School-Wide Factors Facilitating Technology Integration and Implementation

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INTRODUCTION

We focus our remarks about recommendations for overcoming barriers to technology integration and implementation at the school level, that is, concerning elements that are associated with the overall school technology environment and shared by all the teachers at a school. These elements are usually beyond the control of any one teacher, but as a group the teachers at a school can, and do, influence the decisions and priority setting that would put these elements into place. The basis for these remarks are primarily from the findings of the Teaching, Learning, and Computing '98 national survey (*www.crito.uci.edu/tlc*) and are further elaborated upon in Dexter, Anderson, and Ronnkvist (2002), who describe the quality technology support conditions that are associated with increased teacher and classroom uses of technology; Anderson and Dexter (2001), who note additional technology organization attributes under administrators that influence the emergence of a technology-supported culture or community; and Ronnkvist and Anderson (2001) and Dexter and Seashore (2001), who identify professional community as a mechanism for increasing teachers' learning about, and integration of, technology.

QUALITY TECHNOLOGY SUPPORT

Part of what makes teachers' integration activities feasible or not is the quality of technology support at a school. Dexter et al. (2002) describe technology support as encompassing both technical and instructional domains. In both of these domains, teachers need facilities, staff support, incentives, and opportunities to provide feedback (see Table 1).

The presence of high-quality technology support programs is correlated to increased use of educational technology by teachers in their own work, by their students in classrooms, and by self-reported increased usage over time. High-quality support was defined as: 1) customized one-on-one help; 2) frequent teacher participation in ongoing; technology-

Table 1. Technology support content and resources used to deliver technology services to teachers

Resource Type	Technical Domain	Instructional Domain
Facilities	Network and Internet access, hardware, software	Content-area specific software, communications access to pedagogical expertise
Staff assistance and necessary services	Technical support, help desk, network services	Instructional expertise and background of support personnel
One-on-one personal guidance, help	Computer experts for trouble-shooting	Guided practice, consultation for curriculum integration
Professional development	Operating equipment, general software, etc.	Pedagogy, models, implementation strategies
Incentives	Release time; free hardware, software, and network access; anticipation of expert status	Release time, support focusing on instructional content

oriented professional support among teacher peers; 3) professional development content that emphasizes the instructional, and not just the technical, needs of teachers; and 4) access to a broad range of technology resources.

PROFESSIONAL COMMUNITY

The terms *professional community, professional development,* and *professional culture* are often used interchangeably, especially when used to describe teachers in schools. We use the term "professional community" here consistent with the new "school as a learning community" movement. Specifically, professional community involves reflective dialogue, deprivatized practice, collaborating with other teachers, and shared values and teaching goals. In a recent report Ronnkvist and Anderson (2001) found that school-level professional community is important to technology integration. This was a consistent finding even when the model is controlled for technology management structures, as well as shared vision between key stakeholders. Hence, schools where teachers have a high degree of professional community do in fact have higher levels of technology integration. This research supplements the findings in the other sections on leadership and support by identifying an additional mechanism essential to the effectiveness of technology leadership: it reinforces the importance of organizational culture and learning for the effectiveness of school technology programs.

From case studies of schools identified as exemplary in their implementation of technology-supported schooling, Dexter and Seashore (2001) found an unusually high level of professional community, especially its component of deprivatized practice. Preliminary analysis of these data suggest that the teachers' shared goal to use technology in support of student learning, along with excellent technology access and support, was mutually supportive of their willingness to share with one another their failures as well as successes with technology, and facilitated their learning and integration efforts. When a school staff has habits of discussing the ways technology is used and supported, it appears they identify ways to make the technology environment at the school more conducive to effective use.

STRONG TECHNOLOGY LEADERSHIP

Charismatic administrators and enthusiastic teachers contribute to technology integration, but it is even more essential for a school to become a "technology learning organization," where administrators, teachers, students, and parents together work on how best to adapt new technologies to the improvement of learning. Anderson and Dexter (2001) found that school technology leadership, as defined in terms of a variety of supportive administrative actions, is necessary for effective technology applications to pervade the school community. They found that infrastructure (funding and amount of equipment and access) is important, but for it to become part of the school culture, school leadership is necessary, in fact, even more essential. Technology integration was measured by: 1) integration of technology in teaching, 2) network and Internet utilization, and 3) student use of application tools. For technology to become an integral part of a school, it not only is necessary to help teachers use the technology, but to have administrators involved in it, too. Based upon the nationwide research, the following organizational attributes are needed in a school; however, not all are required simultaneously or in every instance:

- technology committee, which refers to whether a school had a computer technology committee;
- technology budget, in which the school has sole discretionary authority;
- principal days, where the principal spends quite a number of days annually on technology planning, maintenance, or administration;
- principal e-mail, meaning that the principal makes regular use of e-mail;
- district support, meaning that the district supports technology costs;
- grants, that is, some external funding for technology has been successfully acquired; and
- staff development, a policy of "periodic staff development regarding technology."

In general, the more technology leadership attributes present, the more likely that a technology-supported culture or community will emerge and function effectively.