TEACHERS' INSTRUCTIONAL BELIEFS ABOUT INTEGRATING EDUCATIONAL TECHNOLOGY

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Abstract

The so-called computer revolution in schools never took place as expected. Teachers' instructional beliefs are to a certain extent responsible for such a disappointment because a significant number of teachers do not support the principle that technology is a powerful tool for teaching and learning as recommended in current curriculum guidelines. Teachers' instructional beliefs act as a filter through which teachers make instructional decisions in class rather than relying on their own pedagogical knowledge or curriculum guidelines. It is indispensable that teachers' instructional beliefs match principles underlying current constructivist reform, particularly in regard to incorporating technology in the classroom, so that effective educational change can take place.

Teachers' Instructional Beliefs

Teachers' instructional beliefs have become a central issue in education. It has been argued that those beliefs have a strong impact on teaching and learning (Handal, Bobis, & Grimison, 2001; Lovat & Smith, 1995). Teachers' instructional beliefs reflect personal theories of knowledge and knowing. Such nature has been seen as influencing teachers' curriculum decisions. Teachers' beliefs have been conceptualized as a set of assumptions that teachers hold on various educational processes such as curriculum, schooling, students, teaching and learning, and knowledge (Lovat & Smith, 1995). The term teachers' beliefs have been used to represent teachers' conceptions, practical knowledge, personal knowledge and experiential knowledge" (Anderson & Bird, 199; Marland, 1994; Pajares, 1992). According to Lovat and Smith (1995) these beliefs also act as mental models driving teachers' practice and processing of new information. These instructional beliefs seem to act as mediators between curriculum goals and their actual implementation since teachers are to make curricular decisions based on their own affective and cognitive schemes.

Lack of implementation of educational reform can be the result of teachers' instructional beliefs

not matching the original goals of a particular innovation (Haynes, 1996; Koehler & Grouws, 1992). If teachers' beliefs do not match those goals, it is likely that resistance will be generated resulting in a low take-up (Burkhardt, Fraser, & Ridgeway, 1990). Conversely, if teachers' beliefs are more compatible with educational reform, it is probably that new ideas will be accepted and adopted in the classroom. Teachers therefore can be either obstacles or conveyances of change (Prawat, 1990). Consequently, it is very important that prior to any educational innovation, teachers' instructional beliefs are explored, identified, and dealt with to determine whether they are appropriate or not (Handal & Herrington, in press, a). In Cuban's words (1993, p. 256): "The knowledge, beliefs, and attitudes that teachers have... shape what they choose to do in their classrooms and explain the core of instructional practices that have endured over time."

In the last decade, there has been an increasing interest for the study of teachers' instructional beliefs and their influence on curriculum implementation. The low degree of success in many educational reforms has been seen as a major reason why teachers' instructional beliefs need to be considered (Fullan, 1993). It is very improbable that teachers can amend their own instructional practice if their beliefs on teaching and learning remain unexamined. There is more than just transferring resources to schools if educational change is to be attained. Teachers' instructional beliefs need to be confronted and re-appraised in terms of the beliefs and principles underpinning an innovation. Otherwise, changes will be only "cosmetics" or a "travesty" of the original innovation goals as it has happened in the past with a large number of large-scale innovations (Burkhardt, Fraser, & Ridgway, 1990).

Teachers' Beliefs on Technology in Education

There have many studies showing that technology, that is, computer-related tools, when used regularly in class, they bring positive effects on students' cognitive and attitudinal outcomes (Cotton, 1997; Godfrey, 2001a; King, 1997; Newhouse, 1998). Despite this strong evidence and the fact that governments are putting resources in place, there is a body of research suggesting that technology has not been adequately adopted in schools (Maddux, LaMont Johnson, & Willis, 1997; Mann, 2000; Newhouse, 1998). Exciting early learning expectations have evolved since the early times when computers were introduced in mass to schools to the disappointments of the past decade that have led some critics to assert that computers in education were a failing revolution (Maddux et.al, 1997, Norman, 1993). In the words of Ertmer, Addison, Lane, Ross and Woods (1999, p. 54): "Despite the fact that the number of computers in teachers' classroom has increased dramatically in the last 20 years, researchers and educators alike report that integrating technology into classroom curricula is not easily accomplished". Similar issues have been identified in Australia by Bowes (1998), Fifoot (2000), and Mann (2000).

Many reasons have been offered as an explanation for this low take-up. These reasons include lack of supporting teachers' beliefs, traditional teaching practices, lack of teacher training, no enough instructional preparation time, unavailability of adequate educational software and hardware in general, among others (Godfrey, 2001a; Handal, Handal, & Herrington, 2003; Hadley & Sheingold, 1993; Ringstaff & Yocam, 1994). A number of studies which are discussed below seem to indicate that the lack of teachers' supporting beliefs and traditional teaching practices appear to be the major factors in the low take-up of technology in schools.

For example, Ertmer, Addison, Lane, Ross and Woods (1999) examined barriers to technology implementation by interviewing and observing seven primary teachers. The authors classified these barriers between first (external) and second (internal) order barriers. First order barriers included the practical aspects of implementation such as availability of hardware and software, administrative support and insufficient time to prepare instructional tasks. Second order barriers (internal) refer to teachers' instructional beliefs and attitudes towards the implementation of technology in education and established classroom practices. According to the authors, the effect of many external barriers can be ameliorated by providing adequate training and by confronting teachers' beliefs. However, changes in the classroom will not be very effective till teachers adopt more positive beliefs about technology. In their study, the authors concluded that internal barriers were determinant in achieving higher levels of use of technology and argued that resistance to implement technology were still there even when external barriers were removed. Teachers with a poor perception of technology as an instructional tool referred to computers as "an add-on", an "optional activity", "supplemental", and "a way to keep kids busy". A teacher commented that "I kind of see it [technology] on the outside. It's still touching [the curriculum] but it's not my focus". (p. 62). Another teacher saw the "classroom computer not as a teaching tool but kind of as a reward kind of thing, like when kids are done with their work" (p. 62).

Another important factor for explaining resistance to use technology are teachers' traditional instructional styles (Hannafin & Savenye, 1993; Hativa & Lesgold, 1996). These styles are characterized for lecturing, lack of groupwork, classroom organization of desks by rows, and use of the blackboard as the main instructional tool. Many teachers have been educated in teacher training colleges and schools, at a time in which computers were absent of the educational landscape. In fact, the average age of a NSW school teacher is 47 years (Godfrey, 2001b). Many teachers tend to repeat the instructional pattern they learn while sitting in classroom during many years of schooling. This follows the apprentice style of learning which is predominantly in their trades such as mechanics, carpentry, among others, in which the learner actually learns by watching. Godfrey (2001a), citing a number of research studies, adds that teachers' are "reluctant to hand over control of the learning environment to their students" (p. 15).

Recent instructional theories draw on a constructivist view of learning and teaching as opposed to a transmission mode of acquiring knowledge. In the constructivist view, teachers are facilitators of knowledge and students are encouraged to construct their own knowledge through problem-

solving tasks. In the transmission mode, the teacher is the only source of knowledge and students are encouraged to acquire that knowledge without discussion (Niederhauser & Stoddart, 1994). Constructivist learning tasks may include problem-solving tasks, reflective and investigative learning and open and plenty discussions. Translating these two views on technology in the classroom implies a bearing towards a constructivist view if successful implementation of technology is to occur in the classroom (Handal & Herrington, in press, b). Along those lines, Godfrey (2001a, p. 30) defines technology in education in the following terms:

> Computer technologies enable the manipulation of environments and events to afford multiple perspectives on complex phenomena. Such representations are important for building flexible knowledge assembly and construction processes in complex learning domains. Furthermore computers afford flexibility, making it possible for teacher to adapt the tool to their particular approach, incorporate a number of supporting pedagogical features into instruction, and cater for individual differences.

Studies on Teachers' Beliefs about Technology in Education

A number of studies show that the current nature of teachers' beliefs are not favourable to adopting technology. Newhouse (1998) surveyed 60 Australian teachers and found that even, when teachers had technical skills, they were reluctant to implement technology in their classroom. Teachers were not convinced about the benefits of computers in education and supported very limited roles of technology in the classroom. The author concluded that one the factors for such resistance was teachers' preference for traditional methods of instruction. Similarly, Mills and Ragan (1998) examined the instructional practices of U.S. 30 elementary teachers in their implementation of educational software in their classrooms. The findings showed that they were substantial differences on they way teachers implemented the innovation. They were also differences in the levels of use of the software which were attributed to different beliefs on the role of the software.

Niederhauser and Stoddart (1994) surveyed 2170 school teachers and found two groups of teachers. The first group associated with the constructivist view believe that computers "are tools that students use in collecting, analysing, and presenting information" (p. 2) while the second group associated with the transmission view believe "that teaching machines that can be used to present information, give immediate reinforcement, and track student progress" (p. 2). In the former constructivist group, teachers strongly believe that computers can be used as tool to generate knowledge and learn with understanding. Likewise, Becker (2000) investigated beliefs

and instructional practices of 4083 middle and high schools teachers and found that teachers with a higher constructivist inclination towards teaching and learning were more likely to use technology in the classroom. Similar findings were obtained by Fulton and Torney-Purta (2000).

In addition, there are many teachers that dislike using technology in instruction because there are not enough numbers of computers in school as well as their lack of maintenance and availability (Andrews, 1995; Erickson, 1993). In the area of mathematics and science education, many primary and secondary teachers believing that calculators do not contribute to learning and therefore should be banned from the classroom (Brosnan, Edwards, & Erickson, 1996; Fine & Fleener, 1994; Ford, 1994; Howard, 1992; Reed, 1986; Rogers, 1983; Schmidt & Callahan, 1992). This is contrary to the *National Statement on the use of Calculators for Mathematics in Australian Schools* (Australian Association of Mathematics Teachers, 1987) and several other curriculum reports endorsing the use of calculators as an instructional device to enhance problem-solving skills. Writing in terms of gender, Bobis and Cusworth (1994) stated that "female [preservice teachers] are more likely to display negative attitudes to teaching mathematics when calculators and computers are involved" (p. 14). Moreover, McDougall (2001) has noted that in Australian schools there are more boys than girls undertaking computing studies courses at the secondary level.

Are these beliefs changing? There is evidence from a six-year study conducted by Medcalf-Davenport (1998) that there has not been major changes in teachers' attitudes towards technology in education. In the author's words: "The computer is still viewed as the curriculum rather than as a tool for teaching the classroom". There is resistance and fear in the integration of anything new into the classroom and teachers do not recognize the usefulness or necessity of using technology for teaching and leaning" (p. 1).

Conclusion

The Information Revolution appears not to have reached adequately education. Lack of training, availability of hardware and educational software, no enough preparation time, and traditional teachers' beliefs and practices seem to be the major factors to this dissonance. In particular, teachers' resistance in the form of traditional instructional beliefs may be acting as major negative factor in the implementation of technology in education.

The implications are clear. If technology is to be adopted in the classroom then curriculum designers are to take in account teachers' beliefs and attitudes in any implementation process. The times of the well-polished, 'teacher-proof' curricular documents are gone and policy-makers should no longer assume that curriculum implementation is a process that translates directly into the classroom reality. Likely discrepancies between teachers' opinions and the ideas underpinning a technology-based curriculum innovation need to be foreseen, analyzed and addressed.

The current links between technology in education and constructivist learning environments will succeed more favourably if teachers' beliefs are considered and confronted. Otherwise, despite the quantity of resources poured in the purchase of hardware and software in schools may result in a waste of energy and resources. Certainly, a more grass-root perspective adoption is needed in implementation approaches.

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