Facilitating Technology Integration

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INTRODUCTION

The use of instructional technology is not new. During WWII, films were used as instructional media to train new recruits. The use of film as an instructional technology for training military personnel in WWII prompted the investigation of technology applications in formal educational settings. In the years following WWII, researchers began to study the applications of instructional technology in the classroom, as well as conduct studies on its effectiveness (Reiser 2002). Although technology has changed in the ensuing years and educators have access to many technologies, the integration of technology into the classroom has been slow (Cuban, Kirkpatrick, & Peck; 2001; Culp, Honey, & Mandinach; 2005; Hernández-Ramos, 2005) and its reported effectiveness on student learning and achievement has been mixed (Honey, Macmillan, & Carrigg, 1999; Keller & Bichelmeyer, 2004). The slow rate of integration is often explained from a technology evolutionary perspective, (Cuban et. al., 2001) that purports that with increased availability and access to technology, integration will occur naturally with time, or from technology determinist perspective (Surry & Land, 2000) that proposes that technology integration occurs when a technology is developed to meet a specific need, (i.e., if you build a better mousetrap it will be used). Although these two perspectives might explain some technology integration in society, they fail to provide a reasonable explanation for the lack of technology integration in classrooms. In order to understand why integration has been slow and often times fails to meet intended outcomes, we must adopt an instrumentalist's perspective to technology integration. This perspective considers the human factors related to technology integration, and proposes that integration is more a human endeavor than a natural process. (Surry & Land, 2000). I extend this perspective to include organizational and environmental factors that impact technology integration. This paper will examine the variables that impact technology implementation, and present two approaches that school systems could employ to facilitate the integration of technology.

SUPPORT FOR THE INSTRUMENTALIST PERSPECTIVE

The instrumentalist perspective advocates that human, organizational, and environmental factors impact technology integration. Research into technology integration supports this perspective. A brief presentation of literature on technology integration examines some of the variables related to these three factors, and will help build a foundation for discussing the two approaches for facilitating technology integration.

A review of educational technology polices from the last 20 years resulted in the seven recommendations to facilitate technology use in schools. These recommendations included technology infrastructure, access to technology, professional development, support of teachers, increased financial resources, increased and varied stakeholder involvement, increased research and evaluation of technology integration, assessment of technology-integrated learning, and policies and practices related to technology use (Culp, et al., 2005). Becker (1994) compared exemplary computer using teachers to typical computer using teachers and found the school environments of exemplary teachers were more likely to provide social support for computer use among peers, use computers for project-based activities rather than instructional delivery activities, provide support for teachers through professional development and on-site technology personnel, and provide resources to facilitate the integration of technology into the classroom. Cuban, Kirkpartik, and Peck (2001) indicated that for integration to be maximized, we must move beyond simple access to the technology and address the operational and organizational factors in schools, preparing teachers both technically and pedagogically to integrate technology, develop quality a technology infrastructures, and increase the availability of technology support personnel.

Ertmer (1999) describes the variables related to technology integration as being two distinct sets of barriers. First order variables or extrinsic variables are independent from the teacher. These variables include training, time, equipment, and support. The teacher has limited effect over these variables and can do little to alter them. Ertmer suggests that these variables are addressed by the organization and often lead to the emergence of second order or intrinsic variables. These variables represent the teacher's pedagogical philosophies and practices, view of learning, the classroom environment, and view of technology in learning. The resolution of these variables often requires a shift in pedagogical values, practices, and perceptions of technologies role in instruction. This shift occurs through professional development, support from peers, and support from leaders.

A survey of teachers in California reported that teachers also identified the need for more "release time" and access to educational technologists to develop technology integrated lessons. Additionally, the survey results supported previous research (Becker, 1994) that reported professional development and on-site technical support as critical factors related to technology integration (Hernández-Ramos, 2005). The same study indicated that teaching experience was positively related with amount of technology integration. This finding seems counter to the commonly held idea that younger teachers will be more "tech savvy" and willing to integrate technology. Furthermore, data analysis discovered a positive relationship between constructivist teaching philosophies and amount of technology integration (Hernández-Ramos, 2005).

An evaluation of technology integration projects in K-12 settings in Michigan (Zhoa, Pugh, Sheldon, & Byers, 2002) discovered 11 factors that influenced technology integration. These factors were grouped on three dimensions. The first dimension was labeled the "innovator" and represented the teacher variables such as the technical knowledge and abilities of the teacher, the match between the teacher's pedagogical beliefs/practices and technology being integrated, and the teacher's ability to navigate the schools social and cultural dynamics. The second dimension labeled the "context" and represented the school variables such as quality of the "technological infrastructure" specifically equipment, software, networks, quality of the "human infrastructure" specifically the policies, procedures, technology and pedagogical support personnel, and "organizational culture" (pg. 490), specifically the level of the social support from peers and school leaders related to technology integration efforts. The third dimension labeled as "innovation" represented the project. This dimension was discussed in terms of distance of the project from three factors. The further the project was from the factor the more difficult the integration. These factors were *school culture* or how far the project differs from accepted pedagogical values (i.e., beliefs and practices) of the schools constituency; *existing practice,* or how far the project differed from current or previous technology integration efforts by the teacher; *existing technological resources* or distance between the needed technological resources for the project and the existing resources (Zhao, et al., 2002)

The research on technology integration consistently indicates that organizational, environmental, and human factors can either be obstacles that prevent technology integration or facilitate integration. For schools to foster technology integration they must adopt an instrumentalist perspective and work to create environments that meet these issues.

FACILITATING TECHNOLOGY INTEGRATION

The integration of technology is not a simple task. The mentioned studies indicate that multiple variables influence the integration of technology. In order to assist stakeholders with technology integration we need to provide some structure for facilitating the process. However, we first need to understand the process that leads up to technology integration. Technology integration results from the diffusion of the technology within the organization. The process of technology diffusion consists of three related and sequential stages: adoption, implementation, and integration.

Adoption. Adoption refers to the decision to use a specific technology for some intended outcome or purpose. This decision results from the resolution of feelings and thoughts about how the innovation will assist the organization or meet some organizational need (Rogers, 1995). According to Rogers, the resolution of thoughts and feelings comes about through the innovation decision process. In terms of technology in K-12 settings, adoption refers to the decision to purchase a particular type of technology (e.g., computers, video conferencing equipment, educational software,