



Forward and Introduction

The first Educational Technology Leaders Summit was held on September 26-27th, 1997, in Portland, Oregon. This event hosted eighteen technology leaders in the education field. The attendee list included popular keynote speakers, software editors, educational consultants, published authors, and educators.

Many influential individuals participated in the Education Technology Leaders Summit. This by-invitation-only event was attended by the following:

Bonnie Bracey - Educational consultant, speaker at national conferences, and classroom teacher.

Gail Lovely - NetSchools, Inc and a contributor to *Instructor* and *Electronic Learning in the Classroom*.

Warren Buckleitner - Editor of *Children's Software Revue*.

Dr. Sylvia Charp - Editor-in-Chief of *T.H.E. Journal*.

Patrick Crispen - Author of the *Internet TOURBUS*.

Fred D'Ignazio - President of Multi-Media Classrooms, Inc., published author and educational consultant.

Susan Higinbotham - Chairman and CEO of Chicago 2000 Partners, LLC, and co-founder of the USA Education Charitable Trust.

Joe Huber - Assistant Director of Technology and writer for Linworth Publishing.

William Gattis - Chairman of ICTE and member of editorial board of *T.H.E. Journal*.

Catie D'Ignazio - Presenter at international educational conferences and published author.

Dr. Ted Kahn - President of DesignWorlds for Learning, Inc; Affiliate of the Institute for Research on Learning (IRL) and Senior Fellow, U.C.L.A. Graduate School of Education and Information Studies.

Daniel Kinnaman - Executive Editor of *Curriculum Administrator* and educational consultant.

Joe Lambert - Executive Director of San Francisco's *Life on the Water*.

Dr. Merle Marsh - Published author and school administrator for Worcester Country School, Berlin, Maryland.

Margo Nanny - Educational software designer and technology integration specialist

Bob Pearlman - President of the Autodesk Foundation.

Dan Schultz - Executive Director, The Primary Sources Network.

Arjan Schutte - Student at MIT Media Laboratory's Interactive Cinema Group.

The purpose of the Summit was to bring key educational technology champions together to discuss industry trends and what impact technology can have on education. The discussion topics at the Education Technology Leaders Summit focused on multimedia, the Internet, education reform, learning, teacher training, and curriculum software for the classroom.

This paper is a synthesis from the discussions. It addresses what is happening with technology in schools: what is going right, what is going wrong and why, and what the solutions may be. The purpose of this paper is to document the discussions that took place at the Summit.

8-IX-1998.

Executive Summary

The group assembled had several conclusions about technology in education. Foremost is that technology can provide a path to improving learning, both in schools and in the community. According to Fred D'Ignazio, educational consultant and President of Multi-Media Classrooms, "Educational technology provides real benefits, including the support for different learning styles, opportunities for teachers to teach and grow in new ways, and it provides windows of opportunity for children in disadvantaged situations."

For the introduction of technology to be effective it must be well-planned, be supported through teacher training (pre-service and in-service), and it should support authentic learning, that is the natural learning that takes place when a student is learning a skill or concept in the context of performing a task or tackling a real-world problem. This makes the issue of integrating technology into classrooms larger than the technology itself. Implementation may initiate curriculum adjustments, a rethinking of student assessment models and standards, an investment in staff development, and a recognition of the image of technology and education in the community, the state, the district office, and among the school administrators. Questions about class size, period scheduling, school hours, and the use of school facilities may also be considered.

The group agreed that the Internet holds the promise of driving some of these educational changes. As the technologies and access develop, these materials will become more relevant and easier to find and manage. Teaching and learning may become increasingly decentralized and involve a broader community. The methods for assessing learning will develop to meet the challenges of the classrooms of tomorrow and the 21st century workplace. "The Education Technology Leaders Summit highlighted my interest in the benefits of educational technology as creative knowledge design tools for students and teachers," said Dr. Ted M. Kahn.

The question that remained is *when*. Change has been slow, as evidenced by the repeated conversations about computers and educational technology throughout the years. There are exemplary models of change throughout the education community; examples show curriculum change, exemplary staff development, and technology integration. These remain as evidence that schools do innovate.

Margaret Mead once said that we should not doubt that a small group of dedicated people can change the world. "That is the only way it has ever been done." The group who assembled at the Education Technology Leaders Summit, along with many others who share the vision of technology, could be the group of dedicated people who make a difference in the lives of students and improve the world of learning.

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This publication made possible, in part, by the U.S.A. Education Charitable Trust.

What is Education Technology?

Technology as a Tool

Dan Kinnaman, Executive Editor for *Curriculum Administrator*, said “Every bit of educational value that comes from technology derives directly from the purposeful application of technology by human beings. The technology itself is neither educational or non-educational.” He continued by saying that educational technology need not be limited to school facilities. “Today’s computer and communications technology, just objectively, comprise the richest set of teaching and learning resources in the history of the planet and it is up to us to figure out what the appropriate ways to use those educational resources with the recognition that they are constantly evolving.” Education technology, its practice and definition is not static, but rather, open-ended and dynamic.

Patrick Crispen, author of the *Internet TOURBUS*, said, “I would define educational technology based on its goals and what it is trying to do.” The proper term that was proposed was “technology used for education,” not “educational technology.”

Margo Nanny, a multimedia developer, added, “Education technology is any of those tools that help kids think in new ways. From a calculator that enables them to do arithmetic without necessarily using their pencil and paper to word processors, to all of those things we’ve seen over the years that just help them do their work better.” The fact that it is called “technology” means there is an element of hardware present, from the fax machine because you are able to send a picture to the architect to ask a question, to the telephone because they were able to call the architect up and get their response. She concluded, “I just include everything in this definition of educational technology that is used for an educational purpose.”

Others added that technology could be a blackboard and a piece of chalk if you are trying to teach someone addition or multiplication for the first time. It does not have to be a computer, it does not have to be the Internet, it can be something very, very simple. Education technology would be any appropriate technology used to aid in instruction.

Bonnie Bracey continued this thought by commenting that educational technology is “any tool used for the process of connecting with ideas.” The tools can be simple. She related a story about Tony Harris, a teacher in California, who recorded a video which she uses in her presentations and in the video his students talk about what is in their classroom.

And at different times they are talking about encyclopedias, and old television sets, glue guns, pencils, paper, and on-line services. They will say ‘here is a CD-ROM. Here is an example of high technology’ and then they say, ‘here’s a glue gun. Here’s an example of medium technology. Here’s a pencil. This is low technology, but we still use these.’

Technology as a Tool for Change

Warren Buckleitner, Editor of the *Children’s Software Revue*, added that he sees technology as a Trojan Horse for getting things through the doors of schools and making change happen. “I think it’s really important for us all to consider the culture that is embedded in every CD-ROM or any piece of hardware.” He reminded the group that every media contains the culture of the people who made it: their values about learning and their

values about the contents that they chose to include. “So...you can bring with technology a lot of different agendas and philosophies and learning theories and pedagogy right into your classroom to give your kids. You can use that positively, but you need to understand what the agendas are and how they fit with what your goals are.” The technology could be a tool of change.

“The reason I am interested in technology is that it provides a powerful and economical means of distributing teaching tools and methods,” noted Susan Higinbotham from the U.S.A. Education Charitable Trust. “The Internet could catalyze an important paradigm shift about the nature of knowledge because with the help of new multimedia authoring tools, anyone can become an information creator or publisher,” said Dr. Ted Kahn of DesignWorld for Learning.

Bob Pearlman posed the question, “if you are able to [communicate, learn, share, consult with experts] and you are able to do that on a local, regional, national, or international scale, what difference is that going to make in the way schooling is carried out and schooling is reorganized, redesigned, transformed? How significant are these developments? What does it actually mean in the next several years of schooling changes?”

“Teachers who are using technology effectively, especially the application and the presentation programs, are ahead of the way we view the curriculum and the way we teach,” commented Merle Marsh. “I don’t know if it is so much looking at technology, but looking at curriculum and teaching methods. It seems like we have so many good things, but how do we put these into action if we don’t have changes in the basic ways schools function?”

“One of the things that we have not done with the technology is to bring the parents and the community in as stakeholders,” commented Bonnie Bracey. “We still have schools that close at 4:00 P.M. If they have got all that technology in view why can’t there be room in where people create cookbooks, look for butterflies, or do whatever that community is interested in using the technology.” We have told the community that “kids can have the world at their fingertips but you can’t.”

“I was at a meeting like this in 1983 and we had a very similar conversation,” commented Dan Kinnaman. “I was at an Apple meeting in Vermont in 1986 and we had a very similar conversation, in 1997, the business of schooling has not changed very much.” Technology has changed, but the issues surrounding the use of that technology remain the same. “That is interesting that in other industries, if I think about those in contrast to schooling, none of those is a national monopoly that has no penalty for mediocrity. Our industry is a national monopoly that has no penalty for mediocrity.”

It is an observation about the nature of bureaucracy that it is both self-perpetuating and self-feeding. I think the good news in all of that is that the tools that many people are referencing, the programs that many people are referencing, the concepts that many people are referencing, exist free of that. They don’t require permission of any central authority to exist or to be used or to proliferate. I designed a workshop where teachers took off their teacher hats and became students and made things. It was a constructivist approach and at the end I asked them to put their teacher hats back on and reflect on the activity they had just experienced. A very good teacher raised her hand and she said, ‘this is wonderful but I can’t do it in my classroom.’ And I said ‘why not?’ She said, ‘because what we just did took two and a half hours and in my class, I only have math time for 50 minutes.’ So I thought it would be a good opportunity for the group to talk about that and for the next 45 minutes or so many suggestions were made. Every single

one 100% of the suggestions involved crippling the activity to fit the school schedule, rather than changing the school schedule to take advantage of that wonderful activity. And so it was at that point in time that I started to really think hard about the need for rapid changes in both education policy and school organization to tap the power of the new technology. And I try to be careful about saying that because it is not an indictment of public education, it is a statement of support for public education but it is a statement that we need to find the where-with-all to make the hard choices that we don't have the incentive as tenured faculty to make, even if we have the heart to make it we don't have the incentive to make it in our industry.

“Reforming the classroom, I think, is totally critical,” Arjan Schutte continued. “The Internet is not just a neat device that allows us to do all the things that we can obviously do with it, but it also challenges us to really think differently about how our social structures and how our spaces are organized.” The Internet itself could be a model for education. “That the decentralized nature of the Internet allows us to understand not just how nature works differently and allows different models to see how traffic jams work or how fish school and this kind of thing, but also how we relate within the classroom besides the obvious extension to the community and those kinds of things.” Several participants commented that technology should be viewed as a *means* for achieving better learning, not as an end in and of itself.

Bob Pearlman added that the kind of change proposed can happen in traditional schools, as well as newer charter schools or alternate programs. “The interesting thing is that the technology is not really the end to the change. The change is instructional practice.” It is rapid change to tap the power of technology, but more importantly “for more authentic learning and accurate assessment of student learning.”

Technology and Teachers

Technology and Today's Teacher

Bonnie Bracey proposed that a group of technologically-savvy educators, like the ones assembled, would define educational technology very differently from how a typical classroom teacher might. Those teachers actively using computer technology are still a minority. Most teachers do not have regular access to those tools considered “high technology.” They must find ways to blend the newest and latest tools into a classroom with “medium” and “low technology” tools.

Merle Marsh continued this thought by saying “We are in the age, not of technology, but in the age of the blackline masters and the videotape. If you look at what is easy-to-use and what is in schools, those things are.” She commented that even the most technologically advanced classrooms still use these basic tools.

“Because I am working in school everyday, I can tell you that there is a great excitement about technology. The parents want it, and we school administrators must at least act like they know where we are heading with technology,” added Merle Marsh. “There are some wonderful programs; the software is unbelievably good. We have, however, failed to get across to the public the message: “This materials is good for your children, and this is how we need to use it.””

Fred D'Ignazio noted that the benefit of technology is that it supports different learning styles, opens up project-based learning, 'when kids are doing projects using all the different types of resources and learners in the room and with a teacher.'

The challenge is that technology is like a runaway train. The time between the new machines coming out on the market and the new developments and all these things happening is getting shorter and shorter. So some of us are racing to stay on that wave and many school districts are paying big bucks to keep trying to catch up and land on the cutting-edge. And then within months they find themselves already in the backwater. Technology is often used to do what we have always done, to drill kids, to have them sit quietly in rows, and look at their monitor instead of their teacher, and we have really significantly not changed education. I think that is a failure. I think success is when we can use technology to really make a difference about how people learn.

Joe Lambert said that where he grew up in Texas he "confused school with the criminal justice system."

I did not buy the motivation that you learn so you can have a better life. I thought the motivation to learn was so you can get the hell out of here. Here was the school where I was being talked to or indoctrinated or whatever and I had a pretty hip idea that this was stuff that I probably did not need to survive well, but that these people were getting paid to do it, therefore I should be nice or they will not let me out of here. The Internet is a pretty big ticket out and kids given the opportunity to do that are going to take it. I am one of these people that does not believe that technology invented the need to know. The need was there therefore the technology came along to meet the need and it is popular because it met the need.

Dan Kinnaman furthered this thought by describing two different views of Internet access in the classroom.

Contrast these two phrases, 'let's connect the Internet to our classrooms vs. Let's connect our classrooms to the Internet.' The first way implies the traditional approach to applying technology to schooling and we fit the technology to a current model. The second way, 'let's connect our classrooms to the Internet', that implies a willingness to re-think the definition of school. One of the ways that I have been defining it for a couple of years now, is that the classroom becomes all the places, real or virtual, where people meet to teach and learn or where they visit individually to gain access to educational resources.

The attitude of re-thinking "school" leads to further discussion about staffing, facilities, curriculum, community involvement, and political systems.

Teacher Training for Technology

Bonnie Bracey mentioned that there is little to no teacher training. Patrick Crispen added that "they put a computer in the classroom and say 'Congratulations, you're on the Internet' or 'Congratulations, you have now got the technology, teach', and they don't train the teachers."

"Technology has disempowered a lot of teachers," said Warren Buckleitner. "Good teachers had technology brought into the classroom and suddenly they were nervous about

what they did and that it was not good enough, and we have to get past that we have to help heal those teachers.”

“We not only have to empower the teachers and the students so that they are not afraid of technology, but I think we also need to attack a major problem which is people love to announce the fact that they are ignorant about computers,” said Crispen. “Imagine any other thing that you do in life where you sit there and say ‘I am a complete total and ignorant fool when it comes to doing this.’ People say it with pride and it is not to be something to be proud of, but rather to be ashamed of.”

Bracey contends that even though there are some teachers who might be proud of their ignorance, most “teachers do not want kids to think they are stupid.” This does not mean they are not interested, that they do not care about technology or about school change. Bracey suggests an “assistant project in which there is some way they all have ownership, but if you want to kill technology, keep on putting teachers on the spot where they are told that ‘let the kids do it if they don’t know’.”

Gail Lovely added, “We can not accept teachers being uncomfortable with not knowing and I think we have to help teachers understand that being uncomfortable with not knowing means that all the students are uncomfortable with not knowing as well.” It is important to display a willingness to find out rather than always having to know.

Bonnie Bracey added, “I have been teaching for many years and let me tell you something, I know older teachers who would do it if they ever got the chance. We are not talking about training, I am not talking about teaching a language, I am talking about letting me incorporate practice.” There are teachers who are older who would continue to teach and would use high-technology tools if people allowed them to learn the wonderful ways to do it, she said.

Buckleitner told a story about his daughter who after her first day of kindergarten came home to tell her Dad that “they have a computer at school, but it is broken. You’ll have to come in and fix it.” “So part of me gets real upset when I hear about helpless a lot of educators are with computers,” he said. “I started thinking about if a doctor or heart surgeon did not know about the latest laser surgery techniques, I would be real mad, and that doctor would probably lose their license.” The same with airline pilots, tax attorneys, and other professionals. “I think that teachers need to start knowing about technology. It is part of the job of the profession of teaching and learning, to know about these tools and how to use them.” The systems should support this type of continuing education for professional educators.

Training Tomorrow’s Teachers to Embrace Technology

Merle Marsh addressed the issue of pre-service training by noting that “I think we have failed with the college departments of education. That needs to be a huge thrust, teaching them what they should know.”

The group brought up another point of view regarding training teachers. “At some point as this teaching cohort ages in this country, and in states I am familiar with, the average age of a classroom teacher is forty-six or forty-seven years old and they are near the end of their professional teaching career, you come face-to-face with the law of diminishing returns. Do you continue to put training funding to that segment of the population,” it was asked, “or do you focus on the Head Start argument that says you ought to be front-loading these kind

of training resources?” This would put technology training into the colleges of education and into the first couple of years of a teachers professional career.

“There is a new project called the 21st Century Classroom where we looked at the fact that the technology, even when it is there, people thought that if you just dropped it in the class and teachers put their hand on it and somehow they could learn how to use it,” noted Bonnie Bracey. “They don’t have to know how to do all this, they just need to have direction. And no one is developing directions for the people who are in the classrooms. We do the lecture circuit and keep talking to each other,” she concluded. The direction and vision needs to be brought to the level where the teachers are teaching and the learning is happening.

Gail Lovely added that “teachers should be managing and facilitating rather than delivering.”

I think it is about kids discovering and learning. That is not without planning and a lot of change. I teach in the teacher education program. It is very difficult, the faculties have not changed and they were brought up in a different world: they taught in a different world. We know teachers teach the way they were taught. It is a self-perpetuating problem. We know teaching staff is older than it has been for a while, both at the university level and in the classroom. It just comes back to helping those people, and I count myself among them, to see ways to innovate instead of automate.

The Promise of Technology

Rethinking Learning

“We need to be aware that modern technology does not require the endorsement of schools to be educational,” added Dan Kinnaman. “Parents, children, grandparents, senior citizens, across the board, people are discovering the educational value of technology. Home use of computers and other related types of devices, particularly the Internet, represents the decentralization of educational resources.” He continued, “I think the assumption that educational technology, any type of technology, is panacea for solving the problems is silly. I mean you don’t take a kid and drop him into a town square in Colombia, and say, ‘learn Spanish.’ And you don’t take a kid and sit him in front of a computer and say ‘here’s the future.’” This idea was echoed in the comments by Patrick Crispen and Ted Kahn, the later who suggested expanding our notions of technology as an enabler for lifelong learning opportunities, rather than just for use in formal education/classroom environments.

“All this stuff, from the chalk to the books to the computers to the slide strips that we used to watch when I was in school, all those things are useless without an educator,” said Kinnaman. “Somebody is there paving the way. And that educator could either be a teacher, a parent, a church leader, or whatever, but you know going back to the definition educational technology by itself is useless unless there is a mentor.”

Bonnie Bracey noted that students can access information from anywhere. “You’ve got NASA. You can do a solar class, you can learn about the solar winds, what the northern lights are and look at them without having to buy a book or go to the library. You can talk to some of the scientists, you can use National Geographic and see the world some places you will never get to go.” You can access experts, you can read about places and events, you can join groups, you can view satellite transmissions. You can do GIS sensing and look down on volcanoes that are erupting, and talk to the volcanologists. “You can mix the resources in such a way that lifelong learning becomes a pathway that can evolve just because the information is a world at your fingertips. Kids who have different learning styles can use their brain power and their thinking power to create thoughts instead of just listening to someone filling up their head with ideas.”

Patrick Crispen concurred when he commented that technology “opens doors that have been closed. It also empowers the students, because instead of sitting there and talking about blank concepts and things that are very difficult, you can get onto the Internet or get on with a computer and view a CD-ROM that ends up giving some meat and some depth to something that the teacher was teaching in the classroom. It reinforces the curriculum.”

Utilizing the Technology

“You can have great technology and lousy learning,” commented Gail Lovely, a new addition to the NetSchools integration team. “And you can have lousy technology and experiences that are beyond what many of us have experienced in classrooms as far as learning goes, but technology is interesting and empowering only when used in interesting and empowering ways and so it really does come back to who is using it, how, and why, and to what end. Yes, technology does open doors and opportunities that we have not had, but only if we take them.”

“If there has been successes, and this is certainly the case, I think they have remained mostly isolated or what we might call ‘islands of excellence.’ Technology’s promise lies in its empowering ability to allow more people to participate in learning and in the democratic process, in general,” noted Ted Kahn. “Technology can facilitate much broader community of knowledge producers, including students, teachers, parents, as well as traditional content experts, and what is powerful is knowing that what you produce will really receive attention from an authentic audience of other users.” Kahn said that the “whole thing is about changing the world for the better, so if what we do with technology is a matter of just accumulating more and more information, but we can’t actually empower ourselves to act more effectively in situations that desperately need change, we haven’t gone far enough.”

Patrick Crispen noted the lack of quality materials when he said, “one of the biggest challenges is that a lot of publishers in the software industry are much more interested in the bottom line and shipping products than providing material that educates.” The good software seeks to improve learning and facilitate change, while the bad software is no longer educational, “they are entertainment.”

Warren Buckleitner noted that there are some things that have changed and one is that we are entering a real exciting period. “The \$2,000 computer you can get can today can do a whole lot more than an Apple II, for about the same price. You can take an idea and when you put that mouse in a kids hand they can link that to a calculator, type the number, see the graph move, and something clicks in their minds. These are tools that are just getting too powerful to ignore and pretty soon teachers are going to see that,” he said. He noted that if you “give good people good tools you will get good results” and that an overwhelming majority of teachers are good people. “They went into teaching because they loved kids, they want to see growth, they want to see change and so I think we need to trust these good people with proper tools.” He described an ideal classroom outfitted with a small lab of four computers, a large display, Internet access, and some basic software all for under nine thousand dollars as one example of a classroom model.

Margo Nanny noted that technology teaches students 21st century skills, if we allow it to. Students need to be good at “gathering information, processing it, understanding it, having tools in which they can do wonderful representations of new information, they have to be information designers and inventors so they can get through all this junk on the Internet, and say ‘gee, from these three pieces of key information I have a new idea in my thinking of this issue.’”

Kahn added that technology is an “enable for creating kinds of virtual and other learning, what IRL calls ‘communities of practice.’ These are emergent and informal social affiliations where learning really takes place, a technology can increase the diversity of the communication and ways in which people participate and learn in these communities. We talked about content as one thing, the second thing is that we are now in the process of realizing you get the leverage by participating in different kinds of communities, not necessarily one big one but being able to be part of multiple communities is a good way of encouraging innovation through a process of ‘cross-fertilization’ of ideas and discussions.”

Assessing Technology

Technology and Student Assessment

Patrick Crispen broached the issue of technology and assessment when he proposed that education technology has failed in that it has not properly stated its goals. He mentioned that an overwhelming percentage of parents want to see computers in the classroom and firmly believe that technology, like the Internet, will help their students and improve faculty performance. The majority of the teacher and administrator respondents to a report done by Market Data Retrieval say Internet information is unorganized and does not directly relate to curriculum or textbooks. “Only 13.4% said they believed the Internet helped students achieve better results in standardized tests,” he read. The field of education technology must define its goals and how the results will be measured. How does authentic learning happen and how can technology help?

Ted Kahn said that students love multimedia and that learning to design and produce multimedia might be great training for jobs in any field that involves knowledge work and effective communications. “However, some people still ask, ‘What has this got to do with better learning of basic math, science, etc.?’ Kids learning to make or use multimedia might not show direct improvement of standardized test scores.” It is still hard to find the kind of ‘hard’ statistical evidence many parents and others want showing a direct relation between these creative design and media skills and subject matter learning in most educational evaluation of technology use. Kahn continued, “my intuition, my gut and my experience with kids all tell me that learning to use multimedia and the Internet to create new knowledge will also help facilitate learning of basic content, but I don’t want to have to defend this in the way the questions are typically asked.” Kahn then suggested that today’s standardized tests are not appropriate for assessing 21st century knowledge work. He proposed that alternatives such as digital portfolios and the New Standards Project (National Center for Education and the Economy and LRDC, University of Pittsburgh) are a much richer direction to pursue.

Dan Kinnaman added, “Let’s rethink, let’s recreate, but there are many good things that can be maintained.” He mentioned that Connecticut has worked hard to develop what is actually a good criteria in reference mastery test at the 4th, 8th, and 10th grade levels which has received respect and replication around the country. The problem, he continued, is that teachers teach to the test, administering “a million multiple choice questions that look like those on the standardized tests,” rather than teaching the concept in a constructivist mode.

“If a supermarket can keep track of what kind of diapers I buy, the rental car agent can know how many times I have rented from the card and my receipt in their hand-held computer, why can’t teachers have technology to do assessment,” proposed Crispen, “because it is just data.” Methods for evaluating learning must inventory the skills and concepts the student has mastered, as well as the ability to learn new things as they are presented. Technology can assist in this process.

Kahn relayed an example from a public high school near Los Angeles, Roland High School’s animation and regional occupational program (ROP). “Dave Master, the founding teacher of the Roland animation program, invested a lot of time building world-class animation competency and a real community of practice in this school.” Roland students produced over 1,600 animated films in a period of over 17 years, winning

hundreds of awards; that is more than any other school (including colleges and universities) in the world. In 1996, over a hundred Roland graduates (many of which were not college-bound) were hired straight out of high school by Hollywood animation and film studies because Rowland's performance had exceeded professional and higher education training programs, which were not keeping up the increasing industry demands. Yet neither Dave, not he other pioneering colleague (a math teacher) are still at this school. "They had to keep answering questions such as, 'what were these kid's test scores' which ignored the authentic assessment of the students' work by the community outside of the school. The math teacher, whose students had created entirely new ways of visualizing and explaining complex mathematical concepts through animated storytelling, was also asked to explain why there was a slight drop in his Math AP (Advanced Placement) students' scores. When you do everything you can to prepare students to what the larger (work) world requires and you do not get acknowledged for outstanding success in doing so by your own school community, it is not a surprise that outstanding teachers leave such schools." Kahn continued that Dave is still involved in education. "He is now the Director of Artist Development and Training at Warner Brothers Feature Animation and hires many of his former students. He is also using distance learning technologies to continue teaching students, so his commitment to education is as strong as ever." Kahn noted that if "society does not find a way to inject some kind of competitive (market-driven), choice alternatives into the education system to reward efforts such as these, there will never be a penalty for mediocrity or educational failure."

You should be able to love teaching, and not have to leave. Secretary Riley, I think to his credit, has been pretty forward in saying that it is not acceptable for schools not to work. He has not figured out what you do about ones that do not work, but at least he is recognizing the fact that it is not acceptable to just put up the rhetoric of 'we believe in excellence' when things have not changed in 15 years.

Judging Technology's Impact

"There are administrators who put the hardware in the classroom who have no way of knowing how to evaluate it," noted Bonnie Bracey. "So we who are teachers are walking on a tightrope; we are working to the standards that the state says, we are working to reach the standards that people ask us to do in our curriculum area, we are doing what our school systems say, we are doing the old practices, and instead of using educational technology we are putting little bits of it in there when we can find the time. You can not evaluate educational technology if no one is really using it."

"There does not seem to be coordination from the top. It seems like the Governors are saying we need to go here, the administrators are saying we need to go there, the teachers are saying 'well, OK let's try to go this way' and there is no vision," Bracey said. "That is not a failure of educational technology, that is an education failure."

"I think when technology is successful is when we had the political, social, and economic strategies converging around a set of values," commented Dan Schultz. "That really creates the context and it is context in which we have had problems with appropriations for educational budgets, or cover stories on magazines, or opinion polling to represent one set of numbers or another, or the adoption of state and national standard. We need to think seriously about the context in which all this is going on and it really is a political set of questions."

“How do you know that technology works?” asked Bracey. “Because children say ‘we don’t want to go to lunch.’ Now every teacher knows that lunch and P.E. are the two most important things. The other way that you know that it works is that the children lead you to learning.”

The Public Image of Technology in Education

Merle Marsh mentioned a recent *Atlantic Monthly* article (“Computer Delusions” by Todd Oppenheimer) that criticized the money now being spent on technology and responded that she believes educators “have failed to fit technology tools into the curriculum. I always use the phrase ‘we do cut and paste with technology’ or ‘a little dab will do you.’ Try to fit it in with what we always have done.” The bad press about technology in education should make us rethink the goals of technology and how schools can use it to make necessary changes.

“Why do we keep letting people who know nothing about education define for the public what it is that we are doing?” asked Bonnie Bracey. “Todd Oppenheimer and Clifford Stoll are giving the public their opinion and they are not in education.”

“Education is a very closed society,” noted Gail Lovely. “Teachers don’t know what is going on across the hall, down the hall, next door, let alone in other schools. The good teachers are so busy being good teachers, they are not doing PR and marketing and letting people know what is good and what is happening.” The other reason she notes for bad press about new technologies in education is that often the message is portrayed as “what we used to do is not very good.” If people are talking about new technologies changing the ways schools function, people think back to their own education and resent anyone saying their “school was not good, so therefore they are not what they could have been.”

“Our Grades 6, 7, and 8 students have social studies completely in the computer labs,” added Marsh.

In 6th grade social studies, we don’t have a textbook. They use Digital Chisel and learn ancient history using the technology. They are very excited about this. They will tell you that it is their favorite subject, and how many 6th graders would ever tell you social studies is their favorite subject? When I decided that we should do this, I was asked by some parents about not using textbook. They worried over the change at first, but not as worried, I think, as they would have been had it been mathematics or reading. It was easier to understand how we could use technology and telecommunications in social studies. The attitude seemed to be that social studies was not considered as much of a basic subject as math and reading. Therefore, I think, we can try something new, for parents want computers in education, but they are not exactly sure they want the system to change. That is what we have to think about if we want to move forward.

“Oppenheimer is not having the impact in the public that people think,” commented Bob Pearlman. “Right now the public surveys are profound. People want to put computers into schools. Every state in the country over the next couple of years ought to be able to propose multi-million dollars investments for computers in schools without any problem and win, about half of them have already and they have it in the pipeline.” The public may not understand how technology will change education or schooling, but they believe in it. This is an opportunity for schools to step up to the plate, enjoying the positive public opinion, and use the tools to impact learning.

Continuing Challenges, New Tools

The Impact of the Internet

“The only thing that seems to be changing, as far as I can see, is the use of the Internet,” noted Bonnie Bracey. “If that is the change, and that is going to do something, then what do we as educators do and how do we encourage it? And where do we move ahead?”

“Just as none of us foresaw the collapse of the Soviet Union, none of us foresaw the advent of the World Wide Web at the end of 1993 with the advent of the [Mosaic] Internet browser,” noted Bob Pearlman. “Up until 1995, the Internet meant nothing. You know some executive made a good point when he said ‘if anything, the Internet has been under-hyped.’” He went on to describe the significance of these developments. “So the question is, if technology is leading to some kind of productivity gains in business and industry why is it happening? And I would pose that it is happening because of gains in communications.” In other words, “people are able to talk together with each other more and work with each other more and better,” he continued.

Now how does that translate into schools? What does that mean about kids? Kids working with adults. Adults working with adults. Teachers collaborating across school districts. Digital Chisel is one of the newer, more advanced, tools in which people can do their work; Teachers and kids can do their work and can share their work meaning. They can share it and therefore get reflection, learn better, and use other people’s things. Now that is a very similar kind of thing as to what happened in industry.

“I think part of what has changed with the Internet is that we are now having to re-think what paradigm are we are really in and what is emerging,” mentioned Ted Kahn. “To think about these things is to re-think what it means to be a part of the learning community, or of many of them, as opposed to what it means to be a single individual learner or student.” The Internet has driven many discussions about life long learning and about the roles that people in the system might play. “We typically separate the people who are viewed as professional content creators or providers ad distinct from those who are content recipients or users; this translates directly into ‘teachers’ vs. ‘students.’ We are in the middle of a paradigm shift in which these roles are becoming increasingly blurred and we have not thought enough about the policy implications for this shift,” he proposed. “In a year-long conversation on learning, sponsored by the Institute for the New California, we concluded that the Internet and new learning technologies enable everyone to potentially become a provider, payer, learner and policy makers, sometimes all simultaneously.”

Dan Kinnaman gave an example of how the Internet breaks down traditional bureaucracy. There are tremendous efforts put into producing reports that have been published from different foundations and council, but “I think to a large extent what matters today are not the generation of reports like that develop within a bureaucracy. What really matters is that two guys in Alabama, who have a lot of squirrels around them, can without commission and without funding, create a newsletter that goes to almost 100,000 people now and more that a couple dozen countries.” (The web site for this on-line newsletter is <http://www.tourbus.com/>).

Authentic Learning

“Bonnie [Bracey] said lunch and recess, or lunch and P.E. are the two most important things [in a child’s school day]. I think that is a pretty serious indictment of school the event that it is that school is where you stop learning and start getting taught,” commented another. “One of the things that I think is an issue, that we simply have to address and have to get around, is that modern technology and the traditional model of schooling are incompatible.”

Ted Kahn added band as a third subject or event to the highlights of the student day. “There is something that binds all three of these together in that they are incredibly social occasions inside a school and they allow kids both to be very active and allow the production of some event.”

Arjan Schutte brought a new perspective to the subjects that student’s find most engaging. “P.E., study hall, and band, they all have in common that they are tactile. I think that is something that we are forgetting when we talk about the amazing Internet is that it is not tactile; the mouse is not a tactile device. It is a virtual device.” He mentioned some research going on at MIT Media Lab related to creating a more tactile experience with computer technology.

Dan Kinnaman told a story that shed light on why these subject are student favorites.

If you go up to kid on a soccer field and you say to a kid this morning ‘Hi, excuse me. Are you studying to be a soccer player?’ The kind of response you typically get is a ‘I am concerned for your well being look’ and then they say ‘No, I am a soccer player.’ You go up to a student in a classroom and ask ‘what is your favorite subject?’ ‘Math? OK, are you studying to be a mathematician?’ And they do give kind of a positive answer. They say ‘well, I don’t know what a mathematician is, I am just taking math.’ It is not a negative response on their part, but qualitatively it is a very, very different response than the perception that ‘I am part of a community of practitioners for soccer players’. I have always wanted the kids in my classroom, if you went up to them and said ‘Are you studying to be a mathematician,’ you are going to get that same response ‘I am a mathematician, that is why I am here, don’t you get that.’

Technology really promotes the opportunity to practice what Aristotle wrote centuries ago when he said “We learn to do things by doing the things we are learning to do.” Kinnaman continued, “Technology, all of a sudden, gives us the means in a very distributed broad way to link the acquisition and the application of knowledge.”

“Band is authentic, soccer is authentic, and authentic audiences and authentic collaboration is one of the things that came out with technology that maybe is different from traditional model,” proposed Gail Lovely. “I did some research the last couple of years as I was out doing teacher professional development and 96.7% of kids in K-5 when I asked them as they are coming back from an out of classroom experience, usually technology lab because that is what I was interested in, when you asked them what they were doing they say they were doing ‘computers.’ They know very young that the real learning happens in their classrooms, because that is where the real teacher is,” she continued. “The other side of the coin is that now we are seeing a trend changing and the K-1 population understands that they learn everywhere they are.”

Bracey returned to the student's favorite subject when relating a story where "there was teaching and learning that links in such a way that you, the teacher, are not the owner of it all. That is what makes band, and soccer, and playing, or whatever the things are neat because you can tell by yourself that you are learning." You know you are acquiring skills. "You know you can make a web page, you can see it. Alfred North Whitehead in the 1920's addressed the need for changes in basic education and the top two suggestions were 'don't teach too many subjects', and the second one was that you 'teach thoroughly.'" You can not do that if you are always changing topics and locations.

Renee Poindexter, consulting services manager at Pierian Spring Software related a story about a program called Innovations in Learning.

We had students there who were valedictorians of their class, students who dropped out of school, kids who are in home-schools, and kids who had developed their own strategies for learning and interviewed them. Pretty much across the board the peak learning experience happened in elementary school where they were treated as a whole person. They were not seen as a math student or a science student, but an evolving learner. When asked 'why that does not happen all the time,' it was amazing the insight of what these young people said. They said 'teachers are not rewarded for meeting the needs of individual learners.' And the third question was 'what would you do if you were in charge of the education reform movement,' they said 'schools should be the center of learning community, they should be open 24 hours a day, it should be a place where everybody comes to learn, and all resources are shared.'

Where do we go from here?

Sylvia Charp, Editor in Chief of *T.H.E. Journal* caused everyone to reflect when she said that the group was "continuing to say all the old things that we have been saying for years and years and years." She proposed a more detailed plan of change.

"Some of us around this room have grown very old talking about this same stuff for over twenty years and it might be very important here in this discussion to be somewhat historical," said Bob Pearlman from the Autodesk Foundation. "Except for the word Internet, most of this discussion sounded like a 1980's discussion. The implementation problems, the political problems of putting it all together, the discussion of what we are really striving for and forward discussion about what we can actually do to sort of make things click."

Merle Marsh agreed that the industry should move on and that more than just leaders in educational technology are affected by the stagnation. "When I read about awards or go to award ceremonies for teachers who are working with technology, I am hearing the same ideas and projects that were being done by winners in the Apple Computer Clubs and the Computer Learning Foundation competitions in the 1980s. Our best does not seem to be getting better." The impact of changing technology will not be realized until it is utilized to its fullest potential.

Ted Kahn noted that although "the problem in some ways has not changed over time, we have advanced a considerable amount in our understanding of how to attack it and how to deal with it." Dan Kinnaman offered other evidence. "Technologically speaking, we have a whole lot more capacity now than we had 15 years ago. Even though the conversation was

similar, we did not have the technological capacity. Today's entry level computer has 10,000 times the power and storage capacity than the computers we were buying in 1983. And certainly communications is changing the nature of distribution even more radically. So I think it is progressive in that sense."

Patrick Crispen proposed that although these discussions are new to him, "There was one thing in this conversation that did not exist in the previous conversations and that one thing could make the difference. That one thing is the Internet." The Internet is pushing the change and the discussions are on the leading edge of what might be a national movement. With the "push towards the Internet and the way that the Internet changes everything, changes us, and I think if we did get back here in five years, we would notice that a lot of things that we talked about here might have actually started getting rolled into place."

"One of the differences is there is a great public ground swell looking at education - education is a real issue," added Bonnie Bracey. She submitted the vouchers, the charter schools, the home schooling numbers and the emphasis on public education as evidence of this attention. "Some people change because they see the light, others change because they feel the heat. This an opportunity that has not been around before and we really do have the attention and the interest of the public to change."

Warren Buckleitner suggested that technology will continue to develop a break-neck pace and that this will affect schools. "I think the question is not if we will use technology well in learning. It will happen someday. The real question is when and how many ulcers we all get along the way?" How bumpy is the road going to be and what can be done to make the road smoother? And when will it will be? In our lifetime, our children's lifetime, or in the next five years? "It will eventually happen because software is evolving, the Internet is evolving. The next five years are going to be incredibly exciting to watch. Just to sit back and just watch, but hopefully we are not sitting back and watching. The great promise for education is that parents love their kids."