

Multiple Channels of Electronic Communication for Building a Distributed Learning Community

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Abstract: The Maryland Electronic Learning Community (MELC) is part of the Baltimore Learning Community, a Challenge Grant project funded by the U.S. Department of Education. Created as a partnership between the Baltimore City Public Schools, the University of Maryland, and corporate and public sponsors, MELC was designed to investigate how an electronic learning community could be created around the development and use of a multimedia digital library for teacher-generated lesson plans and activities. In addition to audio, video, image, text, and web resources available in the library, multiple communications technologies (i.e., a community web site, email, a threaded discussion board, and distance learning laboratories) have supported collaboration and interaction among the teacher and university participants. In this paper we present a preliminary analysis of the impact of these technologies on teacher interaction and technology use. We find a substantial level of teacher communication and collaboration across media and we look for evidence that the multiple channels of interaction facilitate teacher's professional development and increasing comfort with technology.

Keywords: Chat, communication, digital libraries, learning communities, professional development, video conferencing

Background: New models of professional growth through learning communities

While most of the focus around technology in K-12 education has been on the role of computers in student learning, one of technology's most promising applications has been as a vehicle for teacher learning (OTA, 1995). Just as projects are supporting student participation in learning communities, the development of learning communities for teachers is increasingly seen as a way for teachers to learn about technology while using it to advance their teaching and professional goals. These learning communities, or "communities of practice" (Lave & Wenger, 1991), can be powerful vehicles for personal

growth and learning, settings in which knowledge is developed collaboratively based on common interests, practices, tools, discourses, and shared values, goals, and activities (Pea & Gomez, 1992; Reil and Fulton, 1999; Ruopp, et al., 1993).

The value of community for K-12 teachers is particularly powerful. Unlike most other professionals, teachers spend most of their working day isolated from their peers and colleagues. With the resources now possible through technology, this isolation can be minimized. Several projects have focused on supporting teachers in learning communities that remove limitations of time and location. (e.g., the Mathematics Learning Forums Projects (<http://www.edc.org/CCT/>); PBS Mathline (<http://www.pbs.org/teachersource/math/>); Classroom Connect, 21st Century Teachers, and the Well-Connected Educator; and LM_Net (http://ericir.syr.edu/lm_net/)). One of the most ambitious of these virtual learning communities, TAPPED IN (<http://www.tappedin.org/>), was developed as a meeting space or "community of communities" for teachers to communicate about and work on documents or projects in a shared virtual office space.

Projects like these are offering teachers new resources for learning that differ from the past models of professional development that consisted primarily of short workshops or formal coursework. Like just-in-time models of employee training in industry, learning communities offer teachers customized and flexible opportunities to learn from peers at times that are convenient for them. According to Darling-Hammond and McLaughlin (1995, as cited in Darling-Hammond, 1999)), the best models of professional development are those that are:

- Experiential, engaging teachers in concrete tasks of teaching, assessment, and observation that illuminate the processes of learning and development;
- Grounded in participants' questions, inquiry, and experimentation as well as in profession-wide research;
- Collaborative, involving a sharing of knowledge among educators;
- Connected to and derived from teachers' work with their students as well as involving examinations of subject matter and teaching methods;
- Sustained and intensive, supported by modeling, coaching, and problem solving around specific problems of practice; and
- Connected to other aspects of school change.

The Maryland Electronic Learning Community

The Maryland Electronic Learning Community (MELC) was built around this model of teacher learning. MELC is part of the larger Baltimore Learning Community (BLC) project, funded as one of the U.S. Department of Education's Technology Innovation Challenge Grants in 1995 (<http://www.learn.umd.edu/>). Created as a partnership between the Baltimore City Public Schools (BCPS), the University of Maryland (UMDd), and corporate and public sponsors, MELC was designed to create and document how an electronic learning community of teachers could be created around the development and

use of a multimedia digital library for teacher generated interactive lesson plans (Marchionini et al., 1997).

Originally MELC consisted of twelve science and social studies teachers at three middle schools in Baltimore, and equal number of faculty and graduates students from the University of Maryland, and technology leadership staff from Baltimore City Public Schools (BCPS) partnered with faculty and graduates students from the University of Maryland. Today MELC has close to forty teachers from four Baltimore middle schools, and it includes math, and language art teachers, and special education teachers. Project partners include Apple Computer, Discovery Communication, the National Archives, Maryland Public Television, and the Space Science Telescope Institute.

When the project began, most of the teachers had no computers in their classrooms and little technology expertise or exposure to technology integration in the classroom. Now in the fifth and final year of the project, each MELC classroom is equipped with at least three student machines provided by the project, one higher-end teacher machine, and two 27-inch monitors for displaying material to their classrooms. The computers are connected to a central server and all of the computers have Internet access through ISDN and T1 lines, and each teacher is given a personal email account. Software and other resources (e.g. a digital camera for each site) are also provided by the project. Just getting comfortable with the technology has been a challenge for many of the teachers. As a result, professional development has been a critical element of the project. In addition to a three-day summer institute held each year, regular after school professional development sessions have been held where the focus is on creating and sharing interactive lesson plans for classroom use. Technical support has been provided primarily by UMD graduate students (many of whom spend a day a week in the classrooms) and BCPS support staff.

Using the technology provided, the goal is to create an electronic community of teachers who create and share interactive lesson plans for use in their classrooms. To aid the creation of these lesson plans, project researchers at the University of Maryland has created a multimedia digital library of approximately 2000 educational resources, indexed by topic and correlated to national standards (Rose et al., 1998). Provided by project partners and found on the Internet, the library contains audio, video, image, text, and web resources from the Internet and project partners. The database was created around topics studied in the middle school curriculum and is enriched by over 28 hours of Discovery Communications video (e.g. *Understanding Oceans*; *The Mystery of Twins*, *The Real Ben Franklin*, and *Buffalo Soldiers*) that has been digitized, indexed, and segmented into small clips the teachers can preview and use in their lessons. Tools for exploring, searching and adding to the library have also been created. To date teachers have created 281 interactive lesson plans. 14 teachers have authored more than five lesson plans each and a few teachers have created over 20. Table 1 shows a breakdown of the various types of multimedia resources used in the lesson plans. We are currently analyzing the lesson plans in more detail and the results will be reported in Semple (in preparation).

Table 1: Use of resources within lesson plans (as of 5/99)

Resource Type	Number
Image	291
Video	118
Text	48
Web site	630
Other	21

The participating teachers are generally enthusiastic about the project, but the learning curve has been steep and slow. Just getting comfortable with the technology has been a challenge for many of the teachers. Some of this has been due to technical problems with both hardware and software. As is the case in many technology projects, a few early adopters have moved along rapidly. Following the Apple-Classroom-of-Tomorrow stages of instructional evolution (Sandholtz, et al., 1996), a few MELC teachers would be characterized as in the early stages (i.e., entry or adoption), more of the teachers are at the adaptation or appropriation level, and, only a few could be considered at the invention stage. But growth has been, for many, quite dramatic since the inception of the project. Rather than the more advanced levels of technology use (i.e., adaptation, appropriation, or invention) professional development has been a critical element of the project. In addition to a three-day summer institute held each year (which teachers attend as a condition of participating in the project, and for which they receive a small stipend), regular after school professional development sessions have been to create and share interactive lesson plans for classroom use. Three-day summer institutes (which teachers attend as a condition of participating in the project, and for which they receive a small stipend) are held each year. They bring renewed enthusiasm to the project but it has been hard to sustain that level of community during the school year when schedules are hectic. From the beginning of the project, teachers were also given email accounts for communication. However, use has been limited due, in part, to technical issues related to implementation of email accounts in the BCPS. Low usage can also be attributed to the teachers' initial comfort level with technology (many teachers had never used email, or computers for that matter) and learning-community issues (teachers needed a reason to send email to other teachers).

During the past 1998-99 school year (the fourth year of the project), a turning point seems to have been reached in terms of teachers' greater involvement with the project and comfort level with technology. We have seen evidence of more communication, more interactions among teachers, and a greater sense of community. Presumably some of this change can be attributed to time and the continuing project support. BCPS created a school-based project web site and the project server is now housed in Baltimore (originally both were housed and maintained by UMD). Presumably some of this change can be attributed to time and the continuing project support. However, observations and

interviews with teachers suggest that the creation of alternate communications venues has been an important reason for in the increased sense of community in the project. This paper deals with the impact to date found for two of these new communication channels, the development of past year a threaded discussion board (called MELChat) was created and the creation and use of four distance learning laboratories (DLLs) were built and we believe these new communication channels have contributed significantly to the increased sense of community. As evidence, one teacher commented "Over the last year I've seen the community **grow** and **expand**. I've personally become more involved with **other** individuals in the learning community at a **more interactive level** than in the past because of the addition of MELChat and the distance learning labs."

How multiple communication channels could affect community and teaching

In this paper, we focus on the community-building aspects of the BLC/MELC project. Communities and friendships tend to develop among people who communicate frequently. Kraut and Egidio (1988) have demonstrated that this proximity effect is also observed among people who communicate electronically. We believe that the synergy among **multiple** channels of communication (like MELChat and the DLLs) greatly reinforces this effect. Each channel supports further communication and interaction (both synchronous and asynchronous), which in turn supports greater use of the technology and more innovative teaching activities. In other words, there may be direct effects such as increased opportunities for discussion of teaching ideas and technical support. There may also be indirect effects such as the opportunity for the teachers to express themselves in the modality in which they feel most comfortable and providing opportunities for increased reflection by the individual teachers on their activities. Weedman (1999) reports this type of effect for email discussion groups among students in distance learning classes.

MELChat

Because teachers were not using their email accounts to communicate frequently a threaded discussion board called MELChat was added in Spring 1999. In the first six months of its existence, over 400 messages have been posted. The majority of messages are regarding project management issues (e.g., coordinating meeting schedules, suggestions). Teachers are also using MELChat to share educational resources (e.g., "I found a great web site"), request collaborations with their peers (Example 1); and ask for technical help. Teachers across schools, and even within schools, have found MELChat useful for learning about what others are doing (Example 2). There is also a high volume of "thank you" and congratulatory messages which seem to foster a greater sense of pride in the community. There is even some of the "I did it!" variety of reporting proud accomplishments (Example 3) Table 2 shows a breakdown of the messages by topic (analysis of 229 messages in first three months).

Example 1:

... my students made Public Service Announcement Posters on the Importance of Childhood Immunizations. We have been learning about viral and bacterial Infectious Diseases. They also are in the process of making PowerPoint presentations on differences between viruses and Bacteria and how these diseases are spread. We would love to do a DLL sharing activity with you and your students!

Example 2:

I work right across from you and I never have time to know what you are doing!!! Sounds like some great projects.

Example 3:

I used the Distance Lab this week and fell in love with it, so did my students. Today they asked when we could return. I used the Doc Cam to show examples of correct and incorrect ways that my six graders were to set their papers up. Then we analyzed a photo. It was great. My next experience with technology was using the digital camera. I selected a repeater to be my student of the week. Took his picture, Bill helped me with the graphic converter, and then I created a slide and posted it on the monitor for others to see. Having printed one out for him, he just marveled with pride and anxiety to show his mother. I know that everyone has been doing these things forever, but I have just got started.

Table 2: Frequency of topics in threaded discussions (as of 5/99).

Topics	Percentage
Project management	39
Request for collaboration	16
Resource sharing	13
Thanks & congratulations	12
Request for help on technology	8
Other	12

MELChat has become an important communication channel for the project. In a recent survey (8/99), 74% of the teachers claimed to access MELChat "somewhat" (5-10 times a week) or "often" (11 or more times a week). Moreover, the teachers' perception of how much MELChat contributes to the sense of community, their professional development,

and their interactions with other teachers increases with use as shown in Figure 1 which is based on 22 teacher questionnaires.

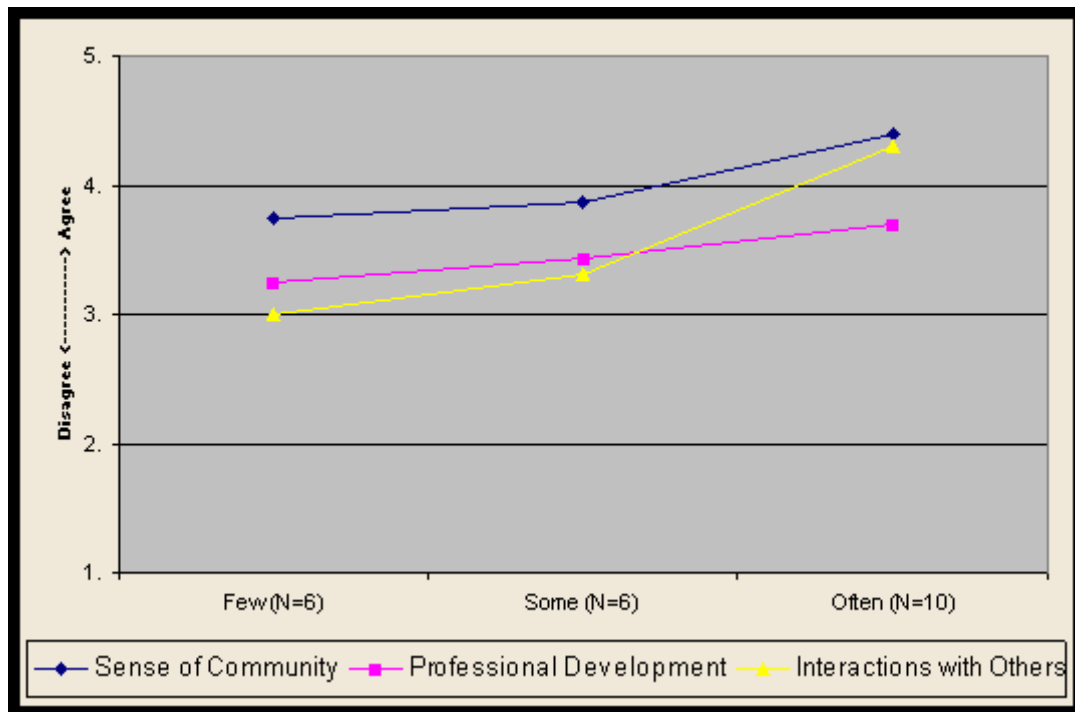


Figure 1. Perceptions of MELChat by frequency of use.

Distance Learning Laboratories (DLLs)

Distance learning laboratories, while common in business and training environments, have been applied far less frequently in education. Usually, they are used for remotely distributing lectures and for offering advanced placement or other classes for students in cases in which the limited numbers of participating students, or limited teacher availability, makes the sharing of teachers and students over a distance learning network practical (OTA, 1989). The use of distance learning for the professional development of teachers is even more limited. What is even less common, however, is the informal kind of sharing via a distance learning network that has been the format of the MELC sessions over the past semester.

In Spring 1999, three MELC schools and the BCPS Professional Development Center were interconnected via Bell Atlantic videoconferencing systems, established by the State of Maryland in several schools around the city and state (one MELC school still does not yet have a facility, but plans to complete construction by the end of the Fall 1999 semester). Each Distance Learning Laboratory (DLL) has two sets of four multiple monitors, one set at the front and one at back of the classroom, allowing simultaneous participation in and viewing of live video from any of the participating locations. Audio is provided through desktop mikes on the tables where participants sit and small clip-on microphones worn by presenters at each site. A remote control device allows switching

between various room cameras and a document camera. Computers, VCRs, document cameras, and other devices are connected to the system and allow shared viewing of information.

Starting with the Spring 1999 semester, two-hour professional development sessions were held each week after school. Prior to the creation of the DLLs, these meetings were rotated among various school locations but were never well attended (i.e., approximately 3-5 teachers came to prior sessions). Teachers reported that they were not enthusiastic about having to drive across town at the end of the school day in order to participate. In contrast, data from the Spring 1999 semester indicate that 66% of the teachers attended some or most of the weekly DLL sessions, approximately 5-10 teachers from each of the participating schools. This percentage is particularly noteworthy because, as noted above, one school does not yet have a DLL. Each week approximately 5-10 teachers from each of the participating schools attended the DLL sessions. 89% of the teachers found these sessions useful. When asked to rank community-building tools in August of 1999, teachers ranked the DLL sessions highest (89% of the teachers found these sessions useful) and MELChat came in as a close second. Face-to-face school meetings were ranked the lowest.

Once the teachers became comfortable using the DLLs they have begun to see ways they can use them for activities involving their students. For example, in order to prepare students for the Functional Reading Exam, which all BCPS students must pass in the eighth grade, one of MELC teachers offered to teach review sessions over the distance learning labs so students in other schools could also participate. Two teachers participated and felt it was a great resource that helped their students focus on the importance of the examination (Example 43).

Example 4:

Congratulations are in order to [Teacher A] and [Teacher B] for using the Distance Learning Link between Lombard and Key this morning (Monday, April 19). They prepared, coordinated and presented a meaningful lesson that should help students (at least two classes) improve scores on the Maryland Functional Reading Test. The lesson was taped on the second VCR so other classes might share in their efforts. Keep up the great work!

An even more ambitious undertaking was a two class-period lesson on the dynamics of flight, taught across three MELC schools. The idea for this collaborative lesson came up during one of the distance learning sessions, and required considerable planning and coordination which was facilitated by MELChat (Example 54).

Example 5:

To summarize our plan for the DL lab lesson on flight, we agreed on the following items:

1. Wednesday and Friday, May 19th and 21st
2. 11 AM to 12 noon

3. Lombard, FSK, and Hamilton students
4. [Teacher C], [Teacher D], and [Teacher D] will be the staff involved.
5. I will be at FSK to push the buttons as needed.
6. [Teacher C] will fax copies of the papers that need to be duplicated.
7. [Teacher C] will send [Teacher E] an electronic copy of the lesson plan for posting on the web site.

One of the teachers from the project, who did not even have students participating in the flight session but dropped in to watch anyway, said,

You know, I used to teach in the same school as [Teacher D] and I'd heard she was a fabulous teacher. I never got to visit her class, even though she was just upstairs from me. Now we teach at different schools and I finally got to see her teaching in action, thanks to the distance learning lab. I learned so much just watching her!

A growing number of nonMELC teachers from the participating schools have been attending the afterschool professional development sessions, suggesting that MELC teachers have spread the word among colleagues that it is time well spent. We hope to track this informal expansion of the community.

As with the Star Schools program (<http://www.ed.gov/EdRes/EdFed/Star.html>), benefits were also found when students used the distance learning facility. For instance, teachers reported that their students were more motivated and paid better attention when they were using the distance learning lab. Some teachers noted that bringing classes together via video caused much less confusion than bringing them together in person. For some lessons involving detailed manual work by the teacher (i.e., folding paper airplanes to test various flight designs) the document camera was particularly helpful in showing close-ups of what the teacher was doing.

66% of the teachers attended some or most of the weekly DLL sessions. This percentage is particularly noteworthy because one school does not have a DLL. The most common reasons for not attending were prior commitments and time of day

Implications and conclusionsImplications for schools

Time, distance, and a lack of shared goals and activities can form barriers to community, but the MELC project suggest one model of how. Nonetheless, in MELC we are finding evidence that technology can bridge these barriers. Still, the technology itself can present a barrier. Teachers' early frustrations with the technology made some hesitant to take the risks of trying it and then having it fail in the classroom. In the early years of the project, it often appeared that the downsides of technology outweighed the positive possibilities. But for many, it was a question of getting past a personal critical point of comfort. As one teacher said, "Now that I know how to logon, I will continue to participate actively." "An important factor has been developing a shared vision of what can be done with technology—a vision that is gradually built, shared, and nurtured in the electronic venues

of the "face to face" interactions experienced in the Distance Learning Lab and the asynchronous reflections and conversations of the MELChat.

Teachers need multiple vehicles of support if they are to work and interact as a true learning community. It is possible that many channels of communication synergize with each other and that the combination is more effective than each channel would be separately. Different people have different roles, different styles, and different goals for communication; multiple complimentary types of interaction provide channels for people with those differing characteristics. Schools are information-rich environments, and teachers have expertise that can be captured and shared in multiple ways.

Enhancing human communication by technology is likely to be a powerful tool for improving schools. It suggests that a larger goal for technology use and school reform should be an explicit focus on community building. This leads to questions such as:: Does broader participation of teachers in learning communities lead to more interest in setting up learning communities for students? Can the use of distance learning labs and other types of video interaction -- such as NetMeeting, extended discussions from chat sessions and electronic teacher's lounge, and other opportunities for communication (e.g., Bly, et al., 1993) -- extend and support the explicit growth and teacher reflection on practice? Will this be sustained after project support ends? Does broader participation of teachers in learning communities lead to more interest in setting up learning communities for students? How might does this expanded community impact students, their learning, and their valuing the idea sense of community?Conclusion

As suggested by the review of collaborative activities and communities, teachers need multiple vehicles of support if they are to work and interact as a true learning community. It is possible that many channels of communication synergize with each other and that the combination is more effective than they would be separately. Different people have different roles, different styles, and different goals for communication; multiple complimentary types of interaction provide channels for people with those differing characteristics. Schools are information-rich environments, and teachers have expertise that can be captured and shared in multiple ways. With growing comfort with technology, supported by human and electronic connections, teachers in the MELC project have shown themselves to be eager to learn more, create more, and share more. We plan to continue to monitor the ways this community evolves and the impact it has on teaching and technology use in the classroom.

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Bibliography

- Bly, S.A., Harrison, S.R., and Irwin, S. Media spaces: bringing people together in a video, audio, and computing environment. *Communications of the ACM*, Vol. 36, No. 1 (Jan. 1993), Pages 28-46
- Darling-Hammond, L., & M. W. McLaughlin. (1995). "Policies that support professional development in an era of reform." *Phi Delta Kappan* 76, 8: 597-604.
- Darling-Hammond, L. (1999). Teacher learning that supports student learning, *Edutopia*, <http://www.gleef.org/edutopia/newsletters/6.2/darling.html>
- Kraut, R. E., & Egido, C. (1988). Patterns of contact and communication in scientific research collaboration. *Proceedings of the Computer-Supported Cooperative Work*, New York: ACM, page 1-12.
- Lave J. & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge, MA: Cambridge University Press.
- Marchionini, G., Nolet, V., Williams, H., Ding, W., Beale, J., Rose, A., Gordon, A., Enmoto, E., & Harbinson, L. (1997). Content + connectivity = community: Digital resources for a learning community. In *ACM Digital Libraries*, pp. 212-220.
- Office of Technology Assessment, U.S. Congress. (1995). *Teachers and technology: Making the connection*. OTA-EHR-616 . Washington, DC: U.S. Government Printing Office. www.wws.princeton.edu/~ota/ns20/year_f.html/index.html or www.ota.nap.edu/pdf/data/1995/9541.pdf.
- Office of Technology Assessment, U.S. Congress. (1989). *Linking for Learning: Technologies for Learning at a Distance*. OTA-SET- Washington, DC: U.S. Government Printing Office. www.wws.princeton.edu/~ota/ns20/year_f.html/index.html or www.ota.nap.edu/pdf/1989/8921.pdf.
- Pea, R. D. & Gomez, L. M. (1992). Distributed multimedia learning environments: Why and How? *Interactive Learning Environments*, 2(2), 73-109.
- Reil, M., & Fulton, K. (1998). Technology in the classroom: Tools for doing things differently or doing different things. *Paper Presented at the Annual Meeting of the American Educational Research Association*, San Diego, *Phi Delta Kappan* (submitted).
- Rose, A., Ding, W., Marchionini, G., Beale, J., & Nolet, V. (1998). Building an electronic learning community: From design to implementation. In *ACM SIGCHI*, pp. 203-210.
- Ruopp, R, Gal, S. Drayton, B, & Pfister, M. (1993). *LabNet: Toward a community of practice*. Mahwah, NJ: Lawrence Erlbaum Associates.

Sandholtz, J.H., Ringstaff, C., & Dwyer, D.C. (1997). Teaching with technology: Creating student-centered classrooms. New York: Teachers College Press.

Semple, P., Rose, A., Allen, R. B., & Fulton, K. (in preparation). Modules and resources in the BLC/MELC video digital library.

Weedman, J. (1999). Conversation and community: The potential of electronic conferences for creating intellectual proximity in distributed learning environments. *Journal of the American Society of Information Science*, 50, #10, pp. 907-928.

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