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**NCTI 2007 Innovator's Conference**

**Date:** Thursday, November 15, 2007  
**Panel:** Speaking Out on the Effectiveness of Research Regarding Educational Technology  
**Presenters:** Gregg Downey, Cheryl Lemke, Milton Chen, Yong Zhao

**Summary**

**Gregg Downey**, Editor, eSchool News [[www.eschoolnews.com](http://www.eschoolnews.com)] (moderator)

There is quite a bit of research demonstrating the effectiveness of educational technology, said Gregg, and a report called *eSchools Work* identifies some of the best of that research. Gregg emphasized that the research is powerful; the key is to be careful how you use it.

Referencing the recently released study on education software in schools [<http://www.nationaltechcenter.org/index.php/2007/04/18/the-kojo-nnamdi-show-education-software>], funded by the Institute of Education Science (IES), he discussed the global impact education research can have. The report to Congress was the evaluation of the first year of implementation of commercial education software in regular education classrooms. Although the report was much anticipated by the education technology community, the findings were consistently framed as “the technology has made no statistically significant difference” in the students’ academic test scores. Other elements of the evaluation – such as amount of time used by students, amount of professional development given to teachers, or qualitative data on satisfaction and engagement – were downplayed. Unfortunately, the report generated much negative publicity all over the world because the news media viewed the glass as “half empty” and repeated PR punch lines without investigating the content, he said. The fallout has filtered down, and will continue to be used at school board meetings by consumers of the media publicity who have not taken the time to investigate the actual content. Gregg chooses to see the glass as “half full,” he said, and views the long term benefits of the IES study as three fold:

1. To put greater emphasis on implementing education technology with fidelity;
2. To galvanize the ed-tech to communicate more effectively about the efficacy of ed-tech; and
3. To make sure quality ed-tech research is put to proper use in schools and colleges.

**Cheryl Lemke**, President and CEO, Metiri Group [<http://www.metiri.com/>]

Cheryl began her presentation by saying that she hoped that the result of this panel would be that participants would gain a better sense of the value of all types of research, and understand that there is a huge disconnect between conversations at this conference about social networking, critical thinking, and 21<sup>st</sup> century learning and the research that is going on around the country.

A broader perspective of educational research is needed which takes into account different phases of research. Intuition and hypothesis, as well as descriptive, qualitative and correlation research, are all important first steps of research before one moves into the arena of quasi-experimental studies and randomized control trials. IES recognized the following five stages of research in a recent funding priority (RFP):

1. *The Identification Process*. What do we think is working – such as evidenced through correlation research – but have not yet researched?



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2. *Development.* Moving ideas/theory from research to practice using quasi-experimental designs.
3. *Efficacy and Replication.* Can it work under certain conditions? Tested by conducting randomized control trials (RCTS) and quasi-experimental designs.
4. *Scale Up Evaluations.* Is it generalizable to the general population of students and teachers? Again tested through RCTS and quasi-experimental designs.
5. *New Measurement Tools.* Don't just think of the metrics that have always been used, such as academic achievement – take into account new findings about metrics.

There is a range of use of technology in schools, said Cheryl. There are a *lot* of technologies and ways to use technologies in schools that are associated with varying levels of instruction, authenticity, and complexity. The IES study Gregg mentioned earlier looked literally at only a couple different types and uses of technology, she said, and certainly not types that we already KNOW are useful for student learning. We need a national research agenda that addresses the range of technologies and ways of using technology, but no one has done that type of a study.

One study Cheryl suggested everyone take a look at is the Rosen and Solomon study (2007) [<http://baywood.metapress.com/link.asp?id=r8m47762282u554j>]. This meta-analysis of 29 studies found that kids in a constructivist, technology-rich environment do better than those that are not. When analysis of the effect was broken down, however, it was found that this type of environment significantly helped even more, specifically with *critical thinking*, but not so much with basic skills. So we need to understand that it is important that we not weave together effect sizes for different values. Critical thinking is just one example of a differentiator – others include *multimodal learning; collaboration and social networking; authenticity, creativity, productivity, engagement; and self-direction*. See Cheryl's presentation for a graphic display of the dimensions of learning and technology use.

The use of technology can combine with some of the theoretical and empirical research that we have to improve learning, said Cheryl. It is not and has never been just the technology by itself that has been helpful; it is combining all the other elements of how we know people learn the best.

In closing, Cheryl discussed the specific points (laid out in her presentation) to consider when doing research.

**Milton Chen**, Executive Director, George Lucas Educational Foundation [<http://www.edutopia.org/>]  
Milton began his research career at Sesame Street in the early conceptualizing days. "We learned a lot about dependent variables," he said. We learned that kids can learn faster than we thought they could, as long as they are given the tools to do so. We learned that through repetition, music, and the use of characters, preschoolers' could learn to count from 1 to 40 – in spite of previous doubts from kindergarten teachers that they could even learn to count to 10. We had initially been advised kids would have difficulty distinguishing between fantasy and reality if we were to use characters such as the Muppets, but it turned out that the Muppets held the kids' attention, and that the regular adult characters did not. So through creative production skill, user (student) research, and the curriculum, we revised our segments and, now, of course, engagement is very high throughout the program.

During this process, Sesame Street had both public and private funding which enabled the team to do the research and production. Forty years later, said Milton, the country needs that same kind of substantial investment into educational research – are we as a nation willing to do that?

An RCT is held as the gold standard for research in the medical field, and people wonder if the same standard should not be applied to the field of education, he said. But it is not necessarily appropriate



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because we do not really understand how the human mind works. We need a whole new understanding of the human mind, kids' thinking processes, and the group collaborative process - and we need new investment in educational research to get there.

We need 21st century models of educational research, said Milton. Instead of the old ideas of using technology to “cover” the curriculum, which continue to persist, we really now need to be valuing *depth over breadth* – and we don't have good research models for that. Instead of emphasizing facts and memory in learning, we need to take advantage of technology – such as the memory in laptops – to store information, and have kids use their minds instead for *thinking and analysis*. Instead of the binary thinking that is common in education – i.e., thinking of technology being EITHER good or bad – we need to think more *synthetically* in terms of BOTH/AND. At the end of the 20th century, around 1999, the National Academy of Sciences published *How People Learn*, and we began to look at the *21<sup>st</sup> century model of the learner*. The publication delved into the importance of such things as engagement, collaboration, etc.

In listing some of the key new dependent variables we need to research and understand, Milton included *student use of computer-aided design* (such as in architecturally designing schools of the future), *elementary student use of GPS* (such as in tracking wildlife and training farmers), *student use of speech-to-text-software*, and *student use of YouTube*. (Examples of students doing all of these things can be seen at [www.edutopia.org](http://www.edutopia.org).) We need to be conducting research on these types of new behaviors to see how these are happening, he said. *Teaching quality* (i.e., teachers' behaviors in the classroom, such as knowledge of how to use technology, skills in organizing technology-based activities, etc.) is another factor that can amplify or dampen technology-based learning. There is also a need for *new research methods*, a new way of looking at how students are learning and what they are doing.

Though the George Lucas Educational Foundation (GLEF) is primarily a consumer of research, said Milton, the Foundation also wants to help bring this new of age of research into being, and as such, is now funding some research to move the field forward. For instance, a new literature review funded by GLEF found that *cooperative learning* works very well *if* organized and implemented well – and in very specific ways. Upcoming, the GLEF will also be conducting research to find out if a project-based approach to AP classes may be more effective than traditional teaching in those classes.

**Yong Zhao**, Professor, Michigan State University and Director, Center for Teaching and Technology [<http://ott.educ.msu.edu/ctt/>] and the US-China Center for Research on Education and Excellence. The biggest problem in education research, said Yong, is that legislators do not listen to the complexities. In this age of accountability, in our studies, we have been asking the wrong questions – or as Milton said, investigating the wrong dependent variables – because Congress cares about *measures* and only wants numbers. With numbers you can understand short term outcomes, but you cannot really understand educational outcomes. The first question, for our community, is to convey the idea that the impact of a person's education is very different than the short-term impact of instruction. Our country has been pushed to educating the test-taker and not the person.

If you look at the IES study Gregg mentioned earlier, said Yong, you will see that it found that while 97% of teachers were present during the technology use, they were not involved in instruction. The software did not require teachers to be involved. So since we found that the software did not *decrease* student achievement, does that mean that it was as good as a teacher, but just much cheaper?

We need to look to see if a teacher's presence makes a difference – in fact, is there a difference between having a highly qualified teacher vs. a paraprofessional vs. no teacher? If not, then what use are they? We need to let the computers do what they do best – the drill and practice, vocabulary, mechanics, etc., and let the teachers do what they do best – add the human touch, do the higher level organization, etc.



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Some things can be done more efficiently and effectively through a computer, but the social interaction – the individualized and small group interaction – cannot be done through a computer.

We need to rethink how we deploy technology in schools; instead of trying to measure what technology is adding, we need to redesign the whole environment so that computers are not duplicating teacher efforts. If you have a perfectly good teacher and you add software, it is doubtful the software would be of much value, because what it has to offer is already there. Schools should be seen as a new ecosystem, and the varying technologies as different species that make the technology ecosystem work. A teacher is only a part of that ecosystem. Teachers have traditionally been thought of as the controllers, the “gatekeepers,” but that may be a mistake. We need to rethink that. Teachers may not have enough flexibility to make the change in the way they use technology, and we may have to rise to the system level.

Technology research has become irrelevant in the sense that policy decisions are typically based on political appeals and images instead of research results, said Yong. Most research on education and technology in the past 20 years has not been outcome-based – and that is not real research. “I think good research would answer the question: *Under what conditions can a piece of technology be used effectively to improve what?* That’s actually a more genuine research question to ask than *whether* it makes a difference, because there are so many mediating factors,” said Yong.

**Discussion:**

1. *I think speech is a good example of the various types of things you were talking about - the myth, the superstition, the image. While most think that a child below the age of 1 cannot do much in the way of linguistic communication, what we have seen is that if they learn to [use American Sign Language], they can communicate much earlier than anyone would have predicted. There is binary thinking in terms of phonics vs. whole speech, and no one has considered signing, even though English literacy of deaf children is highly correlated with signing fluency. There has never been any research to document that learning sign language interferes with the development of speech – in fact, deaf children of deaf parents, who learn ASL from birth, have speech skills equal to or better than children who are brought up orally, and have much better academic achievement as well. But people persist in the belief that learning sign language interferes with speech. What do we do about it?*

Yong Zhao response: I think educators have been on the defense without proposing different alternatives like you mention. Technology has redefined what’s important – for instance, perhaps math and reading aren’t as important as before – but because of NCLB, we can’t challenge the tests of reading and math. There are a lot of children in this new age doing things like YouTube and social media, and this new talent could possibly bring out a new virtual economy that may need something very different. So what we need to do as a community – with any research – is to bring forth folks who say we have an alternative vision of education and accountability than what is prescribed to us, and to challenge it on a grand scale rather than only tweaking the minor details.

Cheryl Lemke Response: The scope of this problem is tremendous; over 30% of the general population believes that humans and dinosaurs walked the earth at the same time. We are so far away from scientific literacy. A recent research study suggests that our IQs are generally going up and our intelligence is generally going down – and I think it’s because we are not open minded. We don’t understand what the scientific process is so we don’t value it; we have emotional arguments. So I think one thing we can do to address the issue is to start teaching critical thinking curricula in our schools so that students are open-minded.



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Milton Chen Response: Quoting Carlos Garcia, the new superintendent in San Francisco, "Knowledge is knowledge in whatever language you speak." Kids ought to be given credit for knowing something in whatever language they speak. We can talk about the value of English, but I do think there is a lot of discrimination in terms of what is the gold standard of what learning is all about.

*2. I would like to add two issues to the list of issues that we've already suggested that research needs to focus on: A) We need new research methodologies and new analysis techniques to better understand what tools work for different individuals, especially in a diverse learner environment – even in the day and age of universal design, we can't assume that a single tool will serve all students. B) We need to have research that really informs practice and is useful for teachers in the classroom. Teachers want to know what instructional strategies work best, but need to understand that there's no prescription. Research needs to reflect that and provide teachers the information that allows them to effectively problem-solve in their classrooms. Maybe the panel can respond to how you think we can better address what works for whom.*

Cheryl Lemke Response: We need teachers who understand the principles of design. For instance, illustrations that add to – rather than duplicate – what the text says have been found to increase learning by 30%. Teachers need to understand the *principles behind the design* so they can look at the issue theoretically and understand how to design it in new ways.

*3. There's a bigger elephant in the room than NCLB – do we have to PROVE that a computer is needed? We talk a lot about software, but how do we get the national agenda to a place where schools will have enough computers where in fact they become teaching and learning tools rather than objects that roll around the building on a cart?*

Milton Chen Response: Ubiquitous technology is important and needed, but the question is, what are we doing with the technology, and where are the new innovations in learning software coming from? I think that's the important issue.

*4. Comment: Surveys are only as good as the questions that are asked and what we are going to do with the answers. Also, if we want to study things that are as tricky and individual as heart surgery – if we can use technology in ways that are even more important than that because they don't just cut up things, they create possibilities that are endless – we really have to think about new dependent variables and methods of research.*

Yong Zhao Response: The mentality of the U.S. public in looking at research is that they are looking for very simple answers – they don't want to know about things working under certain conditions, they just want to know if it works. This actually has to do with the fact that our science education in the U.S. has failed in many ways because we have not taught our children to think.

*5. Comment: Technology has to be understood in terms of the economic base of school districts, such as how the tax money is divided, along with classroom variables, teacher variables (background and motivation), and the entire schooling process. For instance, some schools mandate a certain curriculum (such as social constructivist math) but often the students that attend the school don't have the basic learning skills and experiences to benefit from that and do well on standardized tests. So we have to look at all systemic variables.*

Gregg Downey Response: Your comments speak for themselves.