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I would like to begin with a story I heard which serves to illustrate the gap – the disconnect, if you will – that we are currently experiencing between *an emerging culture of change and innovation*, and *the culture of accountability* in which we live. A principal was scheduled to observe a teacher one morning. When he arrived at the classroom, the students were working in small groups around computers distributed throughout the classroom, intently discussing the questions they were about to explore. The teacher was circulating among the groups of students, helping them clarify the online research needed to solve the problem. The principal came to the door and looked around classroom. He saw a class working in small groups, a class that was highly involved, intent on their projects. He paused, and said to the teacher, “I was going to do your observation today, but I will come back when you’re really teaching.”

What is “really teaching”? What does it look like? How do students experience it, and how will we know if it is working? These are the questions that lie at the heart of the questions facing today’s educators who are, on the one hand, exhorted to use technology and innovate with new approaches, and, on the other hand, face strict accountability standards with serious consequences for their students and their schools.

Our focus today is “Improving Student Achievement through Technology.” Since technology was introduced into classrooms in the 1960s, many have hoped that technology would become a “silver bullet” which would motivate students, make learning more efficient, move students beyond rote learning to higher order thinking questions, and improve test scores all around.

Unfortunately, the research on technology’s impact on achievement is uneven at best. In a review of the literature, Wenglinsky (2005) notes that the evidence of computer assisted instruction (also known as drill and practice) is inconclusive. The results depend on, among other things, prior level of student achievement, cognitive complexity of the task, and duration of the implementation (p. 36). The impact of another well-known study, the Apple Computers of Tomorrow, (a large research project examining the use of computers to support instruction to address higher order thinking skills) did show evidence of positive impact on teaching practices, but the impact on student achievement was mixed.

Wenglinsky argues convincingly, that technology will be used or misused depending on the teachers' quality of instruction. Further, he argues that the key determinant of instructional quality is whether or not instruction is *didactic* – that is, conforming to a linear model of teaching, where the same information is presented to all students and where students progress from basic to advanced skills – or whether it is *constructivist* – that is, when instruction embeds the development of basic skills in the pursuit of “big questions” which emphasize higher order thinking skills and move from abstract to concrete concepts.

Wenglinsky's study uses a national sample of students, teachers, and schools and relates the access and use of technology to student performance on standardized tests (the National Assessment of Educational Progress) to support his thesis. There are 3 key findings in his research:

- The data indicate that, of the non-technological instructional practices of teachers, it is primarily the constructivist ones that are associated with high student performance.
- In mathematics and science, computer use is positively associated with student performance when computers are used in a constructivist fashion, and is either unassociated or negatively associated with student performance when computers are used in a didactic fashion.
- In reading, inferences are somewhat more difficult to make but suggest that when students use computers for word processing for meta-analytic purposes, students perform better, and when they are used for spellchecking or reading stories, students perform worse (p. 77).

In a recent book on the “science of learning” or cognitive science, the National Research Council (2000) quotes Nobel Laureate Herbert Simon, who, in 1996 explained that “the meaning of ‘knowing’ has shifted from being able to remember and repeat information to being able to find and use it” (p. 5). In the Council's book, *How People Learn*, the authors provide a broad overview of emerging research on learning and explore three guiding principles.

First, we need to find ways to understand students' preconceptions by drawing out their pre-existing understandings and building on them. Second, we need to help students develop conceptual frameworks or deep foundations of factual knowledge for organizing future knowledge-building. Third we need to provide opportunities for active learning, or “internal dialogues,” for students to build their knowledge.

All of this is easier said than done. In our professional development work at the Center for Technology and School Change, we work closely with teachers in the design and implementation of technology infused projects. We teach them the technology, we teach them a design process for developing classroom projects focused around “essential questions,” and we follow the teachers back into the classroom to help them implement these projects.

What we have learned over the last eight years at the Center for Technology & School Change is that it is important to keep the focus on teaching and learning. The focus must move beyond technology, per se, although the technology is needed to help make the transition. In the end, the technology is just a tool, a means to improve teaching and learning. It's necessary to learn about the hardware and various software applications, but it is critical to keep the focus on teaching and learning. Teachers may need to shift their very beliefs about teaching and their approach in the classroom as they incorporate technology (Fullan, 2001). This is when technology becomes a catalyst for larger efforts to improve teaching practices and the use of resources.

Students come to us fully "digitized." Some claim that the digital tools are changing the way in which students themselves learn. Linda Stone in *Smart Mob* (2003) discusses the phenomenon of "continuous partial attention" that students maintain as they move between iPods, mobile phones, and computer screens – multi-tasking in ways that make those of us over 25 dizzy. Our teaching approaches need to acknowledge and address these changes.

New York City classrooms need to be technology rich and they need to have strong technological support. These are necessary but not sufficient conditions for transforming our classrooms into more powerful learning environments. What is still needed is ongoing professional development that goes beyond technology application training. We need a strong professional development infrastructure to help teachers design technology-infused curriculum projects. These projects should build on the knowledge students bring to the classroom, and address New York Standards with rich, appropriate content, using technology tools in ways that enhance teaching by actively engaging students in learning.

Although there is a growing body of literature that claims to study the impact of technology, we have yet to prove that increased use of technology causes improved learning – methodologies used to date, for the most part, simply do not allow us to make this strong statement. However, there is growing correlational evidence – evidence that shows that test scores improve when technology is used in certain circumstances. Harold Wenglinsky's recent findings are a case in point: when teachers use technology in ways that are consistent with what we are learning from cognitive science – that is, when students are helped to build their knowledge using technology in constructivist ways – scores improve.

I am Co-Chair of the Technology Policy and Practice Council (TPPC), appointed by the Board of Regents to advise them on the issue of technology access and use in New York. The Council brings together a total of 28 individuals representing the libraries, K-12 institutions, higher education, the museums, and public television and radio to address the larger USNY goal of reducing the achievement gap in New York. We are concerned about equity and emerging policy issues such as "Net Neutrality." We have commissioned a study which will give us a New York "map" of the networking resources, and digital content resources, as well as a representative sample of technology use among USNY institutions. We will use this information to develop a plan for

increased cooperation and collaboration among USNY members to address the achievement gap. New York City Schools should be a primary beneficiary of this study and the subsequent action plan which emerges from the study.

As we begin to gather data, it is important to develop our educational vision for the use of technology. Technology will not improve the educational process by taking the status quo and making it faster or more efficient – simply “tacking on” some technology projects to the existing curriculum. We have the opportunity to use technology and emerging findings from cognitive science to stimulate and develop our thinking about teaching and learning. With a strong professional development infrastructure, technology can be used as a catalyst for these changes, as well as a tool to help implement the changes. The challenge that faces us is represented by that principal I mentioned in my opening story. His definition of what is “really teaching” must expand as we develop more thoughtful approaches for creating active learning environments which support teaching and learning for the 21st century.

References:

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Quote for Press Release:

There is no magic in technology per se: the impact of technology depends on how teachers use it in the classroom. Teachers need the support of ongoing professional development to help them use technology in ways which address our growing knowledge of how students learn, with the goal of reducing the achievement gap in our schools.