

Chapter 6

Diffusion of ICT Innovation in Science Education

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ABSTRACT

In this chapter, the authors first discuss how Roger's theory of innovation diffusion can be incorporated into ICTs in formal and informal learning and teaching environments. The authors begin by presenting the use of ICT in education in general terms, then they introduce Rogers' diffusion of innovation (DoI) theory and the related literature. This is followed by a description of a project which explored the relationship between some characteristics of primary science teachers and their attitudes toward the use of ICT in education. A national project was funded by the Scientific and Technological Research Council of Turkey (TÜBİTAK), and Ege University, Science and Technology Application and Research Center. The last section involves a discussion of the diffusion of technological innovations into science education in the light of Rogers' DoI theory.

INTRODUCTION

The awareness and attitudes of individuals towards innovation are vital factors in the constitution of information societies. The adoption of ICT in education is not as fast as the pace at which technology

is developing. Technology has developed further in terms of fostering learning and teaching but that is not how it is being used in education. We need to find ways of diffusing ICT use within learning environments at the ICT development pace. Rogers' Diffusion of Innovation (DoI) theory may help with this issue (Rogers, 2003).

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PRESENT USE OF ICT IN EDUCATION

In this section we give an overview of how ICT is used in educational settings world-wide. We present a similar understanding for using ICT in education as stated by Shapiro, Roskos and Cartwright (1995): “a technology enhanced learning environment attempts to stimulate classroom activity by demonstrating and using software or tools specific to a particular discipline, by promoting high levels of interaction among students and faculty; and by involving students in simulated activities or data gathering via the Internet and remote databases. These aims require a re-conceptualization of traditional classroom design, not the mere addition of a piece of technology” (p.67).

From this point of view integrating ICT presents a significant change in educational systems however achieving this change, as anticipated, is very challenging. Furthermore, additional complexity is added to the use of ICT in education by other external factors which may be technological, social, political, economical or psychological.

The technologies involved and the approaches adopted in the use of ICT in distance education, in classroom teaching and in management of learning may vary. Technologies related to distance education can support real time interaction and include audio, audio graphics and video teleconferencing. Recently, systems that facilitate collaborative learning and support interaction with the group are gaining importance (Stacey, 1999; Sheremetov & Arenas, 2002). In both distance and in-class education, the Internet is used as a medium for meeting, discussion, exploration and a repository for course material. There is growing evidence that videoconferencing centers are being established for live lecturing and tutoring. Distance education is thought to provide a chance of equity for those who are hard-to-reach, extending learning beyond the classrooms while supporting personalising learning. Innovative practices are also emerging with mobile personal technologies

which are promising to add value to distance learning. These are mostly in the area of revision for examinations, and games-based testing and practice (McFarlane *et al.*, 2008).

Smith and his colleagues (2008) report that around 80 per cent of teachers agree that technology has an impact on students’ engagement in their learning, and around 60 per cent reported that it enabled tutors to better support learners’ diverse needs. Even though the great majority of the teachers identify the use of ICT in education most of them fail to implement ICT in their classrooms (Cuban, 2001; Moersch, 2002; Sandholtz *et al.*, 1997). They still prefer to use conventional instruments like the board, printed materials, projectors, multimedia computers, or video players as instructional aids and prefer to use digital resources in their teaching for information retrieval, communication, word-processing and preparing slide presentations.

The use of technology in the management of learning is developing. The development is mostly in recording and reporting of learner performance; interactive and online assessments; submitting work online; using e-portfolios; and self-and peer-evaluation (Smith *et al.*, 2008; Hollingworth *et al.*, 2008). The success in the use of ICT in education also depends on the consideration of social factors. The students’ learning habits, abilities in adapting to change as well as teachers, shape the use of ICT in education. In developing countries where education tends to focus on memorization, ICT is used as a tool to transfer instructional material and it is used for rehearsal. Whereas, in developed countries, finding ways of integrating the use of ICT as a tool and medium for learning, creating and sharing knowledge into education are a higher priority (Albirini, 2006; Sadık, 2005; Tella *et al.*, 2007). The adoption and dissemination of ICT in education is heavily influenced by the national priorities and initiatives of the policy makers in the individual countries. Policies to introduce ICT into education are supported by the need to build a knowledge society and to foster creative

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