New Literacies, New Challenges

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There is a growing body of research examining the many factors that affect the integration of technology in classrooms. One of the frequently asked questions about technological integration is how technology can be effectively and efficiently integrated in classrooms for meaningful student learning (Dockstader, 1999; Morrison, Lowther, & DeMeulle, 1999). Research has long predicted the computer technology revolution in classrooms, but we have not yet seen that revolution come to full circle. So far, we have not seen any significant paradigm shift that can be credited to the integration of technology in classrooms (Morrison et al., 1999). In fact, there appears to be an increasing gap between educational reform and educational technology (Means, 1994). Explanations for this gap include the teachers' or administrators' failure to consider the design of the school in implementing technology or teachers who do not capitalized on technology to compliment their instructional approaches, such as inquiry learning, guided design, problem-based learning, and collaborative learning. Computer usage in the classroom has also remained disappointingly low (Cuban, 1986, U.S. Congress Office of Technology Assessment, 1995). This widely recognized gap between access to and use of technology in schools begs the question why technology is not used more in classrooms. To adequately address this question we must turn our attention to the interaction between technology and education to identify the conditions under which technology can be effectively used in classroom to improve student learning (Zhao, et al., 2002).

Conditions for Classroom Technology Innovations

What are the conditions under which technology innovation can take place in classrooms? The following section draws from Zhao et al.'s (2002) report on findings from 10 case studies from data from the larger population of 118 teachers. In their study the researchers identified eleven salient factors to explain the degree of success of technology integration in classrooms for all 10 cases. The researchers placed each of the eleven factors in one of the three interactive domains—the innovator, the innovation, and the context.

The Innovator

The innovator is the teacher. According to the researchers, the teacher is the first person one can look to factors that affect classroom technology uses. These factors are: technology proficiency, pedagogical compatibility, and social awareness. Teachers' proficiency in technology plays a major role in classroom technology innovations. Technology proficiency plays an equally important role in knowledge of the enabling conditions of technology—knowing what else is necessary to use a specific technology in teaching.

Compatibility between teacher pedagogical beliefs and the technology is another factor under the innovator domain. The researchers suggest that successful implementation of technology innovation in classrooms is more likely to succeed when teachers are highly reflective about their own teaching. They argue that
The Innovation

According to Zhao et al. (2002), innovation is varied along two dimensions. The first dimension is distance. Distance is how much the innovation deviated from the status quo; it includes distance from the existing school culture, distance from existing practice, and distance from available technological resources. Distance from the school culture refers to "the degree that an innovation differs or deviates from the dominant set of values, pedagogical beliefs, and practices of teachers and administrators in a school" (p. 496). Distance from existing practice refers to "the degree to which an innovation differs from the prior educational practices of the teacher" (p. 498), specifically to the teacher's particular practical experiences. Distance from available technological resources refers to "the amount of new technologies needed for successful completion of the innovation" (p. 499).

The second dimension of innovation is dependence. It is the degree that an innovation relies on other people or technological resources. Dependence on others refers to "the degree that the innovation required the cooperation, participation, or support of people not under the innovator's authority" (p. 500). Dependence on technological resources refers to the "degree that innovations require the use of technological resources beyond the control of the teacher" (p. 500).

The researchers found that each of the factors under the two dimensions - distance and dependence - influences the ease or difficulty by which innovations can be successfully implemented. The following statements concur with the results of their studies about each factor under the dimension of distance:

**Distance from the existing school culture.**

The more distant the innovation is from the school culture, the more likely the innovations will be met with "significant, sometimes insurmountable, roadblocks to a project's success" (Zhao et al., 2002, p. 497). On the other hand, when there is no significant difference between the innovation and the existing beliefs and practices at the school where it is to be implemented, successful implementation of the project is more likely to happen. The researchers found that in most cases distance from school culture was not a salient issue.

**Distance from existing practice.**

The more closely related the innovation is to a teacher's previous projects, the more likely it will succeed. An innovation that significantly deviates from a teacher's prior experience will be more challenging to implement.

**Distance from available technological resources.**

The researchers found that the most successful innovations were not very distant from available technological resources. The researchers also found that a high proportion of innovations that were very distant from available technological resources experienced significant delays or complete failure in getting the technological support needed, resulting in failure to successfully implement the innovations.

The following statements about each factor under the dimension of dependence are supported by the results of the study:

**Dependence on others.**

Innovations with low level of dependence on others are more likely to succeed than those innovations with high dependence on others.

**Dependence on technological resources.**

Innovations that are less dependent on technological resources beyond the control of the teacher are more likely to be successfully implemented than those innovations that are highly dependent on a larger group or variety of technologies.

Overall, the researchers argue that the more successful innovations are those with lower degree of distance, dependence, or both, whereas the less successful innovations are those with higher degree of distance, dependence, or both.
The Context

The researchers identified three aspects of the school context that are of central importance to the success or failure of an innovation. These are: the human infrastructure, the technological infrastructure, and social support (Zhao et al., 2002). Human infrastructure is the organizational arrangement to support technology integration in the classroom, such as a flexible and responsive technical staff, or a supportive and informed administrative staff, including institutionalized policies and procedures related to technology issues. The researchers contend that more than any other innovations, technology innovations "require institutional support because the resources and knowledge required for using any modern computing technology often lie beyond an individual's immediate reach" (p. 505). However, adequate human infrastructure seems to be the least noticed by innovators until they run into problems. Innovators tend to be frustrated and may give up on implementing the innovations if they experience technological difficulties and do not have access to the human infrastructure. In fact, some innovators believe that the solution to this dilemma is to reduce one's dependence on others.

Like the human infrastructure, the technological infrastructure is equally important to the success or failure of an innovation. The researchers found that most of the technological infrastructure for innovations distant from existing technological resources was inadequate. When parts of the technological infrastructure are inaccessible or delayed, it has a domino effect on the implementation of the innovation.

The degree to which peers support or discourage the innovators may increase or hinder the success of the innovations. The more collaborative and supportive the human infrastructure, the more likely the innovation will succeed, especially if the successful implementation of the innovation is dependent on others. The less collaborative and supportive the human infrastructure, the least likely the innovation will succeed.

In this study, the researchers found that adequate human or technological resources were not yet in place. At the same time, social support seems to be the most significant for innovations that are dependent on others. The researchers concluded that there are interactive relationships among the three domains and their associated factors. However, the contribution of each domain—distance and dependence—to the success of successful classroom technology integration is not equal. Occasionally, some factors may be stronger than others, and compensate for the weak factors in facilitating the successful implementation of an innovation (Zhao et al., 2002). Regardless, to integrate technology in classrooms, the researchers suggest knowing "the affordances and constraints of various technologies and how specific technologies might support their own teaching practices and curricular goals. ...how to use the technologies... be aware of the enabling conditions of the technology they plan to use... [and] realize that technology integration requires support from others, even people they have not interacted traditionally" (p. 511).

Negotiating the Conditions for Classroom Technology Innovations in Literacy Instruction

Findings from Zhao et al.'s (2002) study help us to become more thoughtful and deliberate in our thinking about how we can effectively and efficiently integrate technology in our literacy classrooms for meaningful student learning. We recognize that there are various conditions for successful classroom technology innovations. We also recognize that the process of classroom technology integration can be "complex and messy" (p. 482). However, we believe that there is much to be gained from integrating technology in our literacy classrooms. So, how can we account for effective and efficient integration of technology in our literacy classrooms? Labbo and Reinking (1999) identified a set of interrelated realities created by alternate goals that might be adopted to integrate new technologies into literacy instruction. They suggest a perspective of "multiple realities," stating that while it seems to be "a natural tendency to equate technology exclusively with material devices instead of with the processes and capabilities those devices make possible... the perspective of multiple realities focuses attention on what might do, to what activities and tasks it might be applied, and on what effects and implications it may have beyond the conventional goals of literacy instruction" (p. 480).

The five goals for integrating technology with literacy instruction are: (1) Reality 1: New digital technologies should be available for literacy instruction. (2) Reality 2: New digital technologies should be used to enhance the goals of conventional literacy instruction. (3) Reality 3: New technologies should be used to positively transform literacy instruction. (4) Reality 4: New technologies should be used to prepare students for the literacy of the future. (5) Reality 5: New technologies should be used to empower students. In studying these goals we see parallels to Zhao et al.'s salient factors that significantly impact the degree of success of classroom technology integration. The goals "represent a progression of the status quo to seeing new technologies as a potential catalyst for transforming instruction, from seeing new technologies in terms of how their presence or absence in classrooms might affect literacy achievement as it has been conventionally defined to seeing new technologies as creating new dimensions of literacy embedded within a matrix of sociocultural influences" (Labbo & Reinking, 1999, p. 488). We are challenged to negotiate the conditions for classroom technology innovations and the multiple realities in literacy instruction to help us unravel the "complex and messy" process of successful classroom technology integration.
References