 2.0 Tools such as wikis and blogs, students’ work can be better visualized inside and outside of universities.

Grainne Conole and Patrick McAndrew give us a brief overview of what a future technical environment can look like. How can emerging Web 2.0 technologies and beyond be integrated to facilitate collaboration between researchers, teachers and students? Especially if one takes a closer look at open educational resources (OER), there seems to be huge potential for future learning behaviors. Grainne Conole and Patrick McAndrew provide us with an overview of the challenges and the backgrounds to their project as well as the tools used for visualizing and social networking. The authors point out further steps to be taken and how this initiative will help to enhance learning and teaching for tomorrow.

A further article written by Catherine Adams explores the importance of technology through learning and teaching. She discusses how technology influences the daily teaching process and how ubiquitous technology implicates? Complements? Replaces? Involves? old traditional educational settings. Vocative objects and mimetic interventions are carried out as well as new teaching and learning practices. Catherine concludes by pointing out that tomorrow’s digital literacy is of great importance beyond the traditional domains of literacy such as language, arts, music, mathematics and sciences,. Children must be taught the basic vocabularies and languages of the machine; programming may become essential knowledge and will help them to understand the world of tomorrow.

LEARNING APPROACHES

New technologies often entail adopting new approaches and learning methods. Different learning methods are mentioned in connection with new technology: constructive learning, active, self-directed learning or game-based learning. Two articles address the last of these. Michael D. Kickmeier-Rust, Elke Mattheiss, Christina Steiner, and Dietrich Albert provide a brief overview of educational gaming and discuss the psycho-pedagogical foundations of “good” educational computer games.

Fotis Liarokapis and Sara de Freitas study game-based learning in more detail. They present a case study of Augmented Reality Serious Games.

With the dissemination of web 2.0 tools and the increasing use of these technologies there are new demands on learning processes, for example informal learning, at conferences. Marcel Kirchner and Thomas Bernhardt report on a new form of conferences, “EduCamp”, as a special form of BarCamps for teaching and learning topics. Beside this characterization they describe the more general challenges involved in arranging an open “unconference” format. These “unconferences” are supported by strong member participation, and the employment of web 2.0 tools, such as wikis and blogs.

One characteristic of game-based learning is that the learner has to complete a task. Based on the “Generation me”, Thomas C. Reeves and Jan Herrington describe different design principles that can be used for authentic tasks in learning processes. Their aim in working with authentic tasks is to engage learners more than would be usual when using traditional instruction methods.
EDUCATIONAL TECHNOLOGIES

When talking about learning methods, the question of educational technologies soon arises. Educational technologies can be classified into different categories of tools: First, we present all articles addressing mobile learning technology, followed by articles about wikis and virtual worlds.

Tools for Supporting Mobile Learning

Christian Safran, Martin Ebner, Frank Kappe and Andras Holzinger included a mobile geospatial wiki in educational processes. Pictures are of particular value in the field of civil engineering as they provide global coordinates. During learning and collaboration processes students can see the location on maps and can easily integrate and use them in their learning behavior. Furthermore, with the help of mobile devices, pictures can be taken, geotagged and articles edited. The authors point out within this field study that mlearning has great potential for the future and predict that it will be the next step in technology integration.

Wiki

Using wikis in educational settings seems very promising (Cunningham, 2001). Several authors in this book refer to wikis. After Safran et al., who implemented a mobile wiki, Beat Döbeli and Michele Notari dealing to this technology and link the potentials and challenges of e-learning with the required key competencies of learners. They focus more on communication in informal learning settings, an approach that is becoming increasingly relevant to educational settings. They focus on problem based learning as a learning form that addresses the challenges of a world that is changing due to technology. One example they give is the integration of a wiki to support informal educational learning. This article therefore paves the way for articles on (future) learning methods.

After discussing wikis in informal learning settings, Klaus Wannemacher describes working with Wikipedia in formal learning settings in Higher Education. There are two ways to use Wikipedia: in the first way, it can be used as a tool of inquiry in scientific work. The second and more interesting way is to use Wikipedia as a learning tool in university seminars in accordance with a constructivist teaching and learning paradigm. Students can conduct complex research, editing and undertaking further bibliographic related processes using Wikipedia. After providing some background information on the use of Wikipedia among German students, he describes its use in different teaching projects and focuses on the advantages and disadvantages involved.

Virtual Worlds

A key topic in current and in future education settings is virtual worlds. Although not new, Second Life is still discussed in an educational context, in schools and higher education. The discussions of virtual worlds can have two components: technical and pedagogical.

Nadine Ostersjek and Michael Kerres both give an overview of didactic elements that are relevant to learning opportunities in virtual worlds. Learning does not automatically become more effective just because a new technology is adopted in the classroom. Usually, the first time technology is adopted, the learning process is hindered by technological questions and it takes time for the advantage of the new technology to become apparent. Ostersjek and Kerres strongly recommend paying attention to didactic considerations before adopting technology in educational settings. They describe the processes of
interaction, construction and collaboration in new educational settings that have to be included in the instructional concept of the learning and teaching process.

Beside Kerres and Ostersjek, Stephen R. Quinton describes Principles of Effective Learning Environment Design more generally. He does not want to describe the advantages of ‘virtual’ learning environments in educational processes but rather describes the design principles for the construction of qualitative learning environments, both face to face and media-supported.

The benefit of educational technology is at first glance often not clear to learners. Thomas Czerwionka, Michael Klebl and Claudia Schrader describe a way to evaluate user requirements for technology in distance education. They use virtual classrooms for this evaluation. Beside the evaluation they take a meta-view of their evaluation method.

One concrete educational setting in which virtual worlds and simulations are often carried out is science education. The students have to get laboratory practice, but space is often limited at universities, and scientific experiment are very expensive. Rob J.M. Hartog, Hylke van der Schaaf, Adrie J.M. Beulens and Johannes Tramper present a project of virtual experiments in Higher Education. They discuss the benefits and also the limitation of this form of learning for students.

Simulations can also be implement in social sciences, but with different goals. Based on the theory of Andragogy, Lisa Carrington, Lisa Kervin and Brian Ferry describe the support of teacher education with a simulation program to reduce the theory-practice nexus. They describe their experiences in teacher education from Australia and come to the conclusion that simulations can be an appropriate way to learn with technology, particularly with adult learners.

With the diffusion of technology in more and more subjects, it is predicted that schools will not be able to get along without it. Technology will become an integral part of every school subject, even subjects where the use of technology is not immediately obvious. The integration of different tools to support learning in physical education is described by Rolf Kretschmann. When thinking about physical education one might think of action, perspiration and maybe of tools like the microchronometer. But this is changing very fast. In recent years the gap between technology and physical education has been narrowing, due to computer games, handhelds to record heart frequencies or walking routes, and game consoles like the WII. Kretschmann provides a brief overview of the potential of new media in this school subject and describes some examples of their use/integration.

**CONCLUSION**

It can be seen that new technologies will be an integral part of our live, both now and in future. The articles in this book range from physical education to Higher Education, from wikis to virtual learning environments, and from teacher education to chemistry.

We would like to thank all authors for their articles and their great and valuable work. We are very proud to have received such a huge amount of publications addressing how technology plays a role in different scenarios, at different levels and by different means. As we think about the future of learning and teaching it has become obvious that no one is able to predict what it will be like, but we all agree that future education of our children and students is based on the use of technology. A society where mobile phones, netbook and laptops are more or less integrated into daily life will require new strategies, methods and learning environments. We have to take care, research and help the growing generations to become 21st century citizens taking advantages of their access to the biggest information network in mankind to improve the environments in which they live.
Once again, the editors would like to thank all the authors and reviewers, all who contributed to making this book worthwhile, and all who will read it. The education of tomorrow is one of the most important topics today and we hope that this book will provide food for thought as well as suggestions as to how to integrate technology into education both appropriately and effectively.

*Martin Ebner & Mandy Schiefner*  
*Editors*

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