Learning from Case Studies of Technology Integration

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An Annotated Bibliography of Case Studies is available below.

We have heard from the field that, although teachers are eager to integrate technology strategies in their classrooms, educators often face several challenges that prevent them from successfully doing so. Below, we discuss these challenges, and offer descriptive information that may help you and others in your school find ways to overcome the barriers mentioned. The work presented here provides information about challenges that teachers often face when integrating technology into the classroom, drawn from a review of case studies of technology implementation.

CITEd reviewed a variety of case studies related to technology integration. From these studies, we have identified four common challenges teachers face in their efforts to integrate technology into their curriculum: (1) adequate time, both to [a] identify, and [b] learn compatible and relevant software; (2) scheduling of access to computers; (3) adequate equipment and use; and (4) adequate and timely professional development. These findings are consistent with national findings (National Center for Education Statistics. 2000. *Teacher Use of Computers and the Internet in Public Schools.* Washington, DC: NCES 2000-090).

These challenges are most likely familiar to any teacher who has explored technology to support teaching. These barriers can interrupt instructional time and discourage teachers from using technology in their pedagogy. Therefore, it is imperative that teachers receive the support they need to overcome these obstacles. Because every environment is different, and the nature of technology integration involves so many diverse components, it is difficult to offer a one-shot solution that will alleviate these barriers. However, administrators should consider the barriers highlighted as well as challenges that may be unique to their own environment, and consider strategies to address these challenges based on their available resources. In an effort to assist in this process, we offer descriptive information about the barriers to technology integration that derive from the literature.

Time to identify and to learn compatible and relevant software

We found many descriptions of teachers reporting that they lacked the time and expertise to search out, evaluate, and learn software that was compatible with their existing hardware and—more importantly—with their teaching goals. The same time challenge was identified for teachers' identification and evaluation of Internet resources. Teachers' time is notoriously limited, and when faced with increasing variety and complexity of technology tools, teachers reported feeling overwhelmed. Findings from these case studies identified a need in the form of previewed and pre-evaluated resources, as well as time for teachers to become familiar with the technology tools to which they have access.
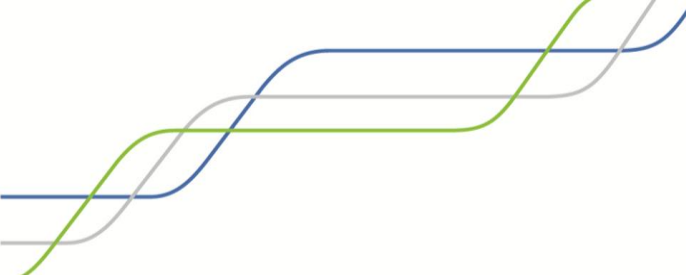
Scheduling of access to computers

The challenging logistics of school schedules formed another salient theme through these case studies of technology integration. Teachers from schools—large and small, elementary and secondary—reported that the scheduling of their time in computer labs, even when the labs were well-equipped, was inadequate and a barrier to integrating technology into instructional activities in a meaningful way. This finding challenges the national statistics citing rising access to computers merely by the ratio of students per computer. Without access to computers when students are engaged in a related project, technology cannot be considered integrated into the curriculum nor can technology be leveraged to transform the curriculum and instructional context. When this challenge was successfully addressed in these case studies, success hinged upon strong and active administrative support.

Adequate equipment and use

Related to students' access to computers is teacher and students' access to adequate equipment. As noted, the national statistics indicate that student-to-computer ratios have been falling; however, many teachers continue to cite outdated or mismatched equipment or unreliable Internet connectivity as major barriers to technology implementation in their classrooms. Additionally, when teachers did have working computers in their classrooms, researchers found that even students of "tech-savvy" teachers were not given enough time on the computers to accomplish meaningful and constructive projects (Bauer & Kenton, 2005). Researchers examining teachers' pedagogical beliefs and styles found that those with a more

student-centered approach and philosophy were more likely to engage in constructive technology-infused activities.

Adequate and timely professional development

In nearly every case study, the significance of adequate professional development was emphasized as contributing to teachers' successful attempts to integrate technology into their teaching. Time and again teachers were heard requesting professional development that was more closely related to their particular classroom, students, and content area; more timely to their teaching; more collaborative with their colleagues; and more problem-oriented and challenging to them as learners. These elements were cited as lacking in much of the professional development opportunities that teachers in these case studies had access to, and indeed, this finding is reported in other national survey data. Additionally, on-demand or regular coaching was identified as a crucial supplement to less-technologically proficient teachers' efforts to integrate technology. Identifying the elements of successful professional development for technology integration is explored in more detail in
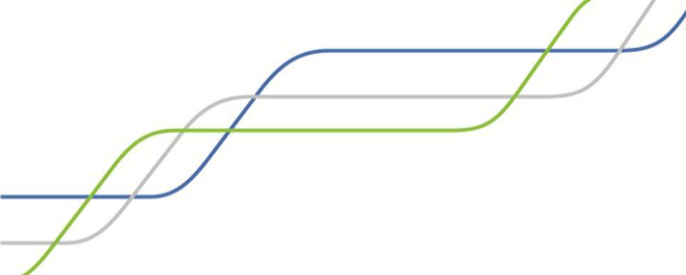
Annotated Bibliography of Case Studies

Adams, S. T. (2005). A strategy for technology training as part of a Master's program conducted at a school site. *Journal of Technology and Teacher Education, 13*(3), 493-514.

The author discusses a field-based approach for training in-service elementary teachers to use technology. The strategy involved a technology course taken by a cohort of in-service teachers in an on-site M.A. program in curriculum and instruction. Courses of the program and technology training occurred at the elementary school where the in-service teachers worked. Most participants entered the course with proficient introductory technology skills, but finished the course reporting intermediate to advanced proficiency levels. The aspect of contextual realism reflected in this field-based approach makes this article a valuable resource for those involved in the creation of instructional technology professional development.

Bauer, J. & Kenton, J. (2005). Toward technology integration in the schools: Why it isn't happening. *Journal of Technology and Teacher Education, 13*(4), 519-546.
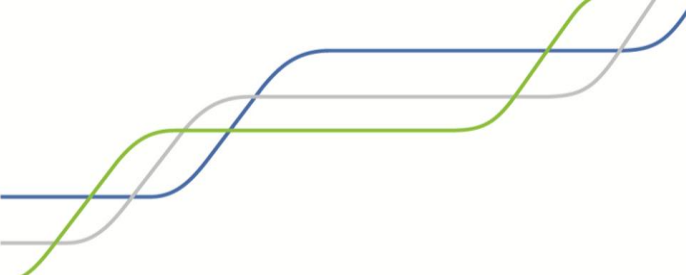
Authors examined the classroom practice of 30 "tech-savvy" teachers who used computer technology in their instruction, how much they used it, the obstacles they had to overcome to succeed in its use, and their general issues and concerns regarding technology. The study found that the teachers were highly educated and skilled with technology, were innovative and adept at overcoming obstacles, yet they did not integrate technology on a consistent basis as both a teaching and learning tool. Given the level of technology expertise of the participants, findings from the case study are especially telling because they illustrate the difficulty involved with technology integration. Even teachers who are technologically proficient are limited when integrating technology into the classroom due to environmental barriers involving access to adequate functional equipment, time to implement technology in teaching, accommodating the various technology skill sets of students, participating in professional development opportunities, scheduling computer lab time, securing appropriate software that is compatible with existing hardware, connecting to the Internet, and engaging a large number of students with a limited number of computers.

Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High access and low use of technologies in high school classrooms: Explaining an apparent paradox. *American Educational Research Journal, 38*(4), 813-834.

Researchers conducted a study in two technology-rich high schools to examine the assumptions that wiring schools, buying hardware and software, and distributing the equipment will lead to abundant classroom use by teachers and students and an improvement in teaching and learning. Findings demonstrated that access to equipment and software seldom led to widespread teacher and student use; most teachers were occasional users or nonusers of technology, and when computers were used during class work, they were used to sustain rather than alter existing patterns of teaching practice. The first author, Larry Cuban, is perceived as one of the leading skeptics of technology use in the classroom throughout the field. However, his criticisms of technology use in this and other articles focus on the actual practice of sustained technology use to transform instruction, particularly to allow for inquiry-based, student-centered learning. As suggested by Cuban, there has been extensive discussion about the potential of technology use for such purposes, but little evidence to suggest that such practices have come to fruition. As with Bauer & Kenton (2005), this article

illustrates the challenges of technology use, even under circumstances that appear to be ideal.
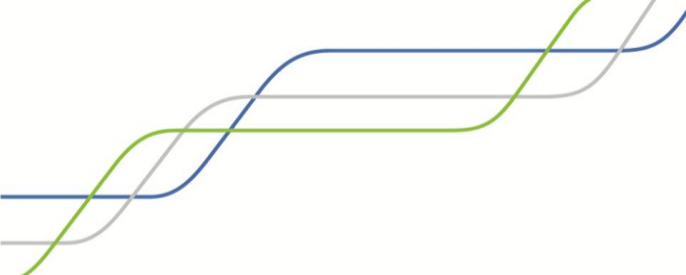
Eib, B. J. & Steele, G. (2004). Districtwide technology integration: A case study. *Principal Leadership (High School Ed.), 4(7), 55-58.*

This case study describes how the Spearfish (SD) School District created a successful comprehensive approach to professional development for its educators and integrated technology into instructional practices. The International Society for Technology in Education (ISTE) National Educational Technology Standards for Teachers served as a framework for the professional development. Professional development activities consisted of "just ask" customized individual services, flexible scheduling for need-based small and large group training, and providing support for attendance at out-of-district conferences. Furthermore, teachers requested professional development opportunities, suggested project ideas, and shared information. Although the article is brief and provides minimal details of the components of the school district's approach, it does point to several desirable outcomes. These include individualized instruction for certain populations through software programs, resulting in new accommodations for special needs students; motivated teachers who were inspired by new applications for integrating technology into the classroom; and a culture of collaboration and communication across grade levels and academic content areas. The absence of a context surrounding these outcomes leaves readers to speculate about specific factors that contributed to these successes. Nevertheless, this article demonstrates that district-level technology integration is a worthwhile endeavor that can yield favorable results.

Hughes. J. (2005). The role of teacher knowledge and learning experiences in forming technology-integrated pedagogy. *Journal of Technology and Teacher Education, 13(2), 277-302.*

The author examines the nature of four teachers' learning during technology professional development activities and the extent to which their subsequent technology-supported pedagogy was innovative. Findings from this study are consistent with concepts reflected throughout the professional development literature (e.g., teachers' interpretations of their newly learned technology values impacts teachers' ability to develop innovative technology-supported pedagogy; content-based training is effective; and teachers with less professional knowledge and/or less

intrinsic interest in technology innovation benefit from collaborative, content-specific technology). This article is of particular interest because it conveys the traditional functions of technology in education in a way that is concise and easy to understand by practitioners. The author divides technology-supported pedagogy into three categories: replacement, which involves technology replacing traditional instruction; amplification, which involves technology being used to efficiently complete tasks; and transformation, which involves technology used to transform students' learning routines to contribute to their cognitive development. These distinctions are important because technology used for replacement and amplification does not have a direct link to changes in instructional practices, yet most teachers who use technology in the classroom use it for these purposes. Though technology use that falls within the transformation category has the potential to provide innovative learning experiences that may otherwise be impossible, impractical, or undesirable, such practices are rarely found in the classroom.
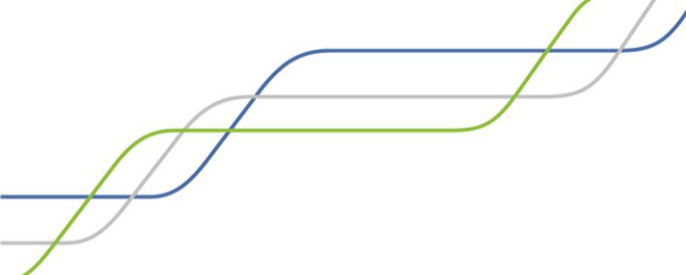
Nisan-Nelson, P. (2001). Technology Integration: A case of professional development. *Journal of Technology and Teacher Education, 9(1), 83-103.*

The author reports on a study of three teachers which explores indicators of how technology will be integrated into instructional practices. This is done by considering teachers' experiences with professional development sessions, teachers' learning styles, and teachers' personal appraisal of problem-solving abilities. Results suggest possible relationships in the following areas: level of confidence; level of perceived control; and match between a teacher's learning style and how technology-based instructional activities are designed. This particular article is distinctive in placing significant emphasis on personal traits of the teacher, rather than focusing on environmental factors that are beyond teachers' control. This article may be of special interest to education professionals who support teachers as they integrate technology into the classroom because it provides insight on technology integration that have previously been under-explored.

Peck, C., Cuban, L., & Kirkpatrick, K. (2002). Techno-Promoter Dreams, Student Realities. *Phi Delta Kappan, 83(6), 472-480.*

Authors report on a study that explored how infusions of technology into two technology-rich high schools impacted the educational experiences of students. Findings from the study show that the widespread availability of technology created a

platform for a small group of students to exercise their knowledge of computer operations. Staff often relied on these students to troubleshoot problems with computers that malfunctioned, and they became valuable and cost-effective members of technology support team. However, students in the group did not learn these skills in school; rather, they acquired these talents outside of the school environment. On average, only 5% of the general student population actually benefited from their technology-enhanced high school. Much of the technology was used for low-end rather than high-end tasks, or was used to support teachers rather than to alter teaching. This case study helps illustrate the concern surrounding three categories of technology-supported pedagogy described in Hughes (2005). Technology was not used to change instruction, thus, according to the authors, technology did not have a significant impact on the educational experiences of most students. Education professionals who support teachers as they integrate technology into the classroom will benefit from this article because it clearly demonstrates that the mere presence of technology cannot impact the way students learn. Furthermore, staff members who are responsible for school technology infrastructure may be interested in the details surrounding the dynamics of relying on students to assist with technology troubleshooting.

Shamburg, C. (2004). Conditions that inhibit the integration of technology for urban early childhood teachers. *Information Technology in Childhood Education Annual*: **227-244.**

The author discusses a formative evaluation of a two-year project which provided professional development in technology for urban early childhood teachers. Findings from the evaluation demonstrated that complex curricular demands placed on early childhood teachers negatively impacted their ability to integrate technology in the classroom; limited access to adequate hardware and software prohibited teachers from implementing technology-supported instructional strategies; additional professional development activities were requested, and a disconnect existed between past professional development workshops and the classroom resources and curriculum; and managing computer work for large classes was difficult, especially in early grades that place an emphasis on play and activity centers. The barriers to technology use were consistent with those found in other studies. However, this study is unique in that it offers insight on technology integration in early childhood environments. Readers do not need to service an urban district to appreciate this

article; it will be of use to anyone interested in technology integration for early childhood populations in general.

Towler, A. J., Miller, L , & Kumari, D. S. (2000). A case study of project OWLink: Teachers' Reflections. *Teacher Education Quarterly, 27*(1), 29-38.

Authors report on findings from a study that explored how Project OWLink, a technology training distance education project, influenced five teachers' behavior. The goal of project OWLink was to develop a community of practice among teachers and students that emphasizes the use of technology to change instruction from teacher-centered to one that emphasizes the collaborative nature of learning. Findings from the study showed that most teachers used technology between 8% and 10% of the time. Although teachers with a student-centered approach were in a better position to advance their instructional agenda, formal teaching remained the same overall. Teachers' limited technology use, especially to drive instruction, is consistent with other literature in the field. This article would be of interest to teachers who are interested in simple examples of how technology can be used to support collaborative and student-centered instruction.

Zorfass, J. & Rivero, K. (2005). Collaboration is key: How a community of practice promotes technology integration. *Journal of Special Education Technology, 20*(3), 51-67.

The authors explain how STAR Tech, a professional development program, used communities of practice to help teachers work together to integrate technology tools into the curriculum to benefit students with and without disabilities. Components of the STAR Tech system include providing teachers with assistance from experts and building leadership capacity to support professional development. Findings from the study demonstrate that a community of practice can promote technology integration. This article will be of particular value to administrators interested in creating a community of practice within their school. However, what makes this article unique is that it presents a professional development program that considers the needs of teachers that service both general and special education students. This would serve as a good starting point for any education practitioner interested in understanding how a professional development program can support teachers as they integrate technology into instruction for general and special education students.

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