

**Guest Editor's Introduction****INTERNATIONAL PERSPECTIVES ON THE PEDAGOGICALLY  
INNOVATIVE USES OF TECHNOLOGY**

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The children of today grow up having information and communication technologies (ICTs) as essential and natural parts of their daily life. As they grow, they are expected to become active and self-directed members in their own local communities and also in the information society at large. Technology creates versatile possibilities for the acquisition and creation of information, for self-expression, and for communication and interaction with other people locally, nationally, and worldwide. Active participation in the information society presumes novel knowledge, skills, and work approaches from children and teachers alike.

The rapid development of technology has challenged also learning environments to adopt ICT to support learning and teaching and in guiding children to become its diversified users (e.g., Baker, 1999; Bergman, 1999; Kankaanranta, 2002). It has been stated that computer use serves as a trigger for transformations and technology-enriched instructional innovations, which involve profound changes in and affect the very nature of entire learning environments (Salomon, 1996). Even though ICTs are nowadays widely utilized in education around the world as tools for instruction, there are tremendous challenges for developing pedagogically innovative and quality practices for technology-enhanced education (Kankaanranta, 2004; Kozma, 2003). It has also become apparent that technology as such is not ready for use in instruction. It is essential to take the knowledge of human development and learning as a basis for understanding the needs for which diverse technologies of learning should be developed and how they can be better designed to satisfy diverse learners, learning environments, and communities.

In this issue of *Human Technology*, the overall theme is the pedagogically innovative uses of ICT. The theme gathers approaches from diverse perspectives as well as the experiences of, research in, and comparisons between countries around the world. The authors of the articles are connected to each other through participation in the Second Information Technology in Education Study (SITES), which was a cross-national comparison of the use of ICT in education. SITES was organized by the International Association for the Evaluation of Educational Achievement (IEA, n.d.) and it was intended to provide policy-makers and educational practitioners, but also the private sector, with information about the use of ICT

in educational systems. The SITES research was initiated to aid different countries in their efforts to evaluate the prevailing status of ICT use in education, and to follow and predict the amount and quality of ICT resources and the trends of its educational use. The SITES program has, so far, consisted of two modules. Module 1, organized 1997-99, was a survey of principals and technology coordinators in primary, lower secondary, and upper secondary schools in 26 countries (Pelgrum & Anderson 2001; SITES M1, 1999). Its basic aim was to describe the status of ICT in schools. Data were collected at the school level with regard to the curriculum, ICT infrastructure, staff development, and management.

The articles in this journal issue are based on or related to Module 2 (2000-2002), which was a qualitative study focusing on innovative pedagogy in relation to ICT use (Kozma, 2003; SITES M2 Projects, n.d.). The main goals of the SITES Module 2 were to:

- Identify and provide rich descriptions for innovations that are considered valuable by each country and that might be considered for large-scale implementation or adoption by schools in other countries.
- Provide information to national and local policy makers that they can use to make decisions related to ICT and the role it might play in advancing their country's educational goals and addressing educational needs and problems.
- Provide teachers and other practitioners with new ideas about how they can use ICT to improve classroom practices.
- Add to the body of research knowledge and theory about the contexts and factors, within and across countries, that contribute to the successful and sustained use of innovative technology-based pedagogical practices. (Kozma, 2003, p. 9)

The participating countries needed to follow four international criteria for the selection of innovative national cases (Kozma, 2003). The first criterion concerned significant changes in the roles of teachers and students, the goals of the curriculum, assessment practices, and/or the educational materials or infrastructure. The second criterion highlighted the substantial role or the added value of technology in pedagogical practice. The third criterion associates the innovation with positive student outcomes. There was to be documented evidence that the intended goals and objectives were attained or had an impact on, for instance, student learning. The fourth international criterion emphasized the potential of the sustainability and transferability of the innovative practice from one classroom to the entire school, to the local region, or even further levels. These international criteria were complemented by a national perspective, as the national culture, educational systems and expectations, and current status of schools vary greatly. Thus, a fifth criterion was a local one, involving a national panel to provide the local definition for innovative pedagogical practices using ICT.

According to these criteria the participating countries selected their national cases for the study. Altogether 174 case studies were collected and analyzed from exemplary implementation sites across 28 countries. The national number of cases ranged from 1 to 12, while the average was about 6 cases per country. The data were collected during school visits: through interviews with teachers, school principals, technology coordinators, and administrators; focus group discussions with students, teachers, and parents; classrooms observations; and diverse documents about case practices. National research groups prepared for each ICT-supported innovative practice a case report, which was sent to International Coordination Center of

SITES for further analysis. The case reports can be accessed through a database on the SITES M2 Web pages (SITES M2 Case Reports, n.d.).

This issue of *Human Technology* consists of six articles, from authors representing seven countries which participated in the SITES M2 study. The first three articles are cross-national comparisons and the three latter articles focus on country-level analysis and issues. The themes of the articles cover different system levels, starting from the macrosystem or policy level and proceeding to the microsystems of classroom with their innovative practices.

On the policy level, expectations exist that new technologies will improve and change schools. In his paper, Robert B. Kozma examines policy-level issues related to the development and use of ICT. He emphasizes that many countries justify investments in educational reform and in educational technology with the need for economic and social development. Kozma reviews literature on economic development, education reform, and educational technology in order to specify factors influencing economic and social growth and development. The review builds up to a systemic framework for national policy analyses. The factors are illustrated through three case countries, namely Egypt, Finland, and Singapore.

The implementation of ICT tools in the curriculum is a complex process. Joke Voogt and Hans Pelgrum's paper explores the relationship between curriculum changes and ICT-supported pedagogical practices. The analysis is based on a subset of SITES M2 cases that indicated changes of curriculum content and change related to new learning goals. In their analysis, they utilize a three-dimension framework of curriculum representations: the intended curriculum, the implemented curriculum, and the attained curriculum. Voogt and Pelgrum argue that the change towards the information society entails changes in the design and implementation of educational curricula and also efforts toward developing innovative technological learning solutions. In their view, students need to develop novel competencies and lifelong capabilities that are not addressed in the traditional curricula.

The primary aim of the SITES M2 study was to characterize and describe the different innovative practices as a collection and not to compare the cases and countries with each other. However, the database of innovative cases provides versatile possibilities for in-depth further analysis and comparisons. Law, Kankaanranta, and Chow compare the cases of two systems, namely Finland and Hong Kong. These two countries have performed well in several recent international comparative studies. However, results of SITES M1 indicated rather different profiles for the two countries in the implementation of ICT in education. This motivated the authors to further explore the differences in the nature of the educational innovations and in the change mechanisms and factors influencing change across countries.

The last three papers each bring one country's perspective to the discussion of pedagogical use of ICTs. An Israeli research group has undertaken secondary analysis of their national cases of the SITES M2 and OECD/CERI<sup>1</sup> studies. In their paper, Alona Forkosh-Baruch, David Mioduser, Rafi Nachmias, and Dorit Tubin examine the characteristics of two patterns of ICT-based curricula innovations, that is, "islands of innovation" and "school-wide implementation." The authors contemplate that the study of diffusion-of-innovation patterns within schools will advance understanding of ICT-based innovation implementation processes, as well as their transferability and scalability.

The SITES M2 study indicated that in many countries' innovative use of ICTs was connected to project work. In his paper, Ola Erstad analyzes ICT-supported project work from the Norwegian perspective, concentrating on two main themes. The first theme relates to the changes technology brings about for students and teachers in learning environments; the

second focuses on the so-called affordances that technology provides for its users. The notion of affordances can be defined as the action potential of a particular object or item in one's environment, or as a range of uses that a person sees for a specific object (Ryder & Wilson, 1996). For example, virtual learning environments can offer users multiple affordances and also enlarge local learning environments by affording ways of connecting with other people (Nardi & O'Day, 1999).

The paper of J. Enrique Hinostroza, Christian Labbé, and Magdalena Claro characterizes Chilean students' and teachers' ICT use, based on seven factors. The authors describe the context of ICT use in Chilean schools as relatively good and as not having any first-order barriers for implementation of ICT pedagogy. Their concern is on finding qualitatively better or optimal ways to take advantage of students' and teachers' time spend with ICTs for learning and teaching purposes.

Altogether, the articles provide a broad spectrum of current issues in the use of ICTs in education: from global perspectives, insights, and visions to the pedagogically innovative practices in the actual use of ICTs. The 174 cases in the SITES M2 study characterize the best practices from the participating 28 countries. This means that the lessons learned from them are not yet part of daily practices in all, or even in most, of the schools worldwide. This is noteworthy in particular because of the juxtaposition of the speed of technological implementation in businesses and society at large versus that of schools. Changes in the processes of education (e.g., curriculum development, pedagogy, the various uses of technology) are coming at a slower pace. As a result, it is taking a long time for the technological tools and developments to be fully incorporated into everyday education at even the most innovative and adaptive schools. How much longer yet will take for this progress to reach the less advantaged schools and students around the world?

The results have also shown that there are vast differences in the processes of transferring and sustaining innovative practices for wider learning communities. According to Kozma (2005, this issue), educational reforms—including ICT implementation—at best, need to be systemic in nature. A systemic perspective on the studies of technology-enriched learning environments focuses on the overall changes resulting from technology-intensive interventions (Kankaanranta, 2002; Salomon, 1996). Technology and the individual technologies are viewed as constituent elements of a learning environment and they can be understood only in relation to the larger systems of pedagogical practices (Bruce & Hogan, 1998). It is acknowledged that at the macrolevel technology and the ability to apply knowledge and technology in new ways (i.e., technological innovativeness) are sources of significant economic growth (Kozma, 2005, in this issue).

At the moment of this journal's publication, the latest phase of the SITES research program, SITES 2006 (see SITES 2006 Projects, n.d.), is in its field test phase in about 20 countries. It is an assessment of teaching and learning practices and of the ways ICT supports them in secondary schools around the world. The participating countries have been implementing policies to promote the use of ICT in their education systems (see Plomp, Anderson, Law, & Quale, 2003). The aim of SITES 2006 is to explore the impact of these policies on daily practices at schools. The major questions focus on the extent and ways ICT is used in education and how it supports and enhances pedagogical practices. Another significant goal is that the results of the new study, taken together with those of the two previous modules of the SITES program, will provide a forum for inspiration on and synthesis of pedagogical

revisions for various audiences, be they from the public sector or private enterprises. We trust that the contents of this issue of *Human Technology* will add to the discussion.

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## ENDNOTE

<sup>1</sup> The SITES M2 study was conducted at about the same time as the OECD study on case studies of ICT and organizational change in schools, as reported in Venezky & Davis (2002).

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Many ICT-supported pedagogical practices strove to realize new goals important for lifelong learning in an information society. Content and goals were offered in curricular settings, often crossing the traditional boundaries of academic subjects. In many of the cases students worked on topics that were meaningful to them.Â Guest Editor s Introduction: International Perspectives on the Pedagogically Innovative Uses of Technology. M. Kankaanranta. Geography, Engineering. In modern society, innovation technologies expand to almost every field of human activity, including such wide field as education. Innovation in education is a highly contentious issue. Education is sometimes perceived as one of the most conservative social systems and public policy fields. Use the [Advanced Search](#) [Close](#). [New Search](#). [Open Access Preprints Full-Text available](#).Â [Click here to see the statistics on "Human Technology"](#) . Cited by 13 articles. [See citing articles](#).