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PROFESSOR SEYMOUR PAPERT, CHAIRMAN

Well, thank you for coming, this is going to be – I think that window into US policies is frightening our panellists because they – policy sounds like too big a word. What we were doing with this little session was taking advantage of the fact that there are four anyway and a few more people who have done exceptionally interesting things in the United States in relation to computers and education and the idea was to use this as an opportunity to hear a few words from those you haven't heard from already. You have heard from me and you've heard from John Gage. I will ask the others to say – needn't make a big speech, 10 minutes or so and then to have a discussion on whatever questions you like to raise. So I'd like to introduce the people you haven't met.

You have met John Gage this morning and Bette Manchester here and Susan Gendron at the end are from Maine and you have heard more than once about the great events in Maine which has taken the lead in the world in a state-wide decision to adopt computers for all post-elementary students, so far in all the middle schools, 7th and 8th grade. Bette Manchester, who has a long and distinguished career as an educator in Maine – she has been a teacher, she has been a principal and most recently she has been the person who has done the magic in working with the schools and the teachers in this laptop project. She will talk to you about that.

At the other end, Sue Gendron is the commissioner, that's the person who is the head of education, the education department in the State, and she came into this job just last year in the middle of the furore of getting this unique huge project adapted and I couldn't believe anyone could handle it, but wow, she did it, and she's carried on the fight in the most brilliant

way and can give us an insight into the politics and the administration at the top level of something of that sort.

Gaston Caperton complains all the time that I talk about Maine instead of West Virginia, as if I've abandoned one lover for another. When I first met Gaston, he was just through with being Governor of the State of West Virginia and if Maine is the state that has taken the leading, biggest state-wide ICT project of the 2^{0th} century, it was Gaston who was responsible for what is the biggest-based state-wide project in introducing computers into schools in West Virginia in the 1990s and maybe he'll tell us a little about that and some of his other observations. He is now in an amazingly powerful position if he is going to use it. He is the head of what's called the College Board and maybe I should leave it to him to explain what the College Board is.

So what order should we – I should say, by the way, I'm moderating this, I've talked too much in this conference already, but I'm moderating half of this and then I'm going to throw it to Carol Strohecker half way through. Who would like to go first?

GASTON CAPERTON

Seymour, first of all, you've made me feel much better because he sort of deserted me for many years. He kind of bragged about what we'd done in West Virginia about using technology and then he lives in Maine, he talked people into doing this remarkable, remarkable project. Every once in a while he'd call me, I had to go up to speak to all the superintendents in Maine and I sort of felt part of the success of Maine, a teeny, teeny part. But I've gotten so jealous because he doesn't talk about West Virginia and I'm a little bit resentful. But I'm not going to talk about technology today because that's not what I was asked to talk about.

The mission of the College Board is to connect students to college success with a focus on equity and access and I was asked today if I would talk a little bit about equity in the United States. We believe at the College Board that equity means that you give equal opportunity to

all students to succeed and we believe that college is what you have to succeed in today because in our country if you don't have a college education, a middle class lifestyle which is so important to the growth of our country and the success of our country is pretty unattainable.

There are a few things that have happened this year that I think are quite important. If I had to say what the College Board is about most, I think it's about creating possibilities and creating potential and I'd like to quote if I could John Gardiner. John Gardiner was the former secretary of education in the United States and a thoughtful and a powerful man in our country. He said, "If one is leading, teaching, dealing with young people or involved in any other activity that involves influencing, directing, guiding, helping or nurturing, the whole tone of the relationship is conditioned in one faith in human possibilities". I think too often we in education forget that that is what we are all about, is about developing human possibilities and human potential. We get so involved in the details of what we do that we really forget that that is what it's all about, and as this year has gone on, there are about 5, 6 things that I'd like to talk about that we've been connected with that I think is important in that time.

The first is that we were very involved as an organisation providing statistical data in a Supreme Court case in which the Supreme Court against the State of Michigan said that affirmative action could include race as a criterion for choosing students to enter college, and Justice O'Connor said in her opinion about that some words which I think articulate in a beautiful way what those of us who believed it was a very important thing that the Supreme Court did. She said, "In order to cultivate a sea of leaders with legitimacies in the eyes of the citizenry, it is necessary that the path to leadership be visible, visibly open to talented and qualified individuals of every race and every ethnicity."

We have two specific functions as a College Board. The College Board was created 100 years ago originally to create a system and a test for the admissions process in colleges. In the United States as many of you know, colleges have the individual right and choice of what students they accept and the SAT is the major test that is used. We have about 3 million students – 3 million tests are given every year for the SAT, and in our process in the United

States it's not just the scores of the test, it's also the grades the students have made, it's the other activities they have been involved with, it's the application process they do, it's a comprehensive system in which the college admissions process picks the students that they admit to their college.

In the SAT this year, in the spring of 05, we will be adding writing to the SAT; and the reason we have done that is that we believe the quality of writing of our students has deteriorated significantly, and we created a National Writing Commission who came up with that conclusion. The president of the University of Texas, when I asked him if he would serve on that commission, said to me, "If you can't write, you can't think", so we believed it was quite important that we add writing to the SAT. So we do the admissions process.

The other thing that we do that is the most important thing is preparing kids to go to college. The Advanced Placement programme is a programme where students take a course in high school which is a college level course – 34 different courses, that give them credit to go to college. And this year, we have added Chinese to that programme, Chinese language and Chinese cultures. The test is being developed, thanks to the Chinese Government giving us half the money to do that. And we've done that because we believe a better understanding of cultures is critically important to us in our country, that we are – not that it's not very important but we are really too Eurocentric in the education that we give our students; they don't know much about the rest of the world.

The best way that I can explain to you what equity really means is in a programme that we have where we pick three high schools in the United States that we call inspiration awards and which we give them money and national recognition which is talked about in Parade Magazine which is the largest publication that we have in our Sunday papers across the country. And I'd like to ask you to go with me on a visit to Edinburgh North high school, Edinburgh, Texas, which is on the border of Mexico. The student body is almost 100 percent Hispanic. About 85 percent of the students are low-income students, and when we walk in the front door of that school we'll go into the library – which I did about 3 weeks ago – and I'll just describe very quickly what I found.

Twelve years ago that school was written up as a school that was not meeting standards, and the principal – who continued to be the principal – had to write to all the parents and say, "You can go to any school you want to". When I go into that library there is a wonderful string orchestra playing at the back of the library. Everybody is dressed in black, beautifully disciplined and wonderful music coming from them. The principal of the high school took me up to introduce me to a few of his students. The first student was very slight, very small, and I met his mother who couldn't speak English and his father who works on a farm pumping gas at the station at the grocery store on that farm, and this young man was not going to come to college because his parents were quite frightened for him to come into this school of 2000 students, and the principal went to the parents and talked that young man into coming to school. This fall, that young man will be going to CalTech, which is the most difficult scientific school to get into other than MIT (and I might even say that it is more so, but being here at the Media Lab today I could never say that).

The other people who were on the stage as we gave that award was a young woman going to MIT, another young man who was going to Stanford. The fourth student was a student who was at the University of Texas who went to Texas in his first year as a junior because he'd taken so many AP courses that he qualified as a Junior. That school today has 75% of it's students going to college – and that's what I mean about equity, that's what we are fighting so hard to do in our country, because it's real easy to get your most talented and good students into college, and successful students – but the society is no better than it is to bring all those students up to a standard where they can go to college, succeed in college and live a productive and good life. Thank you so much.

PROFESSOR SEYMOUR PAPERT

Well, thank you, Gaston. I'm going to ask Bette. Can we provoke you to take equity as your theme?

BETTE MANCHESTER

I'm happy to do that. It's easy to talk about equity, I think. I want to put the main conditions that existed in Maine that is probably not going to happen again for a while. One is, there was actually a surplus of money, and the Governor at that time, Angus King, decided that he would take some of that money and put it in a rainy day fund for the times that we are now having, and take another chunk of money and do something in education that could make a difference: an investment in the educational system, thinking about the economic conditions that exist in Maine; and our economic conditions include a couple of things: we have an aging population, students are – the age group 20 to 24 tend to be moving out of the State. A nd the manufacturing jobs – we have enormous job loss in that area, along with changes in our fishing, our farming and our woods, so there needed to be something done.

So Angus King had a discussion with Seymour Papert, and originally Angus King's idea was that he was going to add more computers to the classroom. So traditionally in Maine we've had one computer per classroom, and he thought the best idea was to bring it to 4 computers to a classroom – and then he had a conversation with Seymour, and Seymour told him the famous pencil story. So if you don't know it sometime it's worth hearing it from Seymour; and he began to think about one-to-one and decided that that was what he was going to do. And because he was a wildly popular governor he just threw the idea out and he said that he was going to give every 7th grade student in the State of Maine a laptop computer.

Needless to say, people went crazy. They either thought this was a brilliant idea or the dumbest idea they had ever heard, and were astounded that this man who was pretty fiscally conservative would ever come up with such a wild notion. The legislature in its wisdom, because this was an independent governor, neither a Democrat or a Republican, decided that they would select a group to study the idea for a year rather than just out and out dismiss it, so each of the – the Governor selected some folks, the Senate and the House each selected representatives to this commission, made up of 19 members. There were three educators on the commission.

The majority of the people on the commission were opposed to the project, so the 3 educators, we were sure that this was going to be an interesting exercise in study and end up probably with a recommendation of no, but we proceeded through the year, did a great deal of study; I believe that Gaston Caperton was asked to come and bring evidence from West Virginia. We talked with all the biggest researchers in the United States, we looked at our own demographics, we heard from people who were doing the forecasting for the state of Maine. We looked at what was happening, and conditions in our schools were that teachers were using computers but were not using them in the classroom unless they were classroom – for instance the tech labs where they had a number of computers. There was a unanimous report put forth to the legislature that the project should go on.

The educators of course said there are some conditions that need to be included in this and one of this is there has to be a match with the technology and with the professional development, and that is essential. So what I want to talk about is how we have rolled out this project because we both paid attention to two things: the technical network and the human network, and feel that we've given equal if not more work towards developing the human network. Maine already has an infrastructure that is quite incredible. Every one of our schools is already wired and as a part of this project they were going to become wireless. We have an extensive infrastructure system set out with the university and libraries across Maine that had Internet access for everyone, also a filter system was set up at the university and through clever work with the PUC and a person, Ray Poolen, who is sitting here today, they were able to work out a deal where the citizens now pay 5 cents a month on their phone bill to cover the cost to keep this network in place.

So that was put in place, and then through a million dollar Gates grant we were able to establish – we said, if this is about teaching and learning, this project, then who should be at the centre of the work? It should be the teachers. So with a Gates grant and we believe it's the only grant they have given in the United States, we set up a teacher leader in each one of the buildings of the project and that teacher leader was there to assist and work with the building principal and the tech co-ordinator for that school or tech support person. We also asked and this is based on the research from the University of California, Irvine, that the teacher leader not be technically current, but that this person has good classroom practices

and is collaborative in nature and that has been the key to moving things forward because this person has worked to make sure that all the efforts and the capacity building of the school are placed at the heart of the classroom.

We have continued to work in building what we call the leadership team and we consider the building principal, the teacher leader and the tech co-ordinator for each building as a leadership team and we find that that team needs ongoing work, so part of our programme has not just looked at the learning and the teaching and I'll talk about the resourcing later, but the professional development. It has been as critical to do professional development with the principals and the tech co-ordinators as it has been the classroom teachers and that has been a hallmark to our work, is to continue that effort, because there are teachers who really don't want to do this work. Once you begin to work with them, it's starting with where they are and allowing them to have staff development during the day with their colleagues around the work that they are trying to do, and so that – with that as a focus, we hired three teachers who came from the classroom, have good classroom practices, understanding of good pedagogy, who have worked with these teachers and have continued to work throughout this project.

At the same time, two or three times a year, we meet with the building principals, to talk about what is happening in their buildings, how we can support then and actually how they can work their own community of learning in their region to work with other principals. As part of our professional development we had to look at content and where do we need to start and we decided because in the United States there is a heavy emphasis on assessment, too heavy on assessment of learning and we decided with this project we were going to focus on assessment for learning and we really used the resources and from the beginning worked with a variety of teacher leaders to build in – and we hired Ann Davies from British Columbia to actually help us build in resources from the beginning around assessment for learning so that teachers would learn that these tools we were providing for them, the students and the teachers, these tools would be helpful in helping students show evidence of their learning against our Maine learning results.

Further, we organised all of the – an organisation we made up which was called the Digital Media Group and this was just a group of people who provide digital content in the State of

Maine. It includes our libraries, our museums, our archives, the historical society, public broadcasting system and this groups meets 3 or 4 times a year to look at the content that is being provided, write grants, provide for other resources.

I want to bring this all back to equity. One of the things with this project was that we really – I think this was the first time in Maine that a resource has been given to every single student and teacher across the State of Maine regardless of the income of the community or where you live. We also, with our professional development, we are able to provide the same kind of equity of resource and what we find with the project is that really bringing the technology in only magnifies the issues that exist in a school. So what we tried to do is shape the professional development to meet the needs and then where we found that people are having difficulty really have a team go in and help them sort out the issues. So we've really tried to be equitable in the way that we work with people. We've included the librarians as central to the work because they in fact are the information experts at this point in time.

So I just wanted to give you an overview of our project. We feel that yes, in some ways it has been a step into the darkness but we are seeing an incredible amount of light at the end of the tunnel. I must say that in my career as an educator I've really had trouble with top-down decisions but in this case, if the Governor hadn't decided to do this and take this bold step, I know for a fact at the educational level, people would say we don't deserve it, we need to fix our roofs first, we need to fix these other things and so each school district got to choose as to whether they wanted to participate or not and every district choose to participate. But at the same time, even our teachers' union was wary because they were so worried that if this project didn't work, the teachers would be blamed once again. And so we promised them that they could see that we have continued with the professional development and we've held to that. So that's sort of a capsule of what has been going on in the main project and our commissioner will follow with how things are expanding and what's happening at the high school level.

PROFESSOR SEYMOUR PAPERT

I guess before Sue starts, I can't resist emphasising one point that you've probably noted, that what Bette said is diametrically opposed to everything we've heard in the last couple of days from people from the European countries about teacher development or training as they call it. We don't like the word teacher training: you train tigers, but she did not teach them to use ICT or computers, she encouraged or empowered them to be leaders and to take the initiative in finding their own way to use these new tools. That is very different from the projection that seemed to be given in a lot of the presentations here, of "We've got to teach the teachers how to teach the kids with computers". Sue?

SUSAN GENDRON

That's where I appeared on the scene about a year ago, as Seymour has said, we had an incredible opportunity for not only the educators but the students, and as Seymour just mentioned, there really was an empowerment about learning in our State and you would see that evidenced with each and every student as you visited the classrooms, students were empowered, learning was personalised and we were well on our way when Governor King was turned out and left office. Fortunately for the State of Maine our new Governor embraced Governor King's vision to continue this work.

Now, as Bette also mentioned to you, the project began when we had a surplus of funds in the state and our new Governor and myself arrived on the scene when we had close to a billion dollar deficit in our funding for the State of Maine. So the challenge that has faced us is to develop a proposal that will sustain the resources, the professional development, a continuation into our high schools throughout the State of Maine, with this technology and wireless infrastructure that will allow the educators to continue the work which they have begun. We have introduced in Maine a new funding formula that will go into effect in 2006, and within that funding formula we have tried to define what are the resources that are needed to support the work of our educators in every classroom and the key theme of that funding formula is equity as well – equity, excellence to sustain our educational programme.

As we move forward, we are going to be including within that funding formula our dedicated funds for technology, dedicated funds for professional development as well as other educational resources. And based on our projections, to move this programme into our high schools. Maine has right now approximately 70,000 high school students State wide. We are projecting in order to move it into the high school it will be an initial 75 million dollar commitment to continue the empowerment of these students. You can imagine what we would be facing. We have young people in some cases who have had the resource of one-to one-technology for three years and to move them into a high school programme and go back to paper and pencil, I think there would be an uprising of our students because they have been empowered.

So we have looked at a variety of resources in our State that are available to us. We have also introduced a programme to sustain our facilities and it is called a revolving renovation fund, and these are funds that school districts can have access to for upgrading facilities and I have recommended to the Governor and the legislature that we tap into those funds to put the wireless infrastructure in every high school, and we also have vocational centres, and to provide that infrastructure in each of our high schools. And we are looking at some very creative strategies. We have built our proposal to the legislature to sustain the programme on a 300 dollar per year budget, and within that 300 dollars per year includes the hardware, it includes all of the work that Bette talks about with professional development. We know we have to have a sustaining momentum for professional development. It also provides the back-up system, all of the servers into one location, so that schools don't have to worry about how are we backing up all of the student information.

We are also introducing with the high-school programme Open Source. We debated long and hard what was the next step and we believe as John was talking earlier, that is the most appropriate and efficient way of ensuring that our students and teachers have access to that technology. Another initiative that is going to help support this work within the state is that we are designing programmes to also tap into the adults and parents of the children. With our high schools, all of the lap-tops will go home with every student. Our middle schools have the option of making a decision as to whether to send the lap-tops home with youngsters. About 60 percent of our schools presently allow that to happen. But I really believe that we

have to have the resources at the point of learning, when the student is ready to explore, to investigate and to generate solutions those resources need to be at their access at all times. So that lap-tops will go home. We also have lost 17,000 manufacturing jobs in our State in the last few years, so we are working currently with the Department of Labour and the Department of Economic Development in our State to work collaboratively to looking at our economic future. Education we all know is the heart of economic futures and so we are going to be deciding and delivering work force skill, retraining via the web and through our lap-tops for parents so there is a greater accessibility and a chance for them to interact with their children.

Now, we have had a few stumbling blocks along the way regarding the funding, we are still at the table negotiating a very creative solution and our hope and goal by the end of this week, is that we will have a contract that we will take to the Governor to begin this implementation this coming school year with all of our high school teachers throughout the State and our intent is to have comprehensive professional development for the teachers throughout the implementation, to begin with all 9th-grade students next year and then the following year the remainder of our high school students will then receive one-to-one technology. And so we are very excited by what is happening. We have conducted two studies in our State, our legislature when they endorsed the concept for a middle school programme required us to do a collaboration with the legislature and the university and the department to engage in a study where we monitored what was happening to our middle school students and we heard some comments over the last two days about the impact of technology on special education students and at-risk populations. Our research supports that as well. We are seeing improved student achievement, improved attendance, teachers report to us high levels of motivation and engagement in the classrooms and we have the Mitchell Institute within the State of Maine has also conducted an independent study of one of our programmes that has one-to-one technology grade 6 through 12 and that study supports the same findings. So we are very excited about what we are seeing in Maine, we are seeing a transformation within our classrooms as a result of the work that our teachers are doing and the questions that students are probing and pushing. So we look forward to coming back and sharing with you what our results will be in the coming years. Thank you.

JOHN GAGE

Well, I was listening this morning to the Secretary of Education from Britain and he asserted that a year or 6 months advance was seen to be the result of the introduction of technology but then he would say it was spottily introduced and I felt it hard to determine where he felt there had been an investment in technology and where there had not been. So, since you have done a comprehensive introduction then you have a way to measure in a way, you can compare. The 7th graders started when, two years ago?

BETTE MANCHESTER

Some started 3 years ago because we started with some regional demonstrations first.

JOHN GAGE

But the uniformity of it began two years ago?

BETTE MANCHESTER

Right.

JOHN GAGE

So the 7th graders moved to 8th grade; the next set of 7th graders, everyone had a lap-top?

BETTE MANCHESTER

Right.

JOHN GAGE

And that has continued, they moved to 8th grade, they moved to 9th grade so now that comprehensive class is now in the first year of high school?

BETTE MANCHESTER

Yes, they will be next year.

JOHN GAGE

They are just finishing their – so next year they enter high school, I see.

BETTE MANCHESTER

Right.

JOHN GAGE

I see, so that is how they – so in measuring the difference, how did you go about measuring it and what were the results? As I understood what you said, you said in special education you could demonstrably see changes, but what about this cohort of the 7th graders?

SUSAN GENDRON

Because it's only been one year, we only have one year of data. We actually do a state-wide evaluation of students in 8th grade, so we have begun to collect that data, but within the study, the researchers collected writing samples that we could compare to the state assessments. We also collected data from our special education teachers, looking pre- and post-testing of where those students were performing and what they have found is that that particular

population made larger gains than they had in previous quarters of their schooling and so – it's preliminary but we – both the Mitchell study as well as the university study have supported that they are making larger gains. It's hard to quantify at this point because we only have one year of data but what we are truly seeing in the anecdotal data that we have collected over a period of visits to similar schools was documentation from teachers about increased engagement, higher level of attendance, fewer documented discipline issues within the schools, all of those things have declined over prior years – over the prior year.

BETTE MANCHESTER

I'd like to add something else to that, one of the purposes for the teacher leader is to give the State feedback about how the work is going in their building, so we hear from both the building principals, the teacher leader and the tech co-ordinator and the feedback, and we've just finished two weeks of rounds of meeting face-to-face with their leadership teams - was that in all schools people said they just could never go back to working the way they worked before and we had numbers of teachers and principals that told us from the beginning that they really weren't sure this was a good idea and were really reluctant learners. I've worked in Maine education for 36 years and some of the teachers that I started teaching with were involved and they thought we were crazy and then 3 or 4 months into it they said it was clearly one of the best things for equity in the State of Maine. That's anecdotal, we know that, we also have been just funded with a federal grant to look specifically at our math and professional development and that will be a 3-year in-depth look at mathematics and professional development.

JOHN GAGE

So this cuts across rich and poor, rural/urban, all racial categories?

BETTE MANCHESTER

Yes.

JOHN GAGE

So that there is a feeling that there is a universal space, a way to assess over some time, and this has always been the hard part, measuring this differential deployment. I think when I put that in November when we had 210,000 kids all respond, we are going to shoot for I think 2 or 3 million kids in the fall, across all states so the kids will answer not only questions about the technology but if you made a simple classification of schools in the United States, there are the jail schools that kids go to and more or less pass their time in and that's it, there are the schools that prepare you for a life in a factory in which the bell rings and you move to the next room and those are not very flexible at all, and then generally the richer schools where there are all sorts of other things going on and experimentation.

The ones that are the more or less holding cell schools tend to have, just by anecdotal evidence, the textbooks that were written 20 years ago and nothing is new, but we don't know very much, so the thought was we put up the national survey and people do something as simple as, "Open your textbook if you have one".

I think about the Washington DC schools that would bring the textbooks for the school year about a month and a half after school started, as I recall the stories, because it was a deeply corrupt school system and people were stealing the money in Washington D.C. Now I begin to get a feeling from a large number of people, is there an electric power outlet in the room or is there a book in your set of textbooks dated 1955 that discusses the Soviet Union or what are the components that make up the infrastructure inside the school? We began to think of other questions we might ask that would perhaps get to other issues about what goes on in schools from the point of view of the students so I begin to think we can combine together in this kind of way of acquiring data that gives us several – you can never make sense out of these complicated systems until you are there – but the more points of view into the school that we have perhaps the better understanding we can develop.

GASTON CAPERTON

John, let me talk a little bit about what we did in West Virginia because it's a different story but interesting– I became Governor there in 1989 and we decided we'd just start in kindergarten, so we had a basic skills programme on reading, writing and math and every year we started in kindergarten the first year. We put a third of our money into training teachers, we would not put any computers in the classroom – we didn't have labs, we had them in the classroom – we didn't put them in the classroom until we trained teachers. The second year we went to the first grade and we went all the way through the 12 years. I was there for 8 years so when I left they were through to 8th grade and they went to the 12th grade. The significant thing is, we used to say, "Thank God for Mississippi," which was the worst state in our country. We said that because when they were 50th we would be 49th.

When we finished that programme we went from 49th up to the top half, which is a pretty good move to make – 25 places. So it proved to really work and it continues to work, it continues to have full funding. There has been a change – when I left a Republican took my place and that person – a Democrat took his place, and the budget has never been diminished that we had, it has actually been increased for that technology. And what is the most important part about it is, you can only change an education system – because the power of the bureaucracy – you've got to infect it, you've got to do something that will make a change and that's the reason we put the technology – it's like giving somebody a shot, it changes.

The parents recognise that their child knows how to use technology, it is important. Teachers have to teach – different kids learn differently and it just totally changes. The hardest thing in the world is to get things to change and so the technology is a tremendous way to get things clicking and moving. And also John, I will say there is a lot that discourages you about what is going on in our schools in the United States but when you go to this school that I was telling you about in the southernmost part of Texas, and you see – you go into an advanced placement physics class in which you have 18 kids that are all geeks – and I say that in the most positive way I can – all geeks and they are all Hispanic, they are all first generation – some of them – almost to go to high school, certainly first generation to go to college and

they are going to places like MIT and CalTech and wonderful schools, it tells you the intellect is there, the capacity is there, it's about believing that these kids can learn.

This principal in that school and every teacher in that school believes that every kid is going to go to college and succeed, that's just a part of what it is, so we've got some great schools that are doing great things that you wouldn't think they would be able to do it, so – we've done this for 3 years now, so I've been to about 9 schools across the country that are doing that. So I really believe that with great leadership and belief in these kids you can really do quite remarkable things.

QUESTION FROM AUDIENCE

So do you think we should drop the technology staff? You seem to do so well without it?

GASTON CAPERTON

No, let me just give you an example of that school I was talking about in Texas, there is a lot of technology in that school and the teachers are so compelled to do it, they are all figuring out how to do it and – now, every kid didn't have a computer – I think every kid should have a computer. I think Maine is exactly right, but you know, it's quite amazing what you see people – teachers who really care about it, how they get kids involved and there are plenty – in that school there are a lot of computers to use.

JOHN GAGE

Well, do we agree with Seymour's assertion that you are diametrically opposed in the Maine experiment to what we've heard about that is going on in Europe?

BETTE MANCHESTER

I guess I was surprised over the last two days in terms of thinking that incremental change is the way to go and–I think that making a change that is as dramatic as we did is worth it because you have to do something that brings about some dissonance in a school. In fact, you've also got to be there and prepared to give the support, because it is a matter of pressure and support and the pressure was having this introduced. I think our biggest challenge, and where we worry about some of the schools, is where the leadership team is weak – and that's where we have to put even more energy in looking for ways in which we can really engage the principal in what needs to happen in the school, and that's an ongoing challenge for us.

QUESTION FROM AUDIENCE

I think putting that emphasis on the principal, the principal isn't the person who is doing anything with the computer, so the principal is not the one who is being taught how to use the computer for teaching. The principal is being – I would say you liberate the principal to liberate the teachers to following their teaching instincts.

BETTE MANCHESTER

Right, you hope so, but in some cases we've had principals who have decided that the teachers couldn't go to the professional development, even though the State is paying for it and the subs are there, just for a matter of you know, those kind of things. So in fact they do – you would think you are liberating but in some cases, you'll have people make decisions that you wonder, "Why would you make those decisions?"

SUSAN GENDRON

I would also add, Bette, that one of the other key pieces in that is the teacher leader within the building, so partnerships – so you have someone who is modelling, coaching, along with the principal. And one of the things that Bette and her team will do when we bump up against a

principal who hasn't been liberated, that's where a team with tender loving care goes in, meets with the superintendent, meets with the principal and tries to get other folks on board to generate that leadership.

CAROL STROHECKER

I'd like to continue to ask the panel to chime in as they like but also to invite any questions from the audience if anyone has any, or comments.

QUESTION FROM AUDIENCE

I had two questions, one is what would spring to mind as a reason not to do all this and give computers to kids is that they will break them all and I wondered if you had any statistics on – did you have a high level of damage or problems and the other one is, what was the – you talked about the response of the legislature, what about the general population, did they think this was an insane idea? Was there public resistance to it?

BETTE MANCHESTER

Oh, insane, in fact a number of parents thought this was a dumb idea and said just that. In fact, it was really sad as a middle school principal, it was sad to see that people didn't have faith in kids and that their level of responsibility could be that low. So we had numbers of parents who were opposed to this, plus the general public and what we found, one of the strategies was to have principals immediately get parents into the school so that there were parent meetings held all over and principals reporting 98 to 100 percent participation because parents were really worried about this and saw it as a resource and the most worry was in the poorest communities who thought the kids would not take care of this and what happened is over the course of the two years we've had just about I would say close to 100 percent, 95 percent support from parents. And it turned around because when you see what the students are doing then you begin to understand.

The same thing has happened with our legislators, it's the legislators who have not come to visit their school that still think this is not a very good idea. Once people come, they have been generally very supportive. The same thing is true with the press, the press went at this thinking this was not a very good idea and spent lots and lots of time in school and we have had just unbelievable press over the years. But that was definitely pretty much the norm.

SUSAN GENDRON

We also recently held a public hearing to allow for testimony, as we were moving forward. We had one voice in opposition and it was in quasi-opposition, concerned about funding and programmes for the elderly, other conversations that were happening. All the testimony was in favour of the programme moving forward.

QUESTION FROM AUDIENCE

I would like to hear John Gage's opinion about assessing the result of computer-supported education. I'm from Hungary, from Budapest University and our major effort is now focussing on showing the teachers what exactly to expect apart from better learning results. You should expect better skills, different attitudes, motivation, things that PISA or IEA never measures. So when we want to convince the teachers to wish to work much more and have gadgets that kids may definitely break, we have to know what to measure and we I think have to have a whole different attitude towards that thing. So I would like to hear what you have to say about that.

JOHN GAGE

Well, there is a question to me about measuring and I don't know the – my experience in this has been precisely the same as Bette's. In this project to link all the schools, the greatest opposition came from the schools. In fact there were three huge problems which were presented. The first, I thought it would be simple, well, I'm naïve when it comes to the school system. It turned out that the California schools first would love to do this to link the

schools and have people work in the schools to fix the schools but the unions were completely against it. Now, luckily I'd gone to the unions and said, "You are all parents and you do have these contracts that say unions get paid, so you have contract clauses that say you can't volunteer."

So I asked the union would they waive those contract clauses. In the State of California there are 13,000 schools, there are 1050 separate school districts, so they each have independent power to decide things and there are about 1000 separate contracts with the union, so all of those contracts have to waive this contract provision that the union people can't volunteer. So they did waive it; that removed the objection that the school cited as the reason it wouldn't work. Then they discovered that there is asbestos in all the walls of all the schools and they clearly couldn't allow people to come drill holes because the asbestos would kill the children. Otherwise, they loved the idea of putting networks in.

Well, it turned out that the California laws forces, requires schools to have maps of the schools that show where the asbestos is, so I could say to the school, "Of course you obey the law, don't you, with your map of where it is?" So that ended up – they trumped that issue. The third one was the issue of there's no insurance. It turned out that of course there is insurance, people come to play soccer in schools at the weekend. So the pattern is exactly as you describe, people who have no experience in this come up with any possible excuse they can, not to do anything. So you have to be prepared for this. You'll never be prepared because they will dream up something completely crazy. You've gone through many hearings on this I'm sure.

Now, to assess the impact at the end of doing it, my view is once the schools are on the net, then their demonstration of using this will be the presence of e-mail flowing back and forth. They will publish the school websites. Well, I'm happy to report that almost every school now has a school website that talks about all these things, kids are writing newspapers on this, so at least we have overcome that very first obstacle that was always being presented as being something impossible. Now, the deeper assessments about impact on whether or not the children see a future that is a different future than they might otherwise have seen, that was much tougher and I think – that's why I'm enthusiastic about this, ask students to talk

about it themselves because only – well, for the press, unless you have a series of individual stories about someone – I have one for example, this wiring story.

One of the poorest schools in California is in a black ghetto area in Los Angeles called Compton and in that particular school district which is very corrupt – and no money and terrible problems – an engineer who worked at, I think at Lockheed Martin, said, "I used to go to this school but I'm the only one really out of this school who's not been in jail or been shot because all my friends live in a very tough part of Los Angeles. But I, because of one teacher in my school who made me realise I could do something, I'm now a lead engineer at Lockheed Martin and I'm bringing all of my co-workers back to Compton Elementary School to wire the school." What happened after that, and these are the stories that are critically important to keep track of, the people that went back to the school, whether for the technology or the Internet or the computers didn't matter, it was the personal connection they made with the people in the school which then continues.

So that is what you measure, who keeps coming back. So actually the very process of doing the wiring which now we would do wireless, often the unions when they were enthusiastic, said, "We'll just show up and do the wiring for you for free." We said, "That's actually a very bad idea, what you want is for the little girl in the school to see her mother working in the school to do something that contributes to the future of the school." Because that's how you learn how you relate to the school, you don't have some outside force arrive, install the technology and leave – you involve the family, the parents and the community in it. And so much more important then any momentary technology change is that feeling of building community.

And I think in Europe if I can keep going on this for a second, the biggest challenge here that is really awesome and we saw it – and Brendan Tuohy was just back from Jordan this morning listening to all this going on in Jordan – I believe (and you may all fight with me about this), I believe in Europe, the demographic numbers are very clear. The summer – OECD study that says by 2025 the Islamic Muslim adherents will outnumber any other single religious group in Europe, 2025, so that's 20 years from now, that's a very interesting transition. So for the bidonvilles around Paris, for the isolated communities throughout

Europe, for all of these areas which are at the moment – someone once told me if France didn't have gun control there would be a civil war.

The feeling that there is a distinction between the Islamic population and everybody else must be overcome, school by school, neighbourhood by neighbourhood. This is really hard and so I'm hoping – I can't say I know but I'm hoping that these tools of communication and sharing will help to some degree. Clearly, there's much more to be done, but this is a critically important – in Italy the population is decreasing, Spain, we have a solid influx of migration from North Africa into all of the European countries. There are social tensions which must have some form of mediation. So Maine doesn't have this exactly I don't think but those Canadians do show up.

BETTE MANCHESTER

The study that I mentioned, Guildford Maine, is a place– small, rural a mill town – that had very low aspirations for their young people going forward, and they are a community that has had an infusion of technology that has transformed learning. I think it's six years now that the entire school has had the capability of access to technology for all their students, and in the Mitchell Institute study what we looked at were the aspirations, the cultural changes; also the study focused on the community shifts, parental changes. And it has followed these students for the last six years looking at how their learning has changed and what has happened to that community is a total transformation. The number of students going on to post secondary learning now – they take pride in their goals and so that is a study that I would reference. It is on our website at the Department of Education as well.

SUSAN GENDRON

We have another assessment going on: Dr. Anne Davies, who has been working with us on assessment for learning, actually lived in one of the schools in Washington County which is the second poorest county in the United States, and she did a study over three years of what was happening with the students there and that report will be up on the website as well. That

was really looking at what was happening in terms of student work, student community building, etc. The other aspect that I want to build on was the notion of community. One of our hopes for this project was and is about building community and collaboration, and we've begun by having students doing work in their own community, building community websites.

We have a large county that actually three states can sit inside of; their major work is potatoes and the kids built a community website that is now sponsored by the Potato Board, and they've gotten stories and information from farmers. So now we have farmers looking at the website, using the website – and so we've really tried to promote that notion of place and community in our work. Further, we are really trying to expand out to have our kids see themselves as part of a global community. It is critical – rural Maine is rural Maine but we really need to give these children the opportunity and these tools have clearly allowed us to begin to do that kind of work.

QUESTION FROM AUDIENCE

The first two days we heard about bringing about change in education as an interplay of quite a number of interdependent factors. It was claimed here that it's not only infrastructure but that you need adaptations in the curriculum, more autonomy maybe for schools, changes in the assessment systems which also require quite a lot of investments next to staff development etc. What are your observations about how to handle all these complexities, for instance curriculum change, creating a common vision at the supra-school level and within the schools? Maybe hear some thoughts about this?

SUSAN GENDRON

We are beginning to see some changes in the curriculum. Bette mentioned we have established Maine learning results and that provides a framework for standards but each local school system in our state then designs the curriculum and the implementation within their

classrooms. Along with that, we have identified our standards in a way that look at grade spans, recognising the differences in brain development and child development so that we ask our schools to develop their curriculum in a way that allows for recognition of various learning styles and those developmental stages. We also do not believe in a high-stakes test in Maine for exit criteria.

We believe that in order to assess students you need to look at multiple measures, there needs to be a variety of ways of assessing students' learning, and so each of our school systems designs a local assessment system to then certify that a student has met Maine's learning results and their diploma will be issued beginning in 2008 with a certification which in all likelihood will look more like a portfolio, evidence of learning over time of the standards that we have established and as a result of that, the conversations when we were talking about earlier assessment for learning, the practice that we are trying to build within our schools is reflective conversations with teachers to then look at the learning environment for our students, how do they modify their instruction to facilitate the students' learning and generate different types of environments for our children. So those kinds of conversations are ongoing right now and over the course of the next several years, I believe we are going to see greater reforms and changes within our classrooms as a result of this work.

PROFESSOR SEYMOUR PAPERT

I'd like to add to that, an aspect of Maine that might not be evident to everybody who - Maine is the place where I think we're gong to see the most important developments come out of the use of ICT because it is probably the place where there is the least degree of central control. It's the least Soviet-like, to use the analogy. So, actually there isn't any state-wide curriculum, schools can individually decide, so we have an opportunity that we are already seeing of teachers making decisions, different decisions. I believe as a Darwinian and as a believer in an enterprise economy that this is the way that we'll see real innovation come about, not because somebody has decided this is the right curriculum but because we have a free enterprise system where, under tight control – you have to be very close to the parents – the parents have a lot of influence and you can't get away with very much, but you can do innovation and that's happening all over the state. We are beginning to see it already so I

think you should keep your eyes on Maine from that point of view. And again I think it's – it's another aspect that is pretty diametrically opposed to some of the considerations that have come up in these discussions that we've had in the last couple of days. People are concerned with what's the right way to do it, what's the right curriculum and how will we measure it. That's not – that's much more Soviet than free-enterprise and democratic.

GASTON CAPERTON

Let me give you one national perspective which I think will be interesting for you. The advanced placement programme is the most rigourous programme taught across the country in the United States in which there is a national examination given, so you have some sense of what a kid is doing and what a kid is doing in West Virginia as well as Maine or New York or California. The number of kids participating in that programme have increased about 71 percent in the last 5 years but among minority students, low income students, it's increased about 119 percent so what we are finding out is that we can get a lot of what people considered kids who weren't going to qualify and be successful in those programmes into those programmes, and we are teaching with what we call a pre-AP programme where we go down – the calculus teacher goes down and starts talking to the junior high teacher that's teaching algebra in 9th grade, so that they build that competency up. So we are seeing that programme being extremely successful across the country and bringing really excellence and diversity into the system.

BETTE MANCHESTER

We are looking to add some of that content to our work, particularly in schools where teachers are struggling with content that they need. So we'll be looking at that. We have a high school initiative that has been thought out in terms of bold ideas about restructuring and reforming high school but it's based on personalisation, rigour – and I can't remember the third one. But that's sort of a guide for people, it isn't a set of rules but it's a guide as you think about how to move and reshape the learning for the students in this 21st century. So as part of our project we are trying to treat anyone and everyone as a learner, we are learning together. And part of the struggle working with the principal has been how does the principal

help shape the work in the school and not present barriers or help remove those barriers. But seeing this as we are all learning because we are living in a very different age where there aren't rules.

JAMES BOSCO

I had earlier expressed an interest to stay in Ireland but as of yet, Media Lab Europe has not made me an offer so I'm probably going to have to go back home to Michigan, and in view of that I think I should indicate that Michigan also has a state-wide one-to-one wireless initiative underway. It would be the largest state in the United States to move in that direction. Our programme has been severely affected by the economic conditions. It's very difficult even for those of us who are very supportive of this to see when we are cutting teaching staff, cutting everything to the bone to explain how we can move in this new direction. So our effort is quite problematic. A couple of quick points though, what we found, we are in an early stage of this, but the issue of breakage and theft of computers in Michigan, it's not an issue.

I know that's the same experience in Maine and other places. It seems like it should be a big problem, it turns out not to be a problem at all. The other point I wanted to make, the thing up there, the sign, the display up there says US policies. We are talking about state policies. It is my own sense that our own federal policy flies right in the face of this and provides no positive help to us, those of us trying to move in this direction. As a matter of fact, what I've said in some instances, if you really want to do what makes most sense in terms of the current federal policy for education and ICT, don't buy one computer, what you need to do is invest your money into programmes that teach kids how to take tests. Those programmes really do make a difference.

School districts in the United States were having kids learn how to take tests show substantial improvements in their achievement testing which is the coin of the realm at the present time certainly as far as federal policy goes. So we are in a situation where states like Maine are trying to move in an adventurous direction and West Virginia and other school districts are finding it I believe flying in the face of federal policy. The approach at the federal level in

the United States is a very, very raw, market economy kind of approach: give test scores, let people know what the test scores are and the market will control it, and they will force bad schools out of business and the good schools will somehow develop. It's a – that is the policy and it is not, I don't think – certainly it has not been conducive to what we are trying to do in Michigan, to move in this direction, and I dare say it hasn't been helpful to others in other states as well.

PROFESSOR SEYMOUR PAPERT

There is conflict in the United States, everybody knows that our federal policies are highly negative from any reasonable educational point of view. This project in Maine is not unique except it was the first to do this on a large scale. But it's been fairly widely followed, there are several school districts that are almost as big as Maine in terms of numbers of students that are doing it. I'm told by somebody who has collected this kind of data, but I believe this is probably closely true – that approximately half of the educational authorities in the country are doing something. Either they have got a pilot study or they have a big school district or they have got a commission studying the one-to-one question. So the one-to-one question is very much in the air all over the United States.

BETTE MANCHESTER

And of course in other countries.

PROFESSOR SEYMOUR PAPERT

And of course in Canada it's in the air and of course the leader in terms of the biggest one at the moment is not in Michigan but France. Bouches du Rhone, the area around Marseilles, is – has I believe just rolled out 27,000 computers in the school year and is planning similar numbers in the next few years. And it's all over the place. It seems to me that the references that we had to the one-to-one debate, that energy is being spent already on, is just silly. It's coming. Even the crudest sort of statistics – in 1973, we had approximately several thousand

computers to a student, in 1983 you had 125 computers to a student, 1983 we had 15 computers to a student, in 2003 we've got 4 computers to a student nationally. I think you don't have to be a wizard at mathematics to predict that it's coming and it's astonishing that serious people seem to consider that we should debate whether it's a good thing or a bad thing, it's coming and what we should be talking about is how to make it work and how to get out of it the best possible results. Let's not spend time discussing is it proven that it's good or bad or – I'm sorry, I'm getting carried away.

CAROL STROHECKER

Okay, one question over here.

QUESTION FROM AUDIENCE

You seem to be very much promoting one lap-top per student and what I want to know is what is a day in the life of a 7th or 8th grader in Maine, like, what exactly are they doing with the technology – a day in the life of a student.

BETTE MANCHESTER

What's the day like?

QUESTION FROM AUDIENCE

No, a day in the life, take a snapshot of what a day is like with the students in Maine, the 7th or 8th grade, what are they doing with the technology?

BETTE MANCHESTER

Well, it depends on the school because we have island schools that have one teacher, we have small schools with two teachers for a single class where the students would spend the day with a teacher or two. We have larger schools where students would go for maybe 80 minute periods, content by content, or we have integrated schools, we have multi-level schools so it would be hard to describe a typical day because there is so much diversity in the middle schools in Maine. But I would imagine kids have math, they have science studies.

QUESTION FROM AUDIENCE

I suppose really what I'm looking for is an indication of how the technology is supporting maths and science or a language development, how is the technology being used to support?

BETTE MANCHESTER

Well, what we try to do with our professional development is share resources and ways in which, by bringing together for instance teachers of mathematics or teachers that teach science, of helping them learn different ways that they might use the technology, for instance we have Apple computers so we chose to put Data Studio on all of our Apple computers so students are able to use that. They are also able to use probes, heat, light, temperature, etc. So part of the workshop for teachers is how to use the very tools that are on their devices to support it along with resources. For instance, we have a blood research centre in Maine, in Scarborough and they have developed in a partnership with Boston Colleges virtual labs in the area of DNA and so kids can go in on the web and do these labs.

So part of it is actually working with the teachers to know what the resources are and what is available and we created a website called Mainelearns.org and that's where we have collected our resources and we are happy to share them because we feel that we needed a place so we have both resources teachers have identified, our staff development people have identified

and we continue to build that as a place for teachers to go for their resources and they know that if something appears there it's been checked out, it's been resourced.

SUSAN GENDRON

One of our colleagues, Jim Moulton is here. Jim, do you want to – he works directly with a lot of our teachers – he can also add to that.

JIM MOULTON

Just to add to it, Maine is a local control state, that means that there are local school boards have direct control and the building principal is the key deal maker, the maker or breaker. If there is an air of intellectual risk taking and authority that has been given to teachers, there can be a wide range in what is going on but fundamentally the teacher is still the teacher, that the day would be, "It's good to see you all here today, and we're going to start with journaling. I want everybody – it's going to be 12 minutes of writing, using Macjournal and when you're done I'd like them emailed to me. Remember file structure is critical, I want everybody's name and date on the file. I don't want anything called untitled coming to me, 12 minutes of writing."

"Ladies and gentlemen, we are moving on to Maths time, we are going to use the National library of virtual manipulatives out of the University of Utah. We are still wrestling with fractions and we are going to nail fractions in this building." – I would name an outlet, I would take kids directly to it, those are the kinds of things. In science, in Grade 7 in the state of Maine, cells, plant and animal cells are critical. They are at the middle level I'm assuming across Europe as well. We'll be in cells a lot, not only reading but we'll be opening up – we call it jamming on the text. We say, "Go to *Cells Alive* and play", and then we bring people back together and everybody is expected to have written down three things that they got from that site. And you would be amazed – because this sounds counterintuitive, but because we have removed the constrictions of saying, "I'm giving everybody three pages, I want you to read the whole thing and take note", we say, "Go play, wander through this" and then we

come back and ask for the three things – we go around in a quick round robin and boom, there are two kinds of cells, animal and plant.

That comes up a couple of times, so those kids will never forget – they will mention mitosis, etc., etc. We go on English Language Arts, etc. It's still school. The three most important words that we begin – staff development, close and focus. Ladies and gentlemen, in a lap-top environment, close and focus. I want everybody's eyes up front, the machine, it is an addictive medium, if it is not there, we are not losing children, we use it to pull people together. The wireless component of it, they talk, they interact, they go into groupings as needed, but it's school.

JOHN GAGE

So Jim, if I'm in Hungary or if I'm in Laos, can I find what you just said on the Mainelearns website, is there some guide there that I could turn to?

JIM MOULTON

The two pieces that we have found, John, that when technology comes there are two components, engagement and rigour. You will find stories, we tried to write them and what we call – and I don't know if this will translate to Europe but I bet it will – Reader's Digest language. We take stories from the field, real school that begin with, "Imagine my surprise" – these are the words of real teachers - "Imagine my surprise when I assigned *A Christmas Carol* as the book we were going to read. There weren't enough copies in the school. It's available in full text. All my kids have it on their lap-tops, they all carry it everywhere they go." Kids are reading Dickens in the hallway in groups, while waiting for the bus, etc.

BETTE MANCHESTER

We also need to mention we have tools – we are working in universal designs where any student who can't read the text can turn it onto text and hear it.

JIM MOULTON

So all of those pieces, we collect stories, we – you will not find – good, innovative, creative, transformative, educational opportunities happen when great technology meets great pedagogy. That's when the good stuff happens. You'll also find the George Lucas Educational Foundation has highlighted two if not three projects from the state of Maine, King Middle School and the Maine Lakes Conservancy Institute – if you know George Lucas, GLEF, that's it. One-to-one, and then real projects, is when the magic begins to happen and you will find those stories in a growing number. The Apple Learning Interchange as well is another place that we put it – but that's exactly where we are working, to put more and more out.

QUESTION FROM AUDIENCE

Could you just clarify, in order to implement the one-to-one programme in Maine did you work within existing structures or was there a new agency or a new structure put in place? You've identified that you had lead teachers, but was it within your existing structures?

BETTE MANCHESTER

Well, we kind of turned the structures on their heads because most – and this was really hard the first year – most technology projects are led by technology people, and I don't have a technology background, and the teacher leaders for the most part don't – so part of changing the structure was doing that, and at the beginning there were some hard feelings about what were we doing because often times the technology person – even the principal – abdicated to the technology person for making the decisions. So by switching that, but also by spending time in the rooms saying we need the technology person, we need the principal, and we need the teacher leader – I think that has been the most important. Now, where we found difficulties is if that team is not working together, they are not problem solvers and it is as clear as a bell. Then you have to figure out okay, how do we have them understand or how do we coach them to change their behaviour. And part of what has helped is other teams

working effectively, being in the same room talking about what is working for them in the schools.

SUSAN GENDRON

But I think the question also is state-wide structure, that's the other piece of it.

BETTE MANCHESTER

All right, what we have set up is regional integration mentors so we have people who are paid a stipend. They are only doing this part-time, they are doing their jobs, but their responsibility is to network with the schools in their region and keep us posted on what are the issues or needs of that region and they also work closely with Jim and two other staff developers so for instance, even though they may do teacher development with a group of math teachers in a region, they will also go to a particular school if the teacher leader says, "We are really struggling here, could you come to our school and spend a day?" – they will do that. What we know about our next iteration is that we really have to increase the on-the-ground people so that there is somebody in each region full-time and right now, we aren't at that level because of our middle school project.

The other piece we are doing – we are also working closely with the university. We are about to embark on teacher development centres with the university and by having a staff developer there, that person, for instance Jim, would be able to work with the university faculty and the people offering the course-work at the regional level so that we imbed some different types of technology inside the actual university because that's a huge issue for us. So we are trying to work on that structure.

SUSAN GENDRON

There's also a technical management team in place that is the backbone to making sure that the system is operational 99 percent of the day, every hour, so that we never want a student to

go without and so there is a small team that we work in partnership with. Apple, who has our contract for the state – there is a project team from Apple and then there is a project team from the department of education, and they work hand-in-hand together.

BETTE MANCHESTER

And that's critical because that vendor partnership – when they came into the partnership they had a notion of how things were going to go, and we had a notion, and we have learned together what matters so we really are a team with Apple – and so when we go out on the road for our principal, teacher leader and tech co-ordinator, the project manager who manages the contract, the devices go with us as well as the member of the Apple team, so that when issues come up all three people in the management team are there to respond and help support the programme as it moves forward and get feedback. We also have an email system that is first-class. We have help-desk, we have content areas on, first-class, to help teachers – so they have a help-desk that is on 24/7 and they can get resources there. We also have Apple-care which is a help-desk for device management end of things. But tech co-ordinators all over the state are part of that network so people just freely – and we've done a lot of problem solving just by going into our first-class mail.

SARAH FITZPATRICK

It's great to see you explicate something more than the numerical because I think quite frankly the one-to-one numeric is a little bit scary, probably, for most of us. I was lucky enough to be in Maine probably when the story was beginning and involved in some professional development in rural schools in Gardiner, Maine – but the question is, if you had to – beyond the explications you have given – if you had to identify the most pertinent cultural changes within the schools as a result of the one-to-one, what might they be? And the reason I ask is because when I visited the schools I was struck by the fact that these were just wonderful schools but wonderful schools much like those that you'd see in any country, with wonderful teachers and great children, great things happening. So if you were to identify just the cultural changes beyond the kind of values, curriculum, assessment, ICT, what might those be?

BETTE MANCHESTER

I think it's the power shift, that everyone has the same tool – and so it allows people to learn together, and that's one of the things we really emphasise from the beginning, we said to teachers, don't try and stay in front of the kids – you can't do it, don't do it. You know about the teaching learning, but it really has helped to shift to a facilitated learning as opposed to the person on the stage or whatever that saying is. So I would say it's been a power shift. Jim?

JIM MOULTON

Bette is exactly right, when teacher and student meet in the middle as learners, then for us to prepare the leaders of the future it is not enough to create a learning, we need to create learners. For too long education has moved on the supposition that it is enough to create learning, that there is a body of knowledge, but teachers and students must meet in the middle.

BETTE MANCHESTER

And what has been fun to see are people my age who actually are staying in education because they are having fun and that's what it ought to be about.
