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Book Review

**Sandholtz, J.H., Ringstaff, C., & Dwyer, D.C. (1997) *Teaching with Technology: Creating Student-Centered Classrooms*, Teachers College: New York, 211 pages.**

*Teaching with Technology: Creating Student-Centered Classrooms*, details the 10-year (1985-1995) longitudinal research study by five Apple Classrooms of Tomorrow (ACOT) school sites across the country, a collaboration between public schools, universities, and Apple Computer, Inc. The purpose of the study was to investigate how the routine use of technology by teachers and students would affect teaching and learning. The book asks the pivotal question of how to account for the contradiction of remarkable gains in accessibility to computers and the major inconsistencies in teacher and student use of these machines. The researchers believed that a “threshold” level of classroom technology would slowly, over time, transform traditional classrooms into student-centered places, though no one knew what the result of teachers and children routinely using technology for learning would actually be. *Research today definitely gives evidence of technology integration success in constructivist (student-centered) learning environments. But, what made the researchers in the ACOT study back in 1985 think that supplying classrooms with technology would make them more student-centered? Currently, technology is extremely prevalent in our society – from buying products on the Internet to electronic chatting on a mobile phone. It has recently become a major focus in the education arena as well. But what did teachers think of technology back in 1985? The capability of computers has changed so much in the last decade, becoming much more user friendly and having the potential to do so much more in education (simulations, graphics, virtual field trips, access to electronic information, software, etc.). But in what ways did the researchers think that technology would cause such drastic changes back then? Even with the advanced capabilities today, teachers are still having difficulty incorporating it into instruction.* The overall goal of the project was to enable teachers to create different forms of learning and teaching with the help of technology, not have the technology determine what was to be learned or how it was to be taught.

The ACOT Project studied the impact of total computer access on students, teachers, and instructional processes for ten years on five classrooms in five schools in various areas of the United States that were a cross section of America’s schools in terms of socioeconomic status, grade level, and community setting. Apple supplied state-of-the-art technologies, such as computers for each student and teacher, printers, scanners, modems, CD-ROMs, software, and VCRs. Additionally, they provided training for teachers on how to use technology and technology coordinators at each school. Data from teachers was gathered by audio-taped journals, weekly email reports, classroom observations, and detailed interviews.

The authors contend that in recent years, there has been a tremendous surge in technology related to education, often attributed to changes in business. Teachers now need to help students compete in a high-tech workplace. *Issues related to business will always influence the goals of education at any point in time, because students need to develop skills to be successful in the present environment of society. Our society today is driven by technology, with new innovations being created every day. Teachers have yet to embrace technology related to education, causing many students not to have the needed skills when they complete their schooling. This must change!* However, the authors note the many barriers preventing teachers from effectively using

technology, such as varied access (by social class, gender, race, and native language), the way it is used (low achieving students are less likely to use technology to enhance critical thinking skills) and teachers' lack of knowledge and skills in technology integration. *Also, many teachers do not have the support needed to effectively integrate it -- there's too much of a focus on standardized testing, budget cuts, and no time for planning or professional development.* Many people continue to blame teachers for the lack of technology integration in schools; however, we can't blame them without considering the context for teaching, teacher beliefs about teaching and learning, and professional development.

Many teachers wonder if technology is just another educational fad that will come and go, failing to revolutionize education like previous innovations that made similar promises. *This is a valid concern. Similar claims (about a product revolutionizing education) were made about overhead projectors, TVs, and VCRs, and none of them significantly changed education. Why should teachers take time out of their busy schedules if they don't believe that an innovation will force a positive, lasting change on student learning? What makes educational technology now different and what are the specific ways that it will positively impact student learning? Teachers have to realize the benefits before they will become exemplary technology integrators.* They often question if the benefits of using technology outweigh the extra effort required of them to integrate it into their instruction. During the ACOT study, technology did not revolutionize instruction at first -- teachers used it simply to translate a traditional (text-dominated, lecture-recitation-seat work instructional approach) to an electronic medium. Over time, technology gradually helped to create classroom environments where technologies were used as knowledge-building tools for communication and collaboration, media-rich composition, simulation, modeling across the curriculum, where students were more active, there were various types of authentic assessments, interaction was ordinary and purposeful, and where children were both novices and experts. *It is amazing that the use of technology was able to change the classroom environment so much in such a positive way. But was the change caused by the use of technology or by the way that the teachers' philosophies of teaching and learning changed as a result of the technology that was the real reason for the drastic changes over time? Maybe it was a combination of both.*

The ACOT study found that there were a multitude of positive effects on students as a result of technology integration when it was used as one of many teaching strategies, when it was integrated into the larger curricular framework, when tool applications (word processing, hypermedia, etc.) were emphasized, and when teachers adjusted the use of technology to individual differences in interest and ability. Teachers reported that when learning with technology, students became more excited about learning, spent more time on assignments and projects when using computers (often wanting to work on before/after school and during recess), exhibited more on-task behavior (they were highly involved in their assignments and frequently able to work with little assistance), had more initiative (many went beyond the teacher's expectations for assignments, and an increase in experimentation and risk taking (individual students or small groups of students independently explored new applications and developed skills). *Were these changes a result of the novelty effect or did the students exhibit these positive changes when using technology long-term? When confronted with something new, particularly in a learning situation, most people will display these same characteristics, simply because it's exciting to learn in a new way.* Technology was a catalyst for change in classroom processes because it provided a distinct departure, a change in context that suggested alternative ways of learning.

The authors present a compelling argument that technology has the potential to change education in beneficial ways, but only under certain circumstances. They emphasize that the operating principle of the study was not for the teachers to use technology all the time, but to use the tool that best supported the learning objective. *Many people in education today don't seem to 'get' this principle, often using technology just to use it. Sadly, by the simple fact that they use technology in their classrooms, they often consider themselves to be expert technology integrators and serve as a negative model for their colleagues. Teachers must realize that technology is only one of many instructional practices and should only be used when it allows you to do something you couldn't do before or that you could do before, but better.* They further assert that teachers need to be at the center of reform efforts related to technology, "as active participants and as leaders of change" (p. 2). *To be "leaders of change," teachers have to be sold on the idea of integrating technology, which means they have to see the positive results with their own eyes and experience success related to technology. Many teachers continue to think that it's just another educational fad, so they are not ready to embrace educational technology or the benefits that it supposedly offers.* The speed and direction of technological evolution in education is closely tied to changes in teacher' beliefs about learning, about teacher-student roles, and instructional practices.

According to the authors, teachers will predictably progress in using technology over time through five specific stages: *entry* (even experienced teachers find themselves facing discipline problems, resource management, and personal frustration), *adoption* (teachers begin to intersperse instruction on how to use technology among traditional whole group lectures), *adaptation* (the new technology is thoroughly integrated into traditional classroom practice and there is higher motivation/ student engagement among students), *appropriation* (evidenced change in classroom practice, teachers' personal mastery of technology, and change in beliefs about the usefulness of technology), and *invention* (teachers experiment with new instructional patterns of teaching and ways of relating to students and to teachers and have an increasing tendency to reflect on teaching, question old patterns, and speculate about the causes behind the changes they are seeing in their students).

*One has to at least question the progressive stages that the authors believe all teachers will go through when learning to integrate technology. Much of the research related to educational technology focuses on how it affects student learning, instead of how it affects issues associated with teachers (such as philosophies of learning, instructional practices, etc.). It seems, however, that although educational technology has become more and more prevalent in schools, many teachers are still failing to be successful at integrating technology effectively and efficiently into their classroom curriculum. How many teachers actually get to the appropriation or invention stage of technology integration? What factors do these stages depend on?*

Sandholtz, Ringstaff, and Dwyer note the significance of personal beliefs to instructional evolution and recognize that replacing old teaching habits takes time and repeated success. Additionally, they assert that there are certain barriers that prevent teachers effectively integrating technology into their classrooms, such as limited access (insufficient amounts of hardware and software), technical problems (no on-site technical support, malfunctioning equipment, lack of troubleshooting skills), lack-of-time (no time to continue learning about technology or to develop technology-rich lessons).

In today's education system, there is the rampant problem of many teachers teaching the way that they were taught -- often in a traditional, direct-instruction approach, which generally means transferring ideas from one who is knowledgeable to one who is not. The use of

technology in the classroom often thrives in a constructive approach, where learning is viewed as a personal, reflective, and transformative process where ideas, experiences, and points of view are integrated. Many teachers do not realize, the book notes, that knowledge instruction (used to introduce skills or concepts, build awareness, etc.) and knowledge construction (to help learners personalize and internalize ideas, create solutions for different contexts, etc.) are complementary to each other -- both have a place in the classroom. However, for those who are just beginning to use technology and are shifting from an instruction to a construction approach for some activities, there are extensive demands in changing deeply held beliefs about classroom activities, roles of teachers and students, goals of instruction, the concept of knowledge, and the definition and measurement of student success. *Learning how to use the technology is hard enough for some teachers. For some, it's almost impossible to change their entire philosophy of teaching as well. A constructivist environment (where many assert that technology integration flourishes) requires teachers to confront many difficult issues, some of which they may not be willing to face.*

The authors emphasize that for technology integration to be successful, there are several key factors that must occur. There must be a long-term value of change -- it cannot happen overnight. *This is a problem for many educators, because they expect to be immediately successful in integrating technology, not realizing that many variables must be taken into account. Gradual success over time is not good enough for some people (the benefits do not outweigh extra time and effort spent on planning).* Technology should only be used when it is the most appropriate means of reaching a learning goal. It is most powerful when used with constructive teaching approaches that emphasize problem solving, concept development, and critical thinking. Teachers need support from administrators, parents, students, the district, and peers to be successful at integrating technology through the creation of a positive learning environment. For example, professional release time, training workshops, and telecommunication networks between sites provide emotional support through encouragement and instructional sharing. Technical assistance (having a person or team that manages equipment, locates software, and deals with technical problems) can enable teachers to focus on teaching and learning with technology, instead of problems related to the technology. Team teaching (joint planning, developing curriculum, teaching together, and interdisciplinary teaching) creates collaborative environments where teachers can work together to implement changes.

The ACOT study found that effective staff development for teachers in educational technology greatly facilitates success in effective integration of technology, but only if certain features exist with the program. They believe that current models of technology professional development are inadequate and focus too much on learning about computers instead of learning how to integrate computers into the curriculum. *Given that many teachers still have no idea how to successfully integrate technology into their curriculum it's logical to assume that one of the problems may be that teachers are simply not prepared, often lacking skills not only in technology use, but also in the pedagogy related to technology.* They need to become more hands-on, collaborative, and reflective. According the authors, teachers need opportunities to observe and reflect on a variety of teaching strategies, engage in hands-on use of computers, productivity, software, camcorders, etc., interact with students in real classrooms, share knowledge and experience with others, and create specific plans for technology use in their own classrooms and schools

Teachers are the “gateway” to technology use by students. This book provides practical information on technology integration for teachers or anyone who works with teachers

(administrators, trainers, etc.). Technology is not going away -- in our society or in the educational system. Used appropriately, it has been shown to cause many positive benefits and to create student-centered environments. "Technology is not a panacea for educational reform, but it can be a significant catalyst for change. To those looking for a simple innovative solution, technology is not the answer. To those looking for a powerful tool to support collaborative learning environments, technology holds tremendous potential" (p.184).

*About the Authors:* The authors, Judith Sandholtz, Cathy Ringstaff, and David C. Dwyer, are all former classroom teachers and served as outside researchers for the ACOT project. They dedicated the book to the project's teachers and to telling their story. They wrote this book to specifically focus on the experiences of technology integration by teachers, believing that most research focused on how students are impacted.