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Identifying discriminating variables between teachers who fully integrate computers and teachers with limited integration

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Abstract

Given the prevalence of computers in education today, it is critical to understand teachers' perspectives regarding computer integration in their classrooms. The current study surveyed a random sample of a heterogeneous group of 185 elementary and 204 secondary teachers in order to provide a comprehensive summary of teacher characteristics and variables that best discriminate between teachers who integrate computers and those who do not. Discriminant Function Analysis indicated seven variables for elementary teachers and six for secondary teachers (accounting for 74% and 68% of the variance, respectively) that discriminated between high and low integrators. Variables included positive teaching experiences with computers; teacher's comfort with computers; beliefs supporting the use of computers as an instructional tool; training; motivation; support; and teaching efficacy. Implications for support of computer integration in the classroom are discussed.
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1. Introduction

Computer technology continues to advance at an unprecedented rate in all aspects of our society. The ever increasing availability of computers and Internet access has made computer technology a fixture in elementary and secondary schools throughout North America. Systematic reviews of computer-assisted instruction suggest that there are small but positive effects beyond those found in traditional instruction (Blok, Oostdam, Otter, & Overmaat, 2002; Torgerson & Elbourne, 2002). However, despite increasing access and potential

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learning advantages, North American research suggests that computers are under-used in many schools and the potential of computer technology is not being realized (Abrami, 2001; Ertl & Plante, 2004; Muir-Herzig, 2004; Sutherland et al., 2004). International research paints a similar picture of computer integration. Work conducted in the United Kingdom, Thailand, Greece, Australia and The Netherlands suggests that computers are still under-used in terms of quantity and quality of use (Conlon & Simpson, 2003; Demetriadis et al., 2003; Hayes, 2007; Pelgrum, 2001; Wilson, Notar, & Yunker, 2003; Wooley, 1998). The impetus for researchers then is to understand why computers are not being used to their full potential in the classroom.

Previous research has identified both environmental variables and individual characteristics of teachers as potential barriers to the successful integration of computer technology (e.g., Becker & Ravitz, 2001; Cuban, Kirkpatrick, & Peck, 2001; Hayes, 2007; Mueller, Wood, & Willoughby, 2007; Rosen & Weil, 1995; Sandholtz, Ringstaff, & Dwyer, 1997; Windschitl & Sahl, 2002). The majority of existing research, however, has focused on environmental barriers (e.g., equipment based issues such as limited access, technical problems and malfunctions); most likely because these issues were immediate concerns facing teachers and administrators when computers were first being introduced in schools. Ongoing advances with computer technology make it important to continue to consider the role of environmental barriers in the integration of computers in the classroom.

The relative impact of environmental barriers is challenging to evaluate over time. Continual and rapid advances in computer technology, compounded with institutional changes within schools (e.g., regarding the presence of technology) constantly change the kinds of environmental barriers that teachers encounter when integrating computers. Recent research (Wood, Mueller, Willoughby, Specht, & DeYoung, 2005), however, suggests that some of the barriers identified early on may no longer be perceived as the insurmountable barriers that they once were. For example, the majority of teachers now have access to and use computers on a regular basis making technical difficulties and lack of access less problematic. Although increased access and familiarity with computers may reduce some of the original concerns addressed in the research, environmental barriers associated with new technologies may still present substantial obstacles to the seamless integration of technology within the classroom (Wood et al., 2005).

Although environmental barriers remain important considerations, it is the individual differences in beliefs, attitudes, and skills among teachers that is the key area of interest for researchers today (Dexter, Anderson, & Becker, 1999; Mercer & Fischer, 1992; Mishra & Koehler, 2006; Sanders & Horn, 1994; Schofield, 1995; Zhao, Pugh, Sheldon, & Byers, 2002). Educators are the focus of interest because it is educators that have the primary contact with students and it is educators that experience the barriers and supports to integration of technology first-hand.

Given the critical role of educators, it is important to understand the contributions that teachers make in supporting or inhibiting the integration of computer technology in the classroom. Although today's teachers may be more familiar with technology in general, they still may not be fully prepared or able to integrate computer technology in their classrooms. Abrami (2001) suggested that teachers may not be using computers to their potential as a cognitive tool due to teachers' lack of experience in the "craft" of computer integration. Others have suggested that developing the skills required to integrate technology can be a lengthy process. For example, Hadley and Sheingold (1993) suggest that it takes 5 or 6 years for a teacher to gain mastery in integrating technology, and that is when teachers are given support and time to learn and plan for integration. Sandholtz et al. (1997) described a multi-stage process that teachers need to navigate before being fully able to integrate technology in the classroom. Transitions across these stages may not be static. For example, transitions could be compromised as a function of the rapid pace of change in computer technology.

Continual changes in technology may result in teachers being "perpetual novices" in the process of technology integration, or at least teachers may find themselves repeating stages or stalling as advances in technology continually present new opportunities and potential uses. Teachers, experience with technology may reflect a recursive spiral (Huberman, 1992) rather than a linear change, with lower levels of computer use simply reflecting that not enough time has passed for higher level uses to emerge in classrooms (Ertmer, 2005).

Some researchers suggest that more professional training in how to integrate technology into classroom practice is needed in order to move teachers through the stages toward integration (Foon Hew & Brush, 2007; McGrail, 2005). Traditionally, professional development has taken a "training" approach, with a short term focus. For example, training might be arranged around a particular software, or on what Maddux and

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