Second Information Technology in Education Study: Module 2

Study Abstract

- Primary school children in a small rural school in Catalonia, Spain took digital photographs of their church and town square and digital recordings of their grandparents telling folktales and singing nearly-forgotten folk songs. They collaborated with students in nearby villages to build a website on the history of their region.

- Lower secondary school students in Norway used the email to collaborate with students in the US and to follow two women (one Norwegian and one American) who crossed Antarctica on cross-country skis. The students communicated with the women and with weather and research stations in the area to learn about the Antarctic continent.

- A technology-intensive upper secondary school in the US was redesigned from the ground up around technology and project-based learning. The school was organized like a high-tech start-up business in which students were given real world projects consisting of complex tasks with long-range due dates for which they had individual and shared responsibility.

- First and second grade students in Chile used low-cost Nintendo *Gameboys* to improve their reading and mathematics skills. The self-regulated educational games were developed by university engineers, psychologists, and educators in support of the country's curriculum objectives.

- A physics teacher in the Philippines wanted to enhance the development of her students' critical thinking skills through hands-on investigation, in-depth verification, exploration, and discovery of scientific concepts and processes. Teams of students used computers and probe ware to conduct experiments and solve a hypothetical murder case.

These are just five examples of 174 case studies that were generated by research teams from 28 countries in Europe, North America, Asia Pacific, Africa, and South America. The Second Information Technology in Education Study Module 2 (SITES M2) examined how information and communication technology is being used to support innovative classroom practices around the globe. SITES M2 (http://sitesm2.org) was a project of the International Association for the Evaluation of Educational Achievement (http://www.iea.nl/) and supported by funds from the participating countries, with special funding from the Ford Foundation, as well as the governments of Denmark, France, Japan, The Netherlands, Norway, and the United States—both the Department of Education and the National Science Foundation. The international project was conducted by research teams in the 28 countries, coordinated by scientists from the United States, Canada, and The Netherlands, and directed by Dr. Robert Kozma at the Center for

Technology in Learning at SRI International in Menlo Park, California (http://www.sri.com/policy/ctl/). The report of the project, entitled "Technology, Innovation, and Educational Change: A Global Perspective" is published by the International Society for Educational Technology (http://www.iste.org/).

The cases were selected by national panels of experts that used both international criteria and local criteria, to assure that the cases would be locally valued. Dr. Kozma, Principal Scientist at SRI, commented that "These cases represent not what is typical in each country but the aspirations that each country has for the future of their educational system."

An analysis of the 174 cases found that technology is supporting significant changes in classroom teaching and learning. They paint a very different picture than the traditional classroom where the teacher lectures in front of the classroom and students take notes or do worksheets. They show important similarities in how technology is being used in many countries around the world.

In these selected cases, students were actively engaged in what are sometimes called "constructivist activities", such as searching for information, designing products, and publishing or presenting the results of their work. Students often collaborated with each other on these projects and occasionally they collaborated with others outside the classroom, such as students in other countries. Productivity tools, such as word processors and presentation software, were used in a majority of the cases, as were World Wide Web resources, email, and multimedia software. These tools and resources were used to create products and presentations, support communication, and search for information.

Only in a small minority of the cases did teachers lecture as part of the innovation. However, teachers were not just passive bystanders who turned things over to the kids and computers. A large majority of case reports said that teachers created structure for students by organizing student activities and teachers advised students and monitored or assessed student performance, as they were engaged in the innovation. A majority of the cases reported that teachers collaborated with other teachers as part of their innovation. And in a few of the cases, teachers collaborated with people outside the class, such as professors, scientists, or business people.

The study found that certain patterns of practices in these cases were more likely to be associated with significant positive outcomes. For example, one group of 14 cases was characterized by a pattern of practice where technology supported students who collaborated with each other to conduct research and analyze data. The cases that fell into cluster were far more likely to report that students acquired new ICT, problem-solving, and collaboration skills than were cases in other clusters.

Another significant finding of the study was that these 174 cases were distributed across a wide range of grade levels and subject areas. As a group, the cases were evenly divided among primary, lower secondary, and upper secondary grades. A large number of cases were in the sciences. Languages accounted for another large group, both mother tongue and foreign languages. A smaller group of cases were in the social sciences or creative arts. Many of these ICT-based innovations involved multidisciplinary projects. In only 29% of the cases was the innovation limited to a single subject area. A small minority of the cases involved only the study of computer literacy, computer science, or "informatics" as a subject area.

Yet, the study found that these technology supported innovations had a limited impact on the curriculum. Only 18% of the 174 cases reported a change in curriculum goals or content that was supported by technology. In many countries curricular goals and content are determined by national policy, rather than local districts, schools, and teachers. However, where technology-supported curricular change did occur in the study it was because teachers provided a more in-depth coverage of a single subject, or schools gave students more responsibility for determining their own learning, or they emphasized a certain curricular theme, like preparing students for the "information society".

Similarly, the study found that the innovations had limited impact elsewhere. While 75% of the innovations had been used for at least a year, only 41% provided evidence that the innovation had been disseminated to other classrooms or schools. In the schools where the had been both continued and disseminated, continuation depended on the energy and commitment of teachers, student support, the perceived value for the innovation, the availability of teacher professional development opportunities, and administrator support. Beyond these factors, innovations were more likely to continue if there was support from others in the school and from external sources, innovation champions, funding, and supportive policies and plans. Particularly important was the connection with national technology plans that provided resources that often enabled the innovation to succeed.

Transfer was more problematic for even these successful cases. Many of the innovations were in the early stages of use and not yet ready for dissemination or they were in the process of being transferred to other settings. But the results of the study indicate that it is difficult to disseminate even successful innovations and this process is dependent on such factors as adequate infrastructure and resources, relevance to the new setting, teacher perceptions of the value of the innovation, and plans and policies that encourage the transfer of the innovation.

Policies—both local and national policies—were important to the success of many of the 174 innovations. At the national level, policies supported innovations by articulating a broad encompassing vision for the use of technology in schools and linked it to education reform, efforts to increase student achievement, or building the technological capacity of society. National programs provided schools with funds or resources that addressed schools' needs for equipment, networking, and teacher professional development. Local policies provided a more focused vision of how technology could be used in the school and classrooms. Local plans and programs allocated equipment and other resources to accomplish the vision, provided teachers with professional development experiences on both computer skills and the integration of technology into the curriculum.

Kozma concludes that, "The results of this study provide teachers all over the world with outstanding examples of how technology can change classroom teaching and provide policy makers with guidelines that they can use to increase the impact that technology can have on their educational systems."