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## **Sustaining Technology In a Discovery Learning Community**

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### **Introduction**

Difficulty integrating technology into classrooms is a well-known challenge. As early as the 1920's, radio and film were predicted to be innovations that would change the classroom. In the 1950's, it was television, in the '60s and 70's teaching machines, and from the '80's to the present, computers. Generally, the teachers who embrace technology are the rare minority, and those who don't are blamed for the break-down in implementation because they are regarded as showing, "indifference, lethargy, even antagonism, toward this revolutionary means of communication" (Tyack & Cuban 123). But the truth of the matter is "in the top-down process of advocating and implementing technology, teachers [are] rarely consulted, though it [is] mainly their job to make it work in the classroom" (Tyack & Cuban 121). Currently, with the near universal availability of the personal computer, it is hard to understand why many teachers still do not use computers in their classrooms. If the machines are installed in their rooms and the teachers receive training, how is it that computers often go unused other than to reward children for finishing schoolwork early or for good behavior?

While working with the teachers employed at The Discovery Institute, I have begun examining how and why some teachers use technology with their students while others don't, and have found that educating teachers rather than training teachers to use technology and providing the support of a community of learners seems to play a significant factor in whether a teacher will or will not use technology to enhance her or his classroom. Through further interviews and focus group observation, I expect to find that teachers who merely receive training outside a discovery learning experience and without the professional and emotional support of a community of learners will be less likely to effectively use technology in their classrooms.

### **Training vs. Education**

To explain this problem, I will first examine the difference between training and education. Even if a teacher is given a traditional training course on how to use a computer, and even if that teacher claims the experience was helpful and enjoyable, this may not result in using technology in the classroom. "[T]raining involves the honing of a person's mind so that his or her mind can be used for the purposes of someone other than that person. Training thus typically entails a radical divorce between knowledge and the self. Here knowledge is usually defined as a set of skills or a body of information designed to be put to use, to become operational, only in a context determined by someone other than the trained person" (Noble 2). Because of this, while teacher training might stem from good intentions, its results are often unproductive. Training a teacher

to perform specific tasks on a computer tends to confine rather than empower the teacher when (s)he tries to use the computer for purposes other than those (s)he has been trained to do. In this case, the teacher has no scope of how to apply these skills outside of the lesson completed during training.

In order for these skills to be more generally applicable, the teacher must be educated, not trained how to use them. A teacher must learn to use these skills within a context of solving a problem or completing a task of their design in order to remove the skills from the abstract and place them in the realm of their experience.

“When the subject matter is psychologized, that is, viewed as an out-growth of present tendencies and activities, it is easy to locate in the present some obstacle, intellectual, practical, or ethical, which can be handled more adequately if the [skill] in question be mastered. This need supplies the motive for learning... But when material is directly supplied in the form of a lesson to be learned as a lesson, the connecting links of need and aim are conspicuous for their absence” (Dewey 25)

### **Learning Communities**

My research (which will be discussed in more detail later) shows that teacher learners can more effectively transform their classrooms with support of other people who are essentially working toward common interests and goals. Within the learning community they are treated as professionals, capable of creating and building a knowledge base with which to enhance and transform their teaching strategies and classrooms. The community is a place where teachers’ ideas can be given legitimacy, thus empowering teachers to transcend the oppressive environment that often comes along with working in a bureaucratized school system. The community itself should be comprised of teachers with different experience levels and disciplines, ranging from the English teacher with two years experience to the veteran science teacher with 30 years experience. All teachers involved in the group are full participating members of the community, where the different experience levels can create an apprentice-like situation where newer teachers can learn by doing tasks with the assistance of master teachers. And while, at first glance, this may seem to be a uni-directional information exchange, it isn’t. Newer teachers will bring with them their own ideas and experiences that will vary from the old timers’ ideas and experiences, thus creating a multi-directional exchange of information that will create a continuously evolving, ever-growing, self-sustaining community of learners.

When using the learning community to educate teachers to use computers, one cannot simply sit the teacher down alone and tell her or him to use the machine. For new users or resistant users, the computer can seem threatening, overwhelming, and often adversarial. There must be a zone of comfort established, and this can be achieved by having a supportive community of learners to engage with. “Rather than asking what kinds of cognitive processes and conceptual structures are involved, [we must] ask what kinds of social engagements provide the proper context for learning to take place” (Lave & Wenger 14). In the case of learning to use technology, the learning community is essential in demystifying the tool. Teachers within the community must have a sense that there is more to the computer than merely the use and significance of it. “[T]he trans-

parency of any technology always exists with respect to some purpose and is intricately tied to the cultural practice and social organization within which the technology is meant to function: It cannot be viewed as a feature of an artifact [of the community] in itself but as a process that involves specific forms of participation, in which the technology fulfills a mediating function” (Lave & Wenger 102). Teachers must see past the computer as object and understand it as a necessary part of the culture of the learning community.

It might be useful to give a sense of this interplay by analogy to a window. A window’s invisibility is what makes it a window, that is, an object through which the world outside becomes visible. The very fact, however, that so many things can be seen through it makes the window itself highly visible, that is, very salient in a room, when compared to, say, a solid wall. Invisibility of mediating technologies is necessary for allowing focus on, and thus supporting visibility of, the subject matter. Conversely, visibility of the significance of the technology is necessary for allowing its unproblematic—invisible—use. (Lave & Wenger 103)

With this type of understanding, the computer can be used for its intended purpose, that is, enhancing knowledge production, informational exchange, and curriculum development. In addition, by effectively using the technology for tasks within the community, the teacher helps to further extend her or his membership within the community of practice, and by having others in the group who can share knowledge and assist when obstacles arise while using the technology, the teacher less frequently has the fear of the machine controlling her or him rather than the other way around. Thus, the computer can be used as it is intended, as an informational “window” to the world revolving around the education within the learning community.

### **The Discovery Institute**

In its design the Discovery Institute aims to create an environment that nurtures teacher education through the support of a learning community. In the words of its founders, The Discovery Institute began in 1987 as the Discovery “Center” when Drs. Leonard A. Ciaccio, Biology; and James W. Sanders, Teacher Education, secured a \$6,000 grant to work with 4 high school teachers in redeveloping their four different academic curricula into classroom activities, using an interdisciplinary theme that would engage their students in learning more actively. They hoped that more interesting classrooms would result in more students graduating from high school adequately prepared for college.

Today, more than 50 additional grants later, this enterprise has expanded into a 4.5 million dollar annual operation. In 2001 the City University of New York officially made it an “Institute” with a mandate to disseminate programs throughout the University. The 10 full-time and 2 half-time professional staff, 8 of them retired teachers who began as participants in the Institute’s programs, assisted by over 30 New York City master teachers and 50 College of Staten Island/CUNY faculty, and supported by 5 full time administrative assistants, implement the Institute’s projects.

All projects are integrated into a single mission: the renewal of teaching, mostly through the professional development of in-service teachers, but more recently through the redevelopment of pre-service teacher education programs and recruitment of highly qualified new teacher prospects through a “Teaching Scholar” tutoring program. All professional development efforts stress the need for teachers to turn learning over to students through a discovery approach, to integrate disparate subjects by working together on common themes, to incorporate State learning standards into all lesson plans, to attend to basic skills development, and to relate lessons to the real world of students.

However, within the above parameters, teachers are left entirely to their own creativity to design lessons and activities to use in their classrooms. This is the Discovery Institute’s fundamental philosophical principle, and the basis of its success. All professional development efforts respect teachers’ professional integrity. Discovery Institute staff never dictate to teachers. They serve only as resources. Within the State-mandated curriculum, teachers create their own curricular activities, and implement these in their own way. The Institute provides no ready-made curriculum guides or materials, and discourages teachers from using such. Experience has confirmed that an imperfect lesson personally developed by the teacher has more impact on students than a perfect lesson borrowed from an “expert”. Every teacher has to “reinvent the wheel.” The hundreds of curriculum development workshops conducted at the Institute every year all stress this principle, which results in the Institute’s signature achievement: TEACHER EMPOWERMENT.

It is because of this philosophy that the Discovery Institute expects that all teachers involved take responsibility for creating their own curriculum and taking charge of their own professional development. Everything is done through teams, or communities of teachers. There are never “professional developers” involved to tell teachers what to do. The process is implemented through a system of curriculum development teams representing each major academic subject. Teams meet weekly after school and more frequently during intensive sessions over the summer. The team members exchange ideas, discuss, critique and develop lesson plans together. Each group has a Discovery Institute “master teacher” who facilitates, but never dictates what the team is to do.

With all this in mind, the over-arching discovery learning process is the perfect environment for helping teachers to incorporate computers into their classrooms. Aside from the fact that many computer software programs make traditional rote learning more tolerable, if used properly, computers put students (and teachers) in open-ended learning situations. Computerized classrooms also force radical changes away from the traditional teaching/learning relationship: from lecturing to coaching, from whole group to individualized instruction, from silent to interactive classrooms, from all students learning the same things to different students learning different things.

### **Learning Communities as Technical Support**

As beneficial as all this is, and as enthusiastic as teachers might be about making these types of transformations in their classrooms, there is an element of resistance that is involved in this too. Resistance is “a word for the fear, dislike, hesitance most people have about turning their entire lives upside down and watching everything they have ever learned disintegrate into lies. ‘Em-

powerment' may be liberating, but it is also a lot of hard work and new responsibility to sort through one's life and rebuild according to one's own values and choices"(Lather 76). When suddenly a teacher has to redefine everything she or he knows about what it means to be a teacher, when their identity as teacher has suddenly shifted to not just teacher but learner, there is a perception that power or authority has been removed rather than supplied, and this is where the support of the learning community becomes so crucial. "Familiarity breeds contempt, but it also breeds something like affection. We get used to the chains we wear, and we miss them when removed" (Dewey 28). Without the support of a community with which to develop a new identity, teachers will go back to working in a way in which they are familiar—the way in which they were taught—*without* technology. While they may feel confined in their old ways, if they do not have strong support for the new ways they wish to embrace, most will inevitably revert to what they knew before their transformation. This is a critical aspect of why the implementation of technology will break down outside the learning community while being sustained within it.

## Research

Over the past few months I have gotten to know many of the teachers at the Discovery Institute by joining them as they work together during round table discussions and in the computer labs. Outside the curriculum groups I conduct in depth one-on-one interviews. These interviews show that the teachers who do not use computers with their students (whether they consider themselves computer beginners or computer proficient) consistently have similar reasons for not doing so, just as the teachers who do use technology have similar reasons and ways for using computers. Usually, even though the reasons for not using computers are many, they all lead to the same thing: the teachers who do not use computers with their students, while having support at the Discovery Institute, do not have community support within their own schools. They have no colleagues who can offer a greater range of uses for the computer than they may already envision. This leads to false expectations of how the computer can be used, often causing teachers to set unreachable goals that feel overwhelming and impossible, thus the teachers abandon the idea of using computers at all.

In addition, because the task of using computers seems so immense, there is a distinct level of fear that accompanies the implementation of computer assisted learning in the classroom. Any fear teachers have of losing their status as the authority and knowledge base in the classroom is magnified by the computer because suddenly, just by its interactive nature, the computer demands that teachers become learners along side their students—unless of course the computer is being used merely to aid in traditional rote learning and test preparation. To exemplify this issue, let's consider some of the most commonly lamented problems of non-computer users, and examine some of the underlying contradictions and meanings behind the perceptions teachers may have about what it means to use computers with students.

Computer availability is one of the most common problems teachers site. Teachers often complain that there are not enough computers for students to use in the classroom. The teacher then must make special arrangements to take the class to the computer lab. Two examples of this are Nadine and Fran who work at the same school. Both claim to be computer proficient, having used computers consistently to type lessons, scan images, create charts, graphs, and complex equations for more than ten years, but neither uses computers with their students:

Question: In what ways do you use computers with your students?

Nadine: “I don’t. I would be willing to do it. But there’s not enough space, and there are no rooms [computer labs] available.”

Fran: “We don’t use computers because we don’t have enough of them in the science department. We have to make arrangements to bring the students to a lab, and sometimes we just don’t have time in the curriculum for that.”

However, another teacher, Howard, works at the same school as Fran and Nadine (in the same department as Fran) and uses computers with students easily. Responding to the previous question:

Howard: “I do everything from simple lessons using multi-media [CD-ROM’s about] circuitry to using the computer with a projector to show clips of how an earthquake behaves.”

There is a contradiction here in the accessibility of computers within their school. Howard has no problem with computer availability, but Fran and Nadine do.

The problem here is not that one teacher has more computer lab privilege than the others, but rather, Howard understands that using computers with students does not necessarily mean that each student must have a computer to use. The computer is used as a tool where it isn’t necessary for students to have individual machines. For Fran and Nadine, using computers means each student must have her or his own computer station. For example:

Question: Why do you not use computers with your students?

Nadine: The students have to get ready for the regents exam, and we don’t have any real good regents prep on the computer. There’s nothing out there that’s worthwhile yet.

Question: How do you think computers should be used in the classroom?

Fran: As a learning tool to maybe do [solve] some genetics problems.

Both teachers indicate that the computer should be used for test preparation of some kind, and this type of work would traditionally be done by students individually. If computers were to be utilized in this way only, it would be impossible to conveniently accommodate all teachers and students in the school unless there were enough computers for all students to use. Yet, Howard understands that there is more to using the computer than just test preparation and questions. He uses it for motivational and illustration purposes with multi-media video demonstration, and this does not require that all students have their own machines. With a projector, this can be done using just one machine.

Another common problem cited is a lack of technical support within the schools. Let's take for example Jeffrey who uses technology at home and at the Discovery Institute but will not use it in school, and again Fran who we heard from before:

Question: How accessible are computer labs in your school?

Jeffrey: Computer labs are accessible, but they may not have tech support. So if I have a problem with a computer, I could go down in flames in the lesson.

Question: What do you think would help you begin to use computers or continue to use computers more efficiently?

Fran: Maybe if there was some software I could use, and then maybe have someone show me how to use it. Also, if they could show me what problems I might have and then how to get out of them.

Initially, it would appear that the problem here is the lack of technical support provided by the school, but underlying is this: both teachers anticipate problems with the computers before they have even begun using them in their classrooms. They consistently experiment with computers at home and around other colleagues, but while students are around they do not. To run into a problem with the computers in front of students would mean that their knowledge might be subject to scrutiny, thus demeaning their authority as teacher and knowledge conveyor. There also may be the fear of students finding information that is contrary to what the teacher is trying to teach which then challenges the credibility of the teacher.

On the other hand, Phillip, who does not consider himself computer proficient, consistently uses computers with students.

Question: How have your views about your students changed [since coming to the Discovery Institute]?

Phillip: I realized they can do more than I ever thought they could. We have this program I-movie that they can do on their laptops. I can't do it, but the kids can. It might take me three days to create something with it, but it takes them one.

Unlike Jeffrey and Fran, Phillip is not afraid of not knowing something in front of the students. The students are more computer proficient, yet this is not intimidating. Phillip understands that using the computer changes the dynamic of the traditional teacher/student dichotomy. The students may know more about the technology than he does, just as he knows more than they do about the subject matter. Together, teacher and student can explore and learn. Instead of the teacher being the knowledge conveyor, the teacher is now a coach guiding the student toward knowledge discovery and production, because while the teacher might not be a computer expert, the student needs the teacher to help decipher and critique subject matter gathered with the computer. And while the student is not an expert in the subject matter, he or she might be more adept at navigating the technology. Thus by sharing the knowledge each possesses, teacher and stu-

dent can learn from each other rather than the teacher being the center of the learning process. But this perceived disempowerment is scary, and teachers often resist it because they feel that they no longer are in charge of their lessons or even their direction and outcome. With this new teacher/student relationship also comes a great deal of uncertainty.

It is because of these things that the support of a strong learning community is so important, and it's apparent especially in the interviews with Howard and Phillip. Howard uses technology in his school even though Fran and Nadine claim it's a difficult task. Part of the reason why Howard looks at using the computer differently than they do is because he shares an office with the school technology teacher—he has someone to talk about technology with every day. Then, in Phillip's school, there is a strong emphasis on technology. Each teacher is supposed to have a website, and all the students use laptop computers. Even though Phillip has little computer experience, he is surrounded by colleagues who believe in using technology in the classroom. This gives him the constant support of his peers. Fran, Jeffrey and Nadine do not have this same support base. Of the twelve interviews I conducted (7 were non-users, 5 were users), those who used technology had consistent support of a community within their schools, and those who did not use computers did not have the support of a community within their schools. This pattern was consistent with the exception of Peter who has a strong desire to use technology with his students, but is often refused computer access, so he encourages his students to use technology on their own by giving them web addresses that correlate with all of his in class lessons. Aside from him, all of the non-users gave up on using computers with their students because it proved to be too overwhelming and unpredictable. But those who used computers, even when working under the same conditions as some of their fellow teachers, did not have any problems using the computers, and their expectations of what computers should be used for were much smaller.

## **Conclusion**

As the research continues, this question arises: will this pattern continue? Will further interviews show that teachers without a strong community of technology users usually opt not to use technology themselves just as teachers who do not have a community of discovery teachers will opt not to use discovery method themselves? Since learning to use the computer is much of a discovery process itself, a learning community is essential for successful computer integration. Teachers do not want to give up all they have known of teaching. They do not want to disrupt their identities as teachers because that can be frightening and uncertain. However, with a strong community of learners to work with, teachers can learn to transform their classrooms to include technology just as the teachers at the Discovery Institute are learning to include discovery methods. And just as knowing the format of a discovery lesson doesn't necessarily translate into discovery learning, computer training doesn't translate into using computers in the classroom--Fran, Nadine and Jeffrey illustrated that.

Technical support is crucial when trying to use technology, but in order to integrate it into the classroom, teachers need more than what an 800 number or a Microsoft office assistant can provide. While 24 hour hotlines can help solve why your computer isn't running smoothly, and an MS office assistant can offer suggestions on the proper formatting for a letter or resume, these things cannot help a teacher see beyond their own realm of experience. Neither of those types of support can suggest that a physics teacher use the computer to demonstrate how an earthquake

works, and if there isn't someone else to suggest that, it might never occur to that teacher to do it. This often prevents teachers from evolving and growing because they can't see beyond their own horizons. Thus, they miss out on a multitude of perspectives that offer a wider spectrum of possibilities than what they already have. Without the consistent support of a community, teachers are limited to their own resources when trying to make changes in their classrooms and professional lives. But with the support of a learning community, teachers come to realize that change and growth is limitless; there are always other ways of doing things.

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