

**INITIAL TRANSITIONS:
METROLINC YEAR 3 EVALUATION
(July, 1999 – June, 2000)**

A U.S. Department of Education Technology Innovation Challenge Grant

submitted to the Project by:

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Executive Summary

Now in its third year, the MetroLINC project is continuing to work strategically and making great strides in helping teachers in Boston and Watertown gain the technology skills and understanding they need to integrate technology in their classrooms. This past year, teachers from 52 different Boston schools and four Watertown schools have engaged over 5,000 students in classroom units which use technology to support their learning in language arts, science, and other subject areas.

The cohort of MetroLINC teachers in Year Three was somewhat less reliant on its veteran teachers in the two districts compared with Year Two, and engaged greater numbers of young teachers who were relatively new to the teaching profession with five years or less of teaching experience. At the same time, veteran teachers with significant technical experience continued to elect to play a role in MetroLINC, with six teachers serving as Pioneers (mentor teachers) for a second year. Thus, the MetroLINC project has encouraged both new and veteran teachers to assume greater positions of leadership in the district, both in terms of technical expertise and knowledge, and in training and mentoring other teachers.

Boston has continued to take wise advantage of local city funds for purchasing computer hardware, coupling teachers' participation in MetroLINC with an incentive program that provides teachers with up to two new computers for their classrooms. MetroLINC teachers in Boston reported a clear increase in the number of computers in their classrooms, increasing from two to four, on average. Selecting from a standard suite of software tools for word processing, multimedia presentations, visual organizers, and graphics, Boston teachers have explored new ways that these tools can be used to enhance students' reading and writing across a variety of subjects.

Watertown had fewer local funds for hardware but has leveraged its project monies to purchase specific kinds of hardware peripherals (e.g., digital cameras, scanners) and software that teachers identify as central to their proposed projects that attempt to "push the envelope" on innovative technology use in the classroom. A wide variety of exciting curriculum units were observed in Watertown classrooms, ranging from using digital

cameras to support third graders' expository writing and middle-school students' field study of the Charles River environmental science data, to the use of an Internet "grocery-shopping" web site to help middle school students see how home economics can be relevant to their own lives regarding nutrition, meal planning, and family budgeting.

Teacher collaboration continued to be identified by teachers as highly positive aspect of the MetroLINC project. MetroLINC teachers in Boston expressed the advantages of working in their design teams, whereby a Pioneer would provide support and assistance to his or her Adapters, or alternatively, members of the team would freely exchange information as "equals." MetroLINC teachers reported an increase in the frequency in which they talked with other teachers about curriculum and pedagogy. However, as in Year Two, Boston teachers voiced the distinct advantages of working closely with colleagues in their own school buildings, both to be able to receive and give support to colleagues frequently and relatively easily, and to build and strengthen a school's own in-house technical capacity and mentoring relationships. The logistical difficulties of cross-school collaboration remain somewhat daunting, and cross-building collaboration primarily occurred when there was a team of an especially dedicated Pioneer and equally committed Adapters. The three cross-district telecommunication projects, although well-intentioned and interesting in nature, met with considerable difficulties which prevented much activity as had been desired.

Not relying on the structure of design teams, teacher collaboration took another form in Watertown. There were three, joint Pioneer projects, in which a pair of teachers would work together to develop and implement a single curriculum unit utilizing technology, often co-teaching the unit together to one or more classrooms of students. The joint MetroLINC projects seemed to give the teachers the rare opportunity to collaborate closely with a colleague, and all three pairs were highly positive about the experience. In contrast, the individual teacher projects in Watertown tended to be somewhat isolated from one another, with participating teachers not actively sharing information with one another, as had been observed with Boston design teams within a school. A number of Watertown teachers relied heavily upon the Watertown MetroLINC director as a prime source of collegial support, advice, and encouragement.

Teachers viewed their own professional growth resulting from the MetroLINC as central to their use of technology: the acquisition of technology knowledge, more effective use of technology with students, and greater integration of technology in the curriculum. In addition to these areas, teachers mentioned broadening their content knowledge, increased networking with colleagues, and changes in their knowledge of curriculum standards and use of project-based instruction, and student-centered classroom environment.

About half of the teachers reported that their MetroLINC unit concerned language arts primarily, possibly influenced by the current strong district initiative in literacy in Boston. MetroLINC teachers varied widely in the duration of their MetroLINC units, ranging from units that lasted from one-to-three weeks, to ones that were used throughout

the entire school year. About half of the teachers reported using units two-to-three times per week, while another fourth reported using a unit about once a week.

Teachers identified four general areas of change in their teaching, including using technology as a teaching tool or resource; changes in pedagogical approach or curricular focus (increase use of hands-on learning and project work in science; more precise targeting of language skills and concepts for children with speech and language delays); greater use of small group work, and classroom management issues raised by the use of computers.

Regarding student learning, teachers reported an increase in a range of areas, with over half reporting “a lot” of acquired knowledge of technology skills, followed closely by increases in self esteem, and subject area knowledge. Over a third of the teachers reported increases in collaboration skills, project-based learning, writing skills, and inquiry and research skills. Teachers discussed students’ acquisition of specific skills and concepts in language arts, math and science, and social studies, such as improved reading and writing skills, seeing the real world applications of math and technology, and use of primary source information. Teachers also described students’ enhanced self-efficacy, various aspects of attitude and behavior which supported students’ desire to learn and ability to pursue that learning. Teachers talked about how the software created a more interesting learning environment and seemed to encourage students to be more highly motivated to tackle and complete class assignments, feel more independent and take pride in their work, work longer on class projects as well as finish work earlier, and have fewer behavioral problems.

Through our case studies of schools, we identified some common issues that portray the power of the MetroLINC approach and its implementation. We saw evidence of strong collaborative relationships between teachers, a sense of “diffusion” of technology use and increased technology awareness amongst teachers, an interesting range of projects and targeted subject areas within a single school, and as with all technology projects, the possibility of technical problems.

The various MetroLINC activities and support events, particularly the Summer Institute, were regarded as useful to teachers as they prepare for, plan, and implement their MetroLINC units. The Summer Institute was viewed as a great opportunity to learn from other teachers, work in groups to plan the coming year, and receive technical information and training from MetroLINC staff. The Spring Showcase was regarded as a positive culminating event to show off teachers’ hard work and to get new ideas from others. The MetroLINC Cafes in Boston received more mixed reactions, underscoring the difficulty of offering training to teachers with wide-ranging skills and interests, and at different points of implementing their MetroLINC unit. Teachers found it particularly helpful when a MetroLINC staff member was able to come to their own classroom, to offer advice and help trouble-shoot right in the classroom.

The MetroLINC website continued to evolve and develop this past year, and increasing numbers of teachers could see the potential of the website serving as a resource of

interesting ideas, lessons and web tours posted on the site. Boston teachers still expressed difficulty in accessing the web-site, due to a variety of factors, included lack of Internet access in their classroom, problems in successfully logging on from home and getting through to their Internet provider during high Internet traffic, non-school hours, and isolated technical problems with the web-site itself. Most teachers described the web-site in terms of the project requirement of posting their lessons, rather than as a helpful resource that they have used to support their teaching.

Time remains the single most mentioned constraining factor in teachers' lives, and the primary barrier to changing teaching practice according to teachers. Limited hardware resources in a classroom (e.g., having fewer than 3 computers that are working well) and the resulting classroom management issue of how to divide and orchestrate students' work both on and off the computer, coupled with lack of Internet access in one's classroom for student research or e-mail to colleagues, also pose challenges to teachers' vision and desired plan of implementing their MetroLINC units. Teachers in Boston also talked about how their MetroLINC work needed to be incorporated into, or take lower precedent than, other high priority initiatives in their district, regarding literacy, and school-based reform in curriculum and assessment.

Despite all these pressures and competing initiatives for teachers' time and attention, the value and benefits of the MetroLINC program are clearly evidenced by the sizable number of Boston teachers who chose to participate in the program for a second year, the new cohort of young Boston teachers who chose to join the program and by the increasing numbers of teachers in Watertown who wish to become Pioneers. Further evidence is provided by the ways in which former Adapters are moving "up" in the system, now assuming increasing leadership positions in their schools, in the district and in the state as Year Three Pioneers, through coaching others, teaching courses, and presenting papers at state-wide conferences.

The report includes recommendations for MetroLINC interventions for the both the coming school year (Year Four) and Year Five.

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INTRODUCTION AND BACKGROUND

The MetroLINC Project, now in its third year, has engaged teachers in Boston and Watertown schools in collaborative efforts to adapt technology lessons and integrate them into their classroom pedagogy. The focus has been on applying technology to improve the teaching and learning of standards-based curriculum in the core subject areas. Through summer institutes and collaborations among teachers, primarily within each district, teachers have acquired skills, knowledge, and have begun changing what they do in the classroom. In Boston, the existing technology program has provided incentives for teachers to participate and its sequential technology training program has permitted increasing numbers of teachers to qualify for participation in MetroLINC. In Watertown, the focus on innovative uses of technology to enhance subject matter instruction, especially in the upper elementary and middle school grades, has permitted some teachers to use technology to advance their efforts. In both locations, the pressures of school reform efforts, beyond technology have influenced the nature of classroom pedagogy, access to instructional materials, opportunities to create and implement new ideas. The MetroLINC Project has attempted to integrate school reform issues, while at the same time advance the use of technology to achieve important goals by integrating the new approaches and materials with the curriculum based on state and national standards.

Complications in the contracting process limited the evaluation efforts for the past school year. The work on evaluation of MetroLINC temporarily ceased in the fall of 1999 and resumed in March 2000. When the evaluation started up again, the research in March concentrated on data collection in Watertown, since MetroLINC teachers in Watertown had finished their projects in December 1999. In anticipation of being re-awarded the evaluation contract in late March for the project period April 2000 through the project end date (August 2002), ROCKMAN *ET AL* also collected data from the current round of MetroLINC teachers in Boston who have participated during the present school year (1999-2000 academic year).

The evaluation activities are divided among formative and summative issues. One primary activity is to document project events, activities, and successes in order to provide feedback to the project about progress towards its goals. A second is to assess

the academic progress of students whose teachers have participated in MetroLINC. To reach these goals, ROCKMAN *ET AL* has undertaken a set of evaluation activities progressing from documenting the activities of the MetroLINC project to conducting case studies of successful implementations to tracking students participating in MetroLINC classrooms.

The key issues and guiding questions for this year portray a narrowing of the range of evaluation goals, with an emphasis on outcomes and less a focus on formative issues. The issues and guiding questions include:

I. Enhanced Teacher Understanding and Professional Development: Has the MetroLINC project supported teachers' learning in the use of new technologies, and its connection to classroom curriculum?

II. Influenced Classroom Practice: Has MetroLINC encouraged teachers to use technology to support standards-based curriculum to enhance their classroom practice?

III. Enhanced Students' Use of, and Learning with, Technology: What are students now doing with technology, as a result of having a MetroLINC teacher? How is their learning in science, mathematics, literacy and other subject areas being enhanced?

IV. Increased Teacher Collaboration: Has the Project enabled teachers within a school site strengthen, or establish new, collegial relationships with other teachers? What have been the successes, as well as the barriers to success?

V. Effectiveness of Program Structure and Support: How effective have the Project's strategies been for teacher participation and support—in the form of the application and recruitment process, summer institutes, teacher call-back sessions, personal support from staff to individual teachers? Are there ways the program can be improved?

METROLINC TEACHER PARTICIPANTS FOR YEAR THREE

A total of 178 teachers participated in Year Three of MetroLINC as either Pioneers (Mentors), or Adapters (Mentees): 115 in Boston and 63 in Watertown. In Boston, there were 28 Pioneers and 87 Adapters. The Boston teachers were drawn from 52 different schools in the district: 37 elementary schools, 6 middle schools, and 9 high schools. Of the 28 Pioneers, 18 had participated in MetroLINC the previous year. Six were Pioneers for a second year, while twelve were former Adapters who chose to be Pioneers in Year Three.

In Watertown, there were 18 Mentors and 45 Mentees. These teachers represented all three of Watertown's elementary schools and its sole middle school. Of the 18 Watertown Mentors, two had participated in the MetroLINC the previous year.

The number of Boston teachers who chose to participate for a second year in MetroLINC is of note. In Year Three, Boston teachers had usually “maxed out” in the number of new computers they could receive; thus, they clearly perceived additional value from participating in MetroLINC, beyond hardware incentives. A diverse range of teachers participated in MetroLINC, including “generalists” who were responsible for teaching a variety of subject areas to their class, as well as specialists of particular subject areas or student populations (e.g., science, computer technology, speech pathologists).

Of the 18 MetroLINC mentors in Watertown, 13 taught at the elementary school level (representing all three of the district’s schools), while five taught at the district’s sole middle school. Of these 13 elementary school teachers, six were regular classroom teachers (pre-K – 5th), three were computer/technology or media specialists, two were subject matter specialists (in music and physical education), one was a special education resource teacher, and one was an ESL resource teacher. The five middle school teachers were specialists in one of the following areas: science, foreign language, family and consumer science, or special education.

MetroLINC teachers in the two districts included both new teachers with 2-3 years experience as well as those with over 20 years of experience. As a cadre of teachers, MetroLINC teachers in Year 3 included proportionately more teachers who were younger and newer to the teaching profession compared with MetroLINC teachers in Year 2. About one fourth (27%) of the Boston teachers have been teaching for five years or less (compared with one eighth in Year 2), while about a third (38%) have been teaching for 20 years or more (compared with half of the teachers in Year 2). Watertown also drew upon a number of younger teachers; 6 of the 17 Watertown Pioneers (35%) had 5 years or less of teaching experience, while 7 of the 17 (41%) had 20 years or more of teaching experience. Thus, it appears the MetroLINC in Year 3 drew upon a different cross-section of teachers from the previous year, identifying individuals newer to the teaching profession to take on increasing initiatives and leadership in the area of using educational technology with students in their classroom.

DATA COLLECTION METHODS

There were three distinct data collection efforts for the current study.

- 1) Pre-program and Post-program written surveys. Surveys included questions on skill level and application of technology, pedagogy, staff development, and collegial activities. We were able to analyze completed written surveys from 90 Boston teachers (28 Pioneers and 62 Adapters), and 18 Watertown teachers. These teachers represented

52 different schools in Boston (37 elementary, 6 middle school, and 9 high schools) and four schools in Watertown (all 3 of its elementary schools, and its sole middle school.)

2) Focus Groups: On March 21, 2000 there were two Evaluation Call-Back sessions held for all Boston MetroLINC teachers. During these afternoon sessions, sixty Boston teachers (15 Pioneers and 45 Adapters) drawn from 32 different schools returned for focus group discussions regarding their MetroLINC unit, and the MetroLINC project more generally. Teachers were asked to arrange themselves into groups by MetroLINC unit's primary subject matter (language arts; mathematics; science; social studies), or if they were primarily special ed. teachers, or bilingual/ESL teachers. Teachers responded to a set of four questions, which they discussed in each group, for approximately 30 minutes. A teacher in each group served as group recorder of written notes.

Table 1. Samples for MetroLINC studies

Method	Boston Pioneers	Boston Adapters	Watertown Teachers	Total
Pre-program & post-program surveys	28	62	18	108 Teachers (56 schools)
Focus Groups	15	45	NA	60 Teachers (32 schools)
Classroom visits/in-person interviews	5	8	15	28 Teachers (7 schools)
Phone interviews	2	6	3	11 Teachers (10 schools)

3) In-person and Phone Interviews: We interviewed a total of 39 MetroLINC teachers: 18 from Watertown and 21 from Boston. All 18 of the Watertown Pioneers participating in MetroLINC during 1999 were interviewed by project evaluators. Fifteen teachers were interviewed in-person in their classrooms, while three were interviewed by phone. Teachers represented all four Watertown schools (three elementary; one middle school) in the district with students of the target age addressed by MetroLINC (kindergarten through 8th grade.)

Twelve of the Watertown teachers were interviewed individually, while six teachers (three teams of two) were interviewed in pairs, given that their MetroLINC project involving co-teaching efforts by the teacher pair. Each interview took approximately 30-45 minutes. Collectively, the teachers represented a diverse range of subject areas that formed the focus of the MetroLINC unit: mathematics, science, expository writing, social studies, computer/technology, music, foreign language, physical education, and family/consumer science. Four teachers specifically addressed special needs or ESL student populations.

We interviewed 21 Boston Pioneers and Adapters. Visits were made to four schools (three elementary, one middle school) which have been the most active MetroLINC

schools, in terms of numbers of Pioneers and Adapters currently involved this school year, as well as last year. A fifth school was covered through phone interviews. Thirteen interviews were conducted in person, while eight more were conducted by phone. Each interview took approximately 30-45 minutes in length.

COMPUTER ACCESS AND AVAILABILITY

Computer Hardware and Internet Accessibility: As in Year Two, the computer hardware and network resources for Boston as compared with Watertown MetroLINC classrooms differed once again in Year Three. While some of this may be due to pre-existing conditions in the districts' schools prior to MetroLINC, these differences appear to be heightened by the incentive structures built into the two districts for MetroLINC participation for both Year Two and Year Three.

In Year Two, both Pioneer and Adapter teachers participating in MetroLINC in Boston could receive up to four new computers for their participation in MetroLINC. (Acquisition of new computer hardware was drawn from local funds in the Boston School district.) In Watertown, teachers participating in MetroLINC in Year Two received a stipend, and could request additional hardware peripherals (e.g., digital camera, scanner) needed in their MetroLINC units. Thus, as reported in last year's report (ROCKMAN *ET AL*, August 1999), at the end of Year Two, many Boston teachers reported a dramatic increase of the number of computers they had in their classrooms (with many reporting an increase from two to five computers). In contrast, most Watertown teachers continued to have only one computer in their classroom, with students using the school's computer lab when the teacher wished to have more students on the computer at one time.

In Year Three, the incentive structure in Watertown remained much the same, with teachers participating in MetroLINC being able to request hardware peripherals and software necessary for their MetroLINC units. The incentive structure in Boston changed somewhat, given scarcer local funds for hardware acquisition, with Adapters being able to receive up to two new computers (as opposed to four the previous year.) Boston also offered MetroLINC teachers classroom licenses to use a core set of software tools (e.g., ClarisWorks, KidPix, PowerPoint, HyperStudio, and Inspiration software). Inspiration was purchased for both Boston and Watertown teachers to increase cross-curricula and organizational activities.

Reflecting this incentive structure, teachers indicated in their pre-program survey in Year Three that a primary reason they chose to become involved in MetroLINC was that they "wanted to get equipment for their classroom." This was followed by "recommended by a colleague" and "attended a showcase."

In Year Three, the average Boston teacher had two computers in his or her classroom before participating in MetroLINC. (This average is comparable to that reported by Year Two teachers of MetroLINC, when the reported average number of computers prior to MetroLINC participation was also two.) Of note, 17% of the MetroLINC teachers in

Year 3 reported having **no** computers in their classroom prior to MetroLINC, while an additional 62% reported having only one or two computers in their classroom. (See Table 2.) The handful of teachers who reported having 8 or more computers were typically their school’s computer coordinator who worked in the computer lab.

In contrast, after participating in MetroLINC, the average Boston teacher had four computers in his or her classroom. This increase in the average number of computers per classroom from 2.1 to 4.2 computers is comparable to that observed with Adapters in Year 2 (increase from 2.0 to 4.7). After participating in MetroLINC, over half (52%) of the teachers reported having four or more computers in their classrooms. The receiving of computers also clearly changed the classrooms of the 15 teachers who had previously had no computers in their classroom, and who now had two or three computers for their students.

Table 2: “How many computers do you have in your classroom?” before and after MetroLINC, as reported by teachers (n = 88)

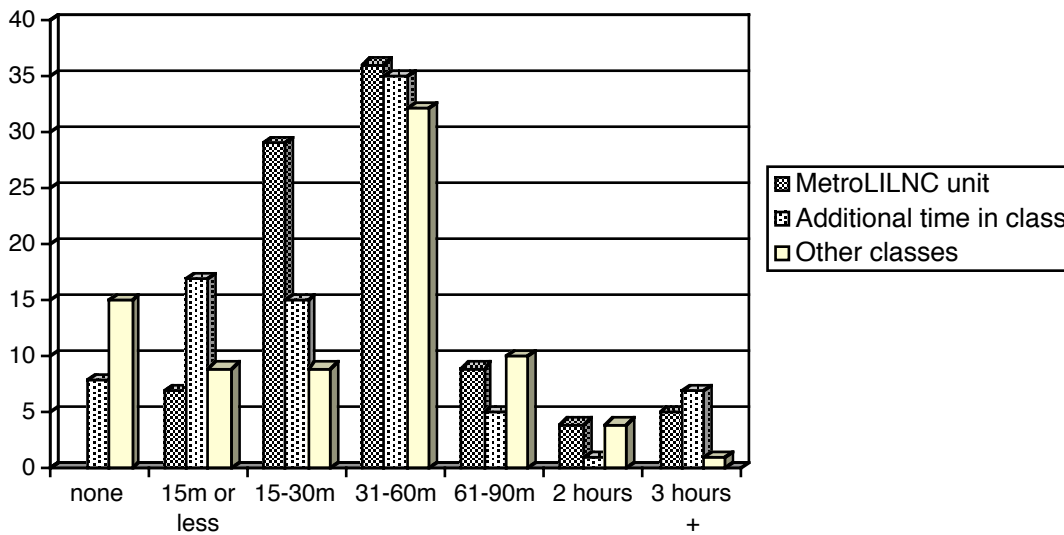
# classroom computers	0	1-2	3	4	5	6	7	8 or more
Before MetroLINC (# of teachers)	15 (17%)	55 (62%)	4 (4%)	4 (4%)	1 (1%)	0	0	9 (10%)
After MetroLINC (# of teachers)	0	17 (19%)	25 (28%)	15 (17%)	6 (7%)	8 (9%)	1 (1%)	16 (18%)

Given that Watertown did not have an incentive structure involving the receiving of new computers for MetroLINC teachers, no increases were observed in the number of computers in MetroLINC teacher classrooms, as one would anticipate. Both prior to, and after MetroLINC, 15 of the 18 teachers had only one computer in his or her classroom. The 3 teachers who had 6 or more computers in their classroom were 2 technology specialists and 1 librarian who served the district’s three elementary schools.

Another difference in technology access across the two districts concerns teachers’ access to the Internet. In Watertown, each classroom is wired to the Internet, so that teachers had easy access in their classrooms to an intranet with e-mail, and other Internet and network services and resources. In Boston, many schools only had their school offices, computer lab, library, and a small number of classrooms wired to the Internet; as a result, a high proportion of Boston MetroLINC teachers we spoke with reported that they did not have easy access to the Internet in their classroom, and when wanting to use the Internet during school hours, either for personal or student use, they needed to rely on their school’s computer lab. While a number of Boston teachers did have e-mail accounts at home, many reported the difficulty of successfully getting through to network services and/or getting onto the MetroLINC web site.

It appears that MetroLINC classrooms use more time with technology, cumulatively, than do other classes that the MetroLINC students are taking. Moreover, MetroLINC units engage students for longer periods than do the other activities in the same or other classrooms that use technology for learning. When asked how much time a student, on average, used a computer as part of their MetroLINC unit per week, two out of five teachers (40%) reported student use as being between 30-60 minutes, while another third (32%) reported student use between 15 to 30 minutes. In addition to students' computer use for their MetroLINC unit, over half (57%) of the teachers reported that students used the computer in their use for their MetroLINC unit, over half (57%) of the teachers

Figure 1: Minutes of computer time per week in MetroLINC and other classes



reported that students used the computer in their classroom for non-MetroLINC activities for an additional 15 minutes to an hour per week. Furthermore, most of the teachers reported that their students use computers in other teachers' classrooms, with most (70%) reporting that students use computers in other classrooms for at least 15 minutes per week. In the elementary schools, it was fairly typical for students to spend one class period per week in the computer lab, under the direction of a computer specialist. Thus, it appears that for many classrooms participating in MetroLINC, students may use the computer for at least 30 minutes per week for non-MetroLINC activities, either in their regular classrooms, or in classes with other teachers in the building.

TEACHERS' PROFESSIONAL DEVELOPMENT

The major change or professional growth over the past year as identified by the Boston MetroLINC participants in their written surveys was in the areas of enhanced knowledge of technology and abilities to use it effectively in the classroom. The improvement was a significant change and more than 60% of participating teachers noted the highest level of change for both these areas.

Another important improvement was noted to be broader content knowledge, again statistically significant, with more than 50% indicating the highest level of change. And parallel to this was the enhanced ability to integrate technology into the curriculum.

These two areas of perceived change—greater technology knowledge and greater content knowledge—along with the opportunity to apply that technology skill in service of the curriculum content, are powerful statements of the value assigned to the teachers' participation in MetroLINC. The areas of interest to the project team appear to be confirmed by the teachers' beliefs in what they have accomplished.

Self-identified areas of change:

- Enhanced technology knowledge (62.2)
- More effective use of technology with students (62.2)

- Greater integration of technology in the curriculum (51.7)
- Broader content knowledge (51)

- Increased networking with colleagues (39.8)
- More project-based instruction (35.6)
- More student-centered classroom environment (34.4)
- Changes in teacher strategies (33.7)

We found similar results for the Watertown pioneers, who were administered a slightly different scale. Selecting from a list of 9 areas, the 18 teachers were asked to rank order their top three areas of professional development. Of the 18 Watertown Pioneers, 13 selected “enhanced knowledge of technology” (8 selected it as a first choice); 11 selected “greater integration of technology in curriculum” (2 selected it as a first choice); and 9 selected “more effective use of technology with students” (1 selected it as a first choice).

In focus groups with Boston teachers, we found comparable, but more detailed information about what teachers regarded as areas of professional growth associated with MetroLINC. Participants identified three general areas of what they regarded as their greatest professional growth: 1) acquisition of technical knowledge; 2) collaboration with colleagues; and 3) pedagogy and teaching approaches. Of the 53 written responses generated by this question, about half of the comments related to teachers' acquisition of technical knowledge (26 of the 53 comments; mentioned by 9 of the 14 teacher groups). Most typically, teachers mentioned learning about particular pieces of software (e.g., Excel; PowerPoint, Inspiration), becoming more familiar with the Internet, or having greater access to resources on the Web. Only four of the 26 technical comments concerned teachers' technical knowledge as specifically relating to students or particular curriculum areas. (See Table 3 for sample comments.)

About a fifth of the responses concerning personal growth pertained to collaborating with colleagues (12 of the 51 comments; mentioned by 10 of the 14 groups). The “teachers

mentoring other teachers” is a hallmark of the MetroLINC project, with its focus on the Pioneer-Adapter teams, sharing of lessons on the MetroLINC web site, and Cafes offering opportunities for teachers to share ideas and tips. Teachers talked about the importance of collaborating with other teachers, sharing ideas, and feeling like they were working together towards a common goals:

About a fifth of the responses concerned pedagogy and approaches to teaching (ten of the 51 comments, mentioned by seven of the 14 groups). Teachers mentioned a variety of facets of teaching, ranging from learning about curriculum standards, rethinking how to teach a particular concept, to becoming more inter-disciplinary while working with other teachers.

In their interviews and on written surveys, teachers identified MetroLINC as a strong catalyst for their own learning and professional development. For some, it compelled them to learn more about technology and various educational applications. For others, it forced them to think more deeply about their teaching approaches and curricula:

It was good that there was an expectation for pioneers to take a class offered in technology during the year. I took four, I really pushed myself to catch up, but I probably would not have done that much if not for MetroLINC..

[What I gained was] equipment, and the opportunity to learn (I NEVER would have learned about Intellitools had it not been for MetroLINC.)

It made me look critically at my delivery of instruction.

[Working with Intellitools] forced me to sit down and think why is it good for them. Breaking down a child’s needs and goals, their learning styles, their weaknesses, and figuring out a tool that will work with them....I think part of my awakening that has been [due to] the computer.

Table 3: Teachers’ Views of the Biggest Area of Professional Growth (Focus Group)

Area Of Professional Growth Mentioned	Sample Comments
Acquisition of technical knowledge regarding software, techniques and personal comfort	<i>A greater knowledge of available software. Increased computer skills. Learn how to do web tour. Learned about new program (e.g., Inspiration) and how to use digital camera, PowerPoint; scanners; KidPix. Having access to more programs. How to deal with technology and staff around technology, and understanding how to keep and stay motivated to use “the machines.” Having “a little” more confidence using the computers</i>
Acquisition of technical knowledge regarding students	<i>Helping develop technology competencies for students. Exposed to multimedia use and how to adapt to appropriate grade-level.</i>

and curriculum	<i>Integration of regular curriculum into the computer lab. Integrating technology successfully into the curriculum.</i>
Collaboration with Colleagues	<i>Increased collaboration with other teachers. We were given an opportunity to work with our peers for a common goal, exchanging ideas and teaching strategies. Encouraged working with others. Interacting with other teachers - sharing and learning, networking. Access to others' lessons for ideas. Use of technology personnel in the school.</i>
Pedagogy & teaching approaches	<i>Knowledge of curriculum standards. Trying to figure out another approach to teaching a concept. The Summer Institutes provided rich opportunities to share curriculum ideas, learn new computer programs, and share classroom management strategies. The acquisition of these skills has made it possible to broaden the range of the subject matter taught. Got me to be interdisciplinary with other teachers. It has given me ideas for future projects. I'm planning to work closely with the science teacher to create and expand lesson plans.</i>

Several Pioneers described how MetroLINC has forced them to take more of a leadership role in helping other teachers learn about technology, engage in public speaking, and that they are now actively involved in other district initiatives through coaching others or teaching courses.

TEACHER COLLABORATION AND SUPPORT

Teachers were asked to compare the year prior to their participation in MetroLINC to the past year's experience. Boston teachers reported an increase in the frequency of discussions with their colleagues about curriculum and pedagogy. Prior to MetroLINC, 53% of the teachers were meeting once a week or more frequently for discussions of these kinds; at the end of the year, 64% of the teachers reported meeting once a week or more often. While the difference is not statistically significant, the change is substantial. As noted earlier, a number of teachers identified "increased networking and collaborating with colleagues" as a major area of their professional growth afforded through MetroLINC.

In the time period since the last Summer Institute (July, 1999), more than one-third of the design teams (39%) met at least once a month or more. Twelve percent of them met one or more times each week. On the other hand, thirty percent of the teams met only once or twice during the school year, and eight percent teachers reported that their team never met at all.

Interacting with the Pioneers on each design team were also seen as quite helpful, with more than 45% of the teachers noting the highest level of usefulness. As expressed by some Boston teachers in their written surveys:

I found working with [my Pioneer] professionally uplifting. My team members were very knowledgeable and shared a tremendous amount of knowledge with me. (Adapter)

I loved meeting with the team. It has been experience to meet other computer people and share. (Pioneer, for 2nd year)

I've enjoyed the opportunity to work with everyone on this project. It has made a difference to me as far as feeling more professional...It gave me more self-confidence.. (Pioneer, was Adapter last year)

A number of teachers in their written surveys indicated the need for greater structure for Pioneers and Adapters to meet throughout the year:

Assign meeting times for Pioneers and Adapters. It is hard to get all together and it makes for extra time on part of the Pioneer [to see each Adapter separately.] (Boston Pioneer)

Would like extra dates added to meet during school year. This time would be used to work on project, have support, etc., so that time doesn't suddenly catch up with you. (Watertown Pioneer)

Another Pioneer we talked to had been an enthusiastic Adapter in Year Two but had encountered some significant hardware problems in her classroom this year. Being transferred to another classroom this year, she no longer had Internet access as she had last year, and also found after much aggravation that the software she wished to use with her students exceeded the memory requirements of the computers she had received just last year. She regretfully acknowledged her lack of follow-through with her Adapters, which she attributes to her frustrations with the hardware, and not being able to communicate easily with them through the Internet either at school nor at home. As a result of her experience, she recommended,

In addition to the summer institute, require one Saturday in September and one in October. Also require Pioneers to go to Adapter schools (with the cluster support person if possible) twice a year. Accountability would have gotten me more motivated in September...Not having classroom access to Internet like last year really affected my participation. I apologize for not being a better Pioneer. My hopes did not come to fruition.

A number of teachers emphasized the advantages of having design team members all reside in the same school, rather than being located in a variety of different schools. As two Pioneers recommended,

I would work to have all the Pioneers and the Adapters in the same school. This would facilitate the group's continued growth during the

school year. I had two adapters in my school and was able to support them with their questions about technology in general. They got the chance to see me on a daily basis. They also were able to see displays that featured my students' use of technology in many areas of the curriculum, not just the MetroLINC work.

If I were to do another one I would not do it with people who were not in my building. I spent way too much time driving from one building to another. It's hard to say it was wasted time because obviously you've got to get there to help them but [there's a] much more productive use of the time if they're in the same building. People who were in the building, I talk to them always. I see them with their classes..[However, for] the majority of communication I had with people outside the building, it was through e-mail, and I was available all the time. It it's someone with the ability then going back and forth on e-mail is a real productive thing.

One teacher who was a Pioneer last year said she has continued having contact with some of her MetroLINC adapters:

I keep running into those same people. One person who adapted my project was one of my close friends so we keep in contact. Actually she just e-mailed me. Another teacher that adapted my project from the first year is now the literacy coordinator at her school and her school also got that Read grant. So when I went to the conference in April she was there and we talked about things we'd done and just keeping our activities on the computer so that when it's time to do them we could just go from there....MetroLINC did open more doors because it was more of an obligation, something that we had to do . Before there were just so many other things to do that you know 'I'll get around to it, I'll get around to it'.

Collaboration and support assumed a somewhat different form in Watertown. Unlike Boston, Watertown teachers were not organized into formal design teams, with a designated Pioneer and set of Adapters, who were expected to be in contact throughout the year. In Watertown, Pioneers had the option of either proposing a project as an individual, or jointly with a colleague. Three pairs of Watertown teachers proposed joint projects: one pair taught foreign languages at the middle school; one pair taught in a multi-age, first/second grade inclusion classroom, and one pair consisted of the technology and librarian specialists who both were responsible for covering two different elementary schools. Each of these teacher pairs were interviewed in pairs, and it was clearly evident that a strong, positive and collegial relationship had been strengthened through the MetroLINC project, and that each teacher served to support, inspire, and relieve some of the burdens of the other.

Watertown teachers also regarded the MetroLINC project director as a strong colleague and ally. Having a fair amount of contact with the director, through training sessions,

MetroLINC meetings, and other trouble-shooting classroom visits, they identified her as very positive MetroLINC colleague:

Lisa is wonderful. She is not a scary person... She keeps you on track but also treats you like an adult. She doesn't harp on you about things. She will give you gentle reminders....We are kind of used to always being told what to do all the time and told we are not good. It really was refreshing. I was treated well. For people to say, here is an opportunity for you if you want to do it, take it and learn...She got me moving and thinking about things.

MetroLINC has been a really positive experience. I can't say enough about what Lisa has done...The ways Lisa helped me consider ways of using technology...it affected every bit of my teaching...[This is due] partially to her enthusiasm and her concrete demonstrations of how to use it (the technology) has really hit home for me.

Lisa Breit was the best! She is extremely knowledgeable, supportive, helpful and has a good way of interpreting her knowledge. She is dedicated to the success of the teachers and technology at school. She is a great resource and Watertown is fortunate to have her.

Without design teams as a component of the past year's activities, there appeared to be relatively little sense of relationship and contact between various MetroLINC teachers in Watertown. Teachers we interviewed were highly enthusiastic about the MetroLINC director or about a colleague if they had had a joint MetroLINC project, but rarely mentioned other MetroLINC teachers in Watertown, even in their own schools.

The three cross-district projects, although well-designed and well-intentioned, did not develop as planned. There seemed to be a variety of factors at play. In one case, the teachers were using a new, relatively novel piece of software, that would allow them to do videoconferencing. The project was not able to be implemented this year, with initial delays in purchasing the software and technical difficulties with the software appearing to cause the teachers to lose momentum and interest in following through as the school year progressed. Second, as noted before, teachers strongly voice the significantly greater ease in which they have to work with teachers in their own school building, and those with whom they already have a good working relationship. Thus, the demands of inter-school collaboration, much less cross-district collaborations, places a considerable toll on teachers. In last year's report, we noted the difficulties associated with cross-district efforts, problems such as different school bell schedules, lack of easy access to telephones during the day, the costs of buses for students to meet face-to-face, and the press of other after-school requirements and commitments. Furthermore, two of the cross-district teams involved Pioneers who were already actively involved in regular Pioneer-Adapter teams as well as many technology initiatives in their own schools. Consequently, they appeared not able to devote the strong and continued focus to the project, given the competing demands of the other technology initiatives.

Only one Boston pioneer described how the cross-district collaboration had proceeded somewhat as planned. She had conducted her unit with her kindergarten class, students had exchanged e-mail across the two classes, the Watertown teacher had visited her classroom, and she was planning to visit the other classroom soon. Besides being a particularly dedicated and energetic teacher, she also spoke about her beliefs in the importance of cross-district projects:

[It's important] to share with a teacher from another district. I guess I've always wanted kids to see that families are pretty much the same. I wanted to do a pen pal type thing. If they get an -e-mail they can just go and immediately respond. I think that's a powerful thing.

I say "we're going on the Internet, where are we going?" [the class responds] "out of the school building!"

[The urban – suburban link is useful because] you can have pen pals in another country, but what are your chances of ever meeting them? That's what makes it real for kids. To Watertown, I'd take them. This is the same person that's been writing me...[Also] there are myths about teachers in different systems. [Through cross-district projects] you can get some of these things worked out and form your own opinions.

MetroLINC events: MetroLINC offered a variety of opportunities for teachers to participate in the program, from summer institutes to on-site collaborations with other teachers. At the end of the year, the participants looked back at what they had done and rated each of a series of project activities on its level of helpfulness. What we found was that the summer institute was perceived as the most helpful activity in MetroLINC with two-thirds of the participants indicating the highest level of utility; 91 percent indicated that it was somewhat or very useful.

Summer was great - gave time needed to get work done.

The summer training is great to give exposure to different programs.

I enjoyed the summer institute. It was nice to be around others that were excited about the same things.

Teachers in Watertown were also positive about the culminating showcase of completed projects. (The showcase for Boston occurred after the interviews and written surveys were completed, so no data is available for Boston teachers' reactions to the culminating showcase held in Boston.) As one teacher said, "I loved the showcase. It really validated all the hard work and put you back into a positive perspective again (when in the thick of it you tend to lose your perspective.)"

Interacting with the MetroLINC project staff was also seen as quite helpful, with more than 45% of the teachers noting the highest level of usefulness. Both Adapters and Pioneers described the importance of having good technical support, as well as having a MetroLINC staff member come to their classroom:

Everything MetroLINC did, in my opinion, was nothing but beneficial . I can't begin to thank the OIT staff enough for all the care, consideration, and commitment they showed to assure the success of this project. Alice and the staff were phenomenal! [Boston Pioneer]

Before [my cluster person] came to meet with me, and because my classroom and home don't have Internet, I felt very disconnected and unsupported. [Boston Pioneer]

I found the on-site support staff was very helpful. When Mr. David Dikter came to my classroom, I showed him what I had done and where my problems were and what else I wanted to know. He showed me what to do immediately. By doing that he gave me a big lift. [Boston Adapter]

I would have appreciated a visit/consultation in my classroom or at our project site for feedback and infusion of energy/ideas. [Watertown Pioneer]

I think that people who are thought of as "competent" don't receive the support they need. I would like to have more ML meetings on an as-needed, drop-in, basis so that you could go to someone with questions periodically. It wasn't always possible to get answers or help in a timely fashion. [Watertown Pioneer]

For most of Year Three, MetroLINC support in Watertown schools was almost exclusively provided by the Project Director after her assistant left in late summer, 1999. The Watertown Director reassigned the funds to add hours for the technicians in the District, who kept a list of MetroLINC pioneers and assigned them higher priority in the daily queue of requests. However, MetroLINC teachers still viewed the district as short-staffed, and expressly conveyed the importance of additional staff support:

I would have liked more one on one time with leaders, but since this year there was only one person in charge it was difficult

We definitely need more personnel to help us. I was lucky that my students were so good, otherwise I may have had problems helping them.

Please supply Watertown ML with more funds for staffing purposes. ML staff here is very helpful, knowledgeable, and friendly, but need more staff to help us set up our equipment, assist with new tech projects, pitfalls, etc. Staff here are wonderful, but need more help!

Lisa has been a great leader, but I think she needs more support staff to help her.

At the other end of the spectrum, the MetroLINC cafés were regarded as the least useful of the project's activities. Almost half of the responding teachers from Boston did not have any experiences with them, and only 10-15% thought they were very useful. Teachers seemed to want more Cafe time devoted to hands-on work with the computer, or expressed the difficulty in feeling that the topic presented was "in synch" with what they personally needed given where they were in their project' design and implementation.

This year, two-third of the teachers said that the web site was somewhat (1/3) or very helpful (1/3). In their interviews, several teachers described how they had found the MetroLINC web site helpful in looking for additional ideas for interesting lessons, looking at web tours, or to make sure they weren't "reinventing the wheel" when designing their units. However, the value and use of the web-site seemed to have been significantly curtailed by the difficulty that teachers had in successfully accessing the site, either due to the difficulty in getting access to a computer with Internet access, in successfully connecting to an Internet provider, or in logging onto the MetroLINC website without experiencing technical difficulties.

Out of the 93 Boston teachers completing post-program surveys, 41 teachers offered specific reactions or recommendations concerning the MetroLINC project. About half of the teachers had specific suggestions regarding aspects of the MetroLINC events or the web-site. Suggestions included:

- that Cafes and Summer Institute offer more hands-on time with the computers to allow teachers to learn and work with particular software applications; perhaps offering some of these events as voluntary/optional to address the needs of teachers who feel they need more technical training;
- offering the Cafes and after-school meetings at a variety of starting times and locations, to distribute more equitably the demands placed upon teachers in "regular vs. late schools", and schools in different locations throughout the district;
- that the Classroom Management cafe be offered earlier in the school year and address the situations of not only elementary school teachers, but the middle school and high school teachers as well;
- have more opportunities to meet in smaller groups with similar grade level or subject matter teachers to exchange ideas, rather than only the large Showcase;
- offering a trouble-shooting hotline just of Pioneers and Adapters, and having more on-site, classroom visits by MetroLINC and OIT staff, which teachers saw as extremely helpful and valuable;
- have the MetroLINC web site be more reliable (easy to successfully access), allow more than one person to access at one time;

Seven teachers expressed the need for greater structure and accountability of Pioneers and Adapters working together over the course of the year, while four other teachers talked about the distinct advantages of having Pioneers and Adapters in the same school.

A few others offered suggestions about hardware, such as teachers' need for Internet access in their classroom, on-time delivery of hardware (one teacher did not receive her two new computers until early spring), and a desire to have more than two new computers. Several teachers expressed the need for MetroLINC staff to ensure the compatibility of hardware and software: one was a first time Pioneer who had tried to use a new piece of software on a new computer acquired last year through MetroLINC as an Adapter, and discovered the software requirements exceeded the hardware's capacity; a second was trying to "press the envelope" with a new technology application for the classroom and ran into various technical problems. Both ended up needing to use their own money to buy equipment or software in order to successfully carry out their project.

There appeared to be at least three different areas of challenge in providing teacher training support in ways that are positively received by all teachers. First, MetroLINC teachers come with a range of skills and experience in technology, and look to the Cafes and other training sessions to fill different needs. There are "competing agendas." Some teachers come with less technical experience and need more hands-on time, learning particular software applications and applying their use to particular classroom interests that the teachers have. They do not want to "just sit around and talk." Others are already fairly well-versed, and are more interested in "sharing great ideas" with other teachers, and are ready to dive in and apply its use in a particular project.

Second, there are challenges in timing the particular topic of the session with what classroom teachers are feeling is most critical or important. For example, several said it was too late to hear about classroom management tips in the spring session, since they have been having to grapple with the major issue since the fall. Others felt it was hard to take advantage of sessions unless one was already fairly immersed in one's unit (or had finished it), in order to fully relate to the session. For this reason, teachers found it particularly helpful to have access to either a knowledgeable Pioneer or adapter in one's own school (to get help on the day that you actually need it), or to have a MetroLINC staff person come to one's classroom on relatively short notice.

Third, while teachers had a pressing need for teachers to meet in design teams during the summer institute to get as much done as possible, prior to the start of the school year, teachers clearly benefited meeting other teachers in other schools, in forms other than the large showcases. As one two-time Pioneer said, "Everybody's not a sharer. Teachers can be self-centered if they aren't aware of the joys of sharing." Another Pioneer mentioned, "[Working only with teachers in your school can] be one-dimensional. Sometimes someone from another place can gets you to see things differently." Several teachers during their interviews talked about how helpful it was to talk with other teachers in their subject area. When we pressed them on when this had happened, they responded that it was during the evaluation focus groups that the evaluation team had set

up, which the evaluators had done in order to see whether there were any clearer trends about student learning when teachers were talking about a common subject area.

CLASSROOM IMPACT: TEACHING STRATEGIES AND STUDENT LEARNING

Number of students reached through MetroLINC: As noted in the project report (June 2000), MetroLINC staff estimated the potential number of Boston students and Watertown students as 4,747. In our post-program survey, the Boston teachers alone reported the “number of students using technology as part of your MetroLINC project” as 4,952. Watertown teachers reported using MetroLINC units with the majority of the upper elementary school and middle school student body in Watertown. (Watertown teachers reported a total of 1,002 students; however a number of these teachers were either elementary or middle school teachers who specialized in a certain subject matter and worked with students drawn from many different classrooms; thus individual students might encounter a MetroLINC unit in more than one teacher’s classroom, which makes an actual head count of “MetroLINC students” difficult to ascertain.)

Foci and Extent of MetroLINC unit: The primary subject area of the MetroLINC unit was language arts (54% of the teachers reporting this subject area), followed by science (17%), social studies (11%) and math (10%). Another 8 percent noted technology as the primary subject area for MetroLINC activities in their classroom.

The predominant length of the instructional units developed and implemented within MetroLINC was from four-to-six weeks (26%), with another 19% lasting about three months and 17% lasting from one-to-three weeks. Twenty percent of the respondents indicated that the unit they developed and used lasted all year.

Engagement in those units was about two-to-three times per week for the majority of the participating classrooms (52%), with another 21% of the students participating once a week or more.

In the post-program survey, teachers were asked “How would you rate the amount of time your students use computers for standards-based curriculum now versus last year? Possible responses were offered on a 7 point scale, where 1 indicates “no change”; 4 = increase some”; and 7 = “increase a lot.” Teachers reported an increased use of technology for this purpose, with a mean of 4.7 on the 7 point scale, with 32% of the teachers rating the change as a 6 or 7. This increase is not as dramatic as last year, in which teachers responded with a mean of 5.5, and 57% of the teachers rating the change as a 6 or 7. It is likely that this is due in part to the fact that a number of current MetroLINC teachers participated in MetroLINC last year as well.

Changes in Teaching Strategy: When asked during the focus groups whether there had been any changes in their teaching strategies used in their classroom during their MetroLINC unit, teachers identified four general areas:

- 1) use of technology as a teaching tool or resource;
- 2) changes in pedagogical approach or curricular focus;
- 3) greater use of small group work; and
- 4) classroom management issues that were raised by the use of computers.

Of the 67 written comments generated by the question of changes in teaching style, the most common response concerned the use of technology as a teaching tool or resource (24 of the 67 comments; mentioned by 11 of the 14 groups). Teachers typically mentioned how they now used particular pieces of software with their students, with only slight reference to how it related to students' learning. (See Table 4 for sample comments.)

The next most common response concerned changes in pedagogy and teaching focus (18 of the 67 comments; mentioned by 8 of the 14 groups). Teachers, particularly those involved in teaching science, mentioned a variety of changes, including more hands-on learning, project work, student research, interdisciplinary connections, and use of real data. The two groups of special education teachers talked at length about their use of Intellitools had allowed them to make significant changes in how they worked with students, enabling them to create special lessons and activities that carefully altered word choice, sentence length, syntactic complexity in a highly visual, auditory and tactile environment, with immediate feedback to students.

An increased use of small group work was also mentioned by a number of teachers (10 of 67 comments; mentioned by 7 of the 14 groups), as was the issue of classroom management (10 of 67 comments; mentioned by 6 of the 14 groups). Teachers talked about the challenges of having only 2 groups work with the computer while others need to be doing other kinds of class work, and the need to figure out how best to coordinate students' use of computers in the school's computer lab (where there were more computers, and where there is Internet access) with the use in their own classrooms.

Interestingly, there were five comments in which teachers pointed out an increase in students' interest and motivation as part of their changes in teaching strategies. Teachers noted that by using the computer and/or particular software applications, students appeared more motivated to learn, and interested in the class work involved in the MetroLINC unit.

Table 4: Teachers' Self-report of Changes in Teaching Style (Focus Groups)

Area Mentioned	Sample Comments
Use of technology as teaching tool or resource	<p><i>Introduced new software like Inspiration and ClarisWorks</i></p> <p><i>Used Intellikeys with regular ed K-2 students.</i></p> <p><i>Use of the Internet in the classroom to teach concepts.</i></p> <p><i>Used the LCD projector.</i></p> <p><i>More variety using computers - graphics, searches, digital science projects.</i></p> <p><i>Able to do sophisticated publication on new computers.</i></p> <p><i>Used PowerPoint presentation to advance child's learning</i></p>
Changes in pedagogy or teaching focus	<p><i>Teachers felt they were more likely to match their goals with the BPS standards.</i></p> <p><i>More hands-on learning.</i></p> <p><i>Longer term project develops; more writing skills.</i></p> <p><i>Could immediately upload data and talk about it.</i></p> <p><i>We used web more and developed research skills.</i></p> <p><i>Inter-disciplinary activities; science and language</i></p> <p><i>Using key words to create sentences (through Intellitools).</i></p> <p><i>Had new strategy (through Intellitools) for increasing length of sentence and syntax; immediate feedback, visual and verbal cueing.</i></p> <p><i>Found the need to increase the students' keyboard skills.</i></p>
More group work and collaboration	<p><i>More small group and team activities.</i></p> <p><i>Classroom brainstorming, then individually at computers.</i></p> <p><i>Using group work projects; less lecture and blackboard teaching</i></p> <p><i>Small group/group projects</i></p> <p><i>Students worked together to solve lesson problems.</i></p> <p><i>Teachers felt they used more independent group activities and more peer-tutoring.</i></p> <p><i>More group (cooperative) learning and independent learning.</i></p>
Classroom management issues	<p><i>Combining the computer lab time with regular classroom lessons</i></p> <p><i>Classroom 1/2 doing regular; others on research.</i></p> <p><i>More planning for small groups - class management of those not at the computer.</i></p> <p><i>Scheduling time to use the computers that are Internet accessible.</i></p> <p><i>Some students had to be pulled out during the Adapters P&D or the student's lunch time.</i></p> <p><i>Didn't feel comfortable trying to have all students on computers - classroom management.</i></p> <p><i>Management is important. Students need to have an objective. Time must be limited and controlled. planning is very important.</i></p>
Increased student motivation	<p><i>Student empowerment. Students and teacher more motivated.</i></p> <p><i>A more exciting way to learn.</i></p> <p><i>More interest and involvement of students.</i></p> <p><i>An increased interest in acquiring the necessary information to create a better PowerPoint presentation. Students were therefore able to cover more of the content area in the time available.</i></p> <p><i>Publishing "on-screen" rather than by hand motivated kids to produce a better product.</i></p>

Student Learning: In their written surveys, teachers reported an increase in a range of areas in which they felt students had acquired a significant amount of additional knowledge and skills. Technology skills was the area in which over half (54%) of the teachers reported “a lot” of acquired knowledge and skills, followed closely by increases in self esteem (47%) and subject area knowledge (46%). Over a third of the teachers reported increases in collaboration skills, project-based learning, writing skills, and inquiry and research skills.

Areas in which teachers report that their students acquired knowledge and skills:

(% teachers indicating “a lot” of improvement over the past year)

Technology skills	53.9
Self-esteem	47.2
Subject area knowledge	45.9
Collaboration skills	40.7
Project-based learning	39.1
Writing skills	37.1
Inquiry and research skills	35.6
Presentation skills	30.3
Cross-disciplinary work	29.9

Areas in which teachers report that their students did not acquire knowledge and skills:

(% teachers noting “none” or only “a little” improvement)

Presentation skills	30.3
Inquiry and research skills	27.6
Cross-disciplinary work	21.8
Collaboration skills	21
Writing skills	16.9
Project-based learning	16.1
Self-esteem	8.9
Subject area knowledge	5.9
Technology skills	.7

Many of these areas of student growth also were mentioned during teachers' focus groups, conducted prior to the administration of the written survey. When asked what they felt was the main educational benefit to their students involved in MetroLINC, teachers mentioned four major areas: 1) concepts, skills and learning process; 2) technical skills and knowledge; 3) student "self-efficacy" (motivation, independence, and self-esteem; and 4) group work and collaboration.

About a third of the comments (22 of 66 written comments; mentioned by 12 of the 14 teacher groups) concerned various kinds of concepts, skills or learning processes that they felt had been enhanced. In the area of language arts and writing, teachers felt that students were writing more, had improved their spelling and vocabulary, and reading. Teachers involved in science and mathematics units described how students had a greater understanding of the applications of math and science in the real world, and of doing research and projects using real data and information off the Internet. Teachers involved in social studies units, as well as other subjects in which student research was featured, described how students were doing more research projects, using primary and secondary sources, and were becoming more knowledgeable in certain content areas under study. (See Table 5, on the following page, for sample comments.)

Another common comment concerned students' acquisition of technical skills and knowledge (19 of the 66 comments; reported by 9 of the 14 groups.) Teachers talked about students gaining technology skills, familiarity with computers, the Internet and different software applications, and features (e.g., bookmarks, spell checks).

A third area mentioned (17 of the 66 comments; mentioned by 8 of the 14 groups) concerned students' self-efficacy, various aspects of attitude and behavior which supported students' desire to learn and ability to pursue that learning. Teachers talked about how the software created a more interesting learning environment, and seemed to encourage students to be more highly motivated to tackle class assignments, feel more independent, take pride in their work, work longer on class projects as well as finish work earlier, and have fewer behavioral problems.

As noted earlier, a number of teachers mentioned organizing students to work in small groups when implementing their MetroLINC unit. Thus, another area mentioned (8 of the 66 comments; mentioned by 3 of the 14 groups) concerned students learning how to work together collaboratively, team-building, and peers helping and correcting each other. It is worth noting that the relative frequency in which teachers discussed students' educational gains in terms of learning processes and acquired content knowledge is in contrast with Year 2, in which teachers tended to describe students' learning primarily in terms of acquired technology skills and increased motivation.

Table 5: Teachers' Views of their MetroLINC Unit's Main Educational Benefit for Students (Focus Groups)

Area Mentioned	Sample Comments
Learning Process, Concepts, Skills	<p><i>Language Arts/Writing: Gained writing, reporting and communication skills</i></p> <p><i>Some students improved their spelling and have increased the length of their writing.</i></p> <p><i>More students have learned vocabulary due to the self-correction factor brought on by the technology (Intellitools)</i></p> <p><i>Helped them develop sentences, helped their reading.</i></p> <p><i>Non-readers practice their sounds and hear the word phonetically.</i></p> <p><i>Working on order, logic, definitions, understanding directions.</i></p> <p><i>Math and Science: Real world application of math and technology.</i></p> <p><i>Able to see math where did not think it could be used.</i></p> <p><i>Using observational skills and converting into data.</i></p> <p><i>Science projects with research on the Internet.</i></p> <p><i>Social Studies: knowledge of subject matter. Motivated to find additional information.</i></p> <p><i>Gave them the chance to find and use primary sources.</i></p> <p><i>Increased creativity.</i></p> <p><i>Computer research skills are developed.</i></p>
Technical Skills	<p><i>Students are more comfortable with a variety of computer skills.</i></p> <p><i>Using Excel entering data on spreadsheet and saving information.</i></p> <p><i>Being able to “spell check” in two languages.</i></p> <p><i>More Internet use, different spreadsheets/templates; fonts; presentation of data, graphics and text</i></p> <p><i>Students using bookmarks.</i></p> <p><i>Access to computers. Only one student has a computer at home.</i></p>
Motivation, interest, self-esteem, self-efficacy	<p><i>Involvement in MetroLINC has allowed some students who may be ordinarily quiet or not engaged in the class, to be more active and participatory with computers.</i></p> <p><i>Students are more critical of their work and more apt to polish it.</i></p> <p><i>Work finished earlier.</i></p> <p><i>Can help cut down discipline problems - motivation.</i></p> <p><i>Feeling of independence.</i></p> <p><i>The work that they have produced shows more pride because it was done differently.</i></p> <p><i>They were amazed to see our name next to the web tours and eager to see what they had to do.</i></p> <p><i>When there is enough equipment in the classroom for the students to be on the computer every day, students get the opportunity to see a completed product before they lose interest.</i></p> <p><i>It’s highly impressive to students to answer a student-generated question immediately by going on-line.</i></p> <p><i>It tantalizes the kids to see how much information is readily available.</i></p>
Group Work, collaboration	<p><i>Working in groups; team building</i></p> <p><i>Increased sharing</i></p> <p><i>More cooperative learning.</i></p> <p><i>The better students helping the less able.</i></p> <p><i>Peer correcting.</i></p>

School Impact: As noted earlier, a number of Pioneers and Adapters strongly recommended that design teams be housed within the same school, as opposed to members being distributed across a number of different schools. Given greater physical proximity, design team members had much more contact with each other, both in structured meetings, informal contacts, and for “just in time” assistance.

Two factors made it particularly difficult for team members to meet after schools: the different school schedules in the district (some elementary schools run from about 8:30 to 2:20; while “late schools” run from 9:20 to 3:20; middle schools and some high schools typically run from 7:20 - 1:30); and the commuting time need to travel across the district, particularly for those teachers who rely on public transportation. Also, given other district-wide initiatives for professional training in literacy and in-depth reviews of schools, there seemed to be a scarcity of unscheduled afternoons and available meeting time.

We conducted in-depth interviews with teachers in 9 different schools: 5 in Boston and 4 in Watertown. The 5 Boston schools were selected on the basis of being ones that had a fairly significant number of MetroLINC Pioneers and Adapters both in the current year and in past years (at least 8 total.). The 4 Watertown schools consisted of the district’s three elementary schools and the middle school. From these interviews, we focused on analysis on three of the schools in order to produce “school profiles”. These profiles are designed to provide a sense of the interesting, diverse range of MetroLINC projects which occurred within a school, the kinds of collaboration that can occur between MetroLINC teachers in a school, and the potential student and teacher impact within a single school.

In the Appendix we have included profiles of three of the MetroLINC schools, snapshots of the activities of groups of MetroLINC teachers. From their experiences, we can identify some common issues that portray some of the power of the MetroLINC approach and its implementation. We saw:

- Evidence of some strong collaborative relationships between teachers. This collaboration was strongest when two compatible teachers produced a joint project, when teachers built upon an already strong collegial relationship and shared commitment to a certain population of students, and when there was an active computer specialist who makes a concerted effort to connect to the classroom work of regular homeroom teachers.
- Evidence of a sense of “diffusion” of technology use and increased technology awareness amongst teachers. There was some indication of Pioneers and adapters showing other non-MetroLINC teachers in the school what can be done.
- An interesting range of projects and targeted subject areas within a single school. There were advantages to allowing adapters and pioneers to take projects in directions that they feel are of interest, and to which they are committed. The disadvantages were the few clear opportunities for teachers to talk about how technology promotes

learning in certain subject areas, and how it does not target “student learning” in consistent ways that might show increases in student learning over time (particularly as seen in MCAS test scores.)

- Teachers who regard themselves as specialists for certain student populations that they serve. As a result, teachers of special needs students can receive great satisfaction when connected with other teachers of similar students. Consequently there was a strong bond between the teachers who use Intellitools. This contagion also radiated out somewhat, to include regular Kindergarten teachers who were dealing with emergent readers. We did not see this same strong bond among teachers of bilingual students. We believe that they, similarly, need a sense of support and focus. This should be addressed in the next school year by the new ways that teachers are being coached by grade, and special population.
- The possibility of technical problems. Shortcomings of and problems with the technology significantly limit what teachers are able to implement, if they have a set idea of what they want to achieve. We saw the importance of checking out the compatibility and feasibility of hardware and the advantages of teachers being flexible in their implementation of units.

BARRIERS TO CHANGING TEACHING PRACTICE

There are still barriers to changing teaching practice, some of them related to technology, but most consistent with overall condition in which teachers find themselves these days. Nevertheless, MetroLINC served to reduce the barriers to some degree.

Limited time continues to pose a problem, with about two-thirds of the teachers noting it as a problem both before and following their participation in MetroLINC. However, at the end of the school year, 48% of the teachers reported lack of planning time as a barrier and, while still a substantial barrier, this is down from 61% at the start of their MetroLINC experience. Similarly, lack of funding for resources is also down from 43% reported as a problem at the start of the year to 28% by the end. This difference is statistically significant.

Lack of administrative support and lack of peer support are also significantly reduced though participation in MetroLINC with 22% of the teachers reporting administrative support as a problem at the start, reduced to 10% at the end of the year and 16% seeing lack of peer support as a problem early in their project experience and only 5% at the end of the school year.

Time remains the single most mentioned constraining factor in teachers’ lives. It is mentioned as a pressing constraint from fully implementing their MetroLINC units or collaborating with MetroLINC colleagues as much as they had planned or desired, and mentioned as a barrier of to changing their teaching practice. This pressure of time takes on a variety of guises. Many of the MetroLINC teachers are already involved in other

curriculum reform and assessment efforts in their school and district. Several teachers specifically discussed the major literacy initiative going on in the Boston, coupled with the pressures exerted from MCAS testing. One Pioneer who this year was a Pioneer for the second year described how her design team was unable to meet regularly as her team had last year, due to the 40 hours of teacher training required for this year's literacy initiative. An adapter expressed a similar pressure of time:

I don't have any recommendations for improvement. The MetroLINC program is a fine project. It's just that the school year has been difficult to manage in terms of time. We're in the process of implementing a new literacy program along with the In-depth Review Process. A lack of time in the school building has hindered me this year.

The flow of the school year also came up in teachers' discussion of implementing their MetroLINC unit. Teachers very much liked the scheduling of the summer institute, finding it a time that they were more relaxed, where they could really focus in depth on planning the unit, and could socialize and share ideas with teachers from other schools.

More time needs to be spent during summer institute to train people for use of programs applicants wish to use for their unit. Once school starts, it's very difficult to spend the time learning it when you could have learned it in a more relaxed time frame.

You need a call back session to discuss projects after they are presented. Everything looks great in the summer, but once school starts, there are so many constraints on our time.

Once the school year began, teachers were swamped with the day-to-day demands of their classroom teaching loads, coupled with the constraints of the school building. A number of teachers we interviewed worked at "late schools." These schools began the school day at 9:10, but ended at 3:40, with teachers often at school until past 4:00, to oversee bus departures. For these teachers, attending afternoon MetroLINC cafes and meetings which began at 3:00 at another location was difficult. As one teacher said, "I hate to be late...and you can only ask for favors [to be excused from school early] so many times." Many teachers relied on mass transit to get from school to school, which further caused delays to get to after-school meetings. The different release times of schools also made it hard for teachers from different schools to get together. "A teacher getting through at 2:30 doesn't want to hang around for an hour and half, for the other teachers to get there."

For these reasons of time and distance, many teachers preferred design teams in which all members were in the same school building, or at least within close proximity of each other. As indicated in the school profiles, several Pioneers talk about the different kinds of support they were able to give their adapters, depending on whether or not they taught in the same building.

Several teachers also suggested that the MetroLINC meetings be offered at a variety of different times in the afternoon, to make it fairer for both regular and late schools, as well as to be offered in different locations throughout the city, to more evenly spread out the commuting distances for teachers. One teacher also suggested that MetroLINC might explore some meetings on-line. A main caveat, however, remains that many MetroLINC teachers in Boston, do not have easy access to a network, either in school or at home.

Teachers did talk about using e-mail as a mode of communication to talk with other teachers. Access to a network, however, varied considerably across teachers. All Watertown teachers had access to a network right in their classroom, while only some Boston ML teachers had access in their classrooms. (In the schools that we visited, this was mainly limited to the MetroLINC teacher who happened to be computer specialist for the school.) In some schools, teachers talked about how they tried to log on in the computer lab during a free lunch period or planning time, if they were fortunate enough to have a Pioneer who was a computer specialist; after school hours were sometimes difficult due to the school building being locked up at 4:00. While a number of MetroLINC teachers did have e-mail accounts at home, several talked about the difficulty of successfully logging on, because the line was busy (one teacher claimed that for Massed.net, a popular network for teachers, there is one main number for all the teachers in Boston). Another teacher said not to be bother to try to log on between 8 am and 11 am, or in the evenings before 11 PM.

Perhaps exacerbated by the difficulties of simply logging onto a network, a number of teachers complained about the problems they sometimes encountered in logging onto the MetroLINC website. Several mentioned they tried getting on once or twice, and when unsuccessful, didn't try again for several months, until they needed to post a lesson as part of the MetroLINC project requirements.

There was some indication of the disadvantages of the Watertown teachers' MetroLINC year spanning two school years, given its operating on the calendar year. Several teachers had designed MetroLINC units based on the class they had in a certain academic year, only to be switched to a different grade the following year, thereby making it difficult to implement the unit with such a different target population of schools. For example, one teacher had been a resource room teacher for Kindergartners and had developed an interesting unit on Intellitools, focusing on (words), but then was switched as the resource teacher for fifth graders, for whom such an application was too simple. Another team of teachers with a project in foreign language instruction felt there were distinct advantages of implementing the unit in the spring, versus the fall, since their students would have greater language skills towards the latter half of the school year.

Hardware and software concerns: As noted earlier, the arrangement for teachers receiving computer and other hardware varied across the two districts, as well as differed from last year's arrangement. In Watertown, teachers participating in MetroLINC did not receive any additional computers, but were able to suggest a hardware and software "wishlist" that would be necessary to complete their project. For a number of teachers, this wish list included a digital camera, a video camera, a scanner, or other type of

hardware peripheral. In Boston, MetroLINC teachers were eligible to receive up to two new computers. This contrasted to the previous MetroLINC year, in which teachers—both Pioneers and Adapters—were eligible to receive up to four new computers.

Unlike MetroLINC teachers from the previous year, Boston teachers did not talk about how their MetroLINC unit had allowed them to organize students into small groups, where a third or a half of their class was on the computer at one time (in groups of 3 or 4). With only two new computers, it was difficult to have the MetroLINC unit be the main focus of a classroom activity. As one teacher expressed, “With four computers, it’s great. Because even if one’s not working, you can still have a pretty good group of students working at one time. With three computers and one down, you still have two computers working. But with only two computers, and one not working, it’s really hard to do anything.” This comment poignantly points out the trouble that some teachers still had with hardware working smoothly. In two of the Boston classrooms visited for in-person interviews, teachers mentioned that one of the two computers was not currently working. A handful of teachers in their survey indicated that a barrier to their classroom practice was “we need more computers”.

Several teachers who were participating in MetroLINC for a second year requested that they be able to trade in their computers for an upgrade. Having “maxed out” in the number of new computers they could receive after the first year, they were seeing new participants receiving more powerful new computers than they had received the year before, and were also finding that software they were now purchasing sometimes could not run on their older machines, even though the machines were only one year old.

The relatively small number of computers in a given classroom was coupled with the general lack of Internet access in individual classrooms. In many schools, the Internet access was limited to the library, the computer lab, and one or two fortunate classrooms in the building. A fair number of MetroLINC teachers in Boston did not appear to have Internet access in their classrooms. As a result, the most successful units occurred when MetroLINC teachers were able to arrange to have their students use the Internet in the school’s lab, ideally with the support and knowledge of the computer specialist. For example, in one school, a 3rd grade teacher had her students do a unit on the Civil Right movement. Students wrote their biographies in the classroom, but went to the lab to do their Internet research, and then used their notes to continue to do the word processing of the reports in their regular classroom.

The opposite hardware situation was true in Watertown. Watertown teachers had only one computer in their classroom, which was linked to the network, but needed to go to the lab when they wished more than one group of students to work on the computer at a time. The lack of projection systems in one-computer classrooms was a serious impediment to more extensive use of technology in the curriculum.

As a result of this need for more computer hardware and/or Internet access, teachers talked about greater connections and collaboration, albeit perhaps out of necessity, between regular classroom teachers and the computer specialist in their building. Several

teachers spoke about the significant apprehension they had had about arranging for their students to use the computer lab. At a minimum, the teachers had to schedule a time for their students to use the lab, outside of the special period that their students worked with the computer specialist. At best, the classroom teacher and computer specialist jointly planned a unit together, understanding clearly the progression of activities, and what would happen both in the regular classrooms and the computer lab, to ensure a smooth and coherent flow to the unit.

In order for teachers to collaborate within a school building, it was important that they had some common planning time, lunch period, or other free period in which to work together. This posed a particular challenge to the specialist teachers -- be it a computer specialist, speech therapist, music teacher, resource room teacher, or other specialist -- since they did not generally have the same "common planning block" scheduled into their days, the way the regular classroom teachers did. (Students generally went to specialists while their grade-level teachers were able to meet as a team.) One dedicated Pioneer who was a computer specialist described how she was fortunate that her schedule happened to line up with the lunch and free periods of her building adapters.

Somewhat understandably, the MetroLINC teachers that focused on the more standard suite of software and hardware ran into many fewer technical problems with implementing their projects. At the same time, there is clear value in giving teachers, particularly as offered to those in Watertown and in the cross-district projects, the chance to be innovative in their projects. Given the considerable pressures of time and classroom demands that MetroLINC teachers, there are clear advantages in having projects that focus on the common suite of software (e.g., KidPix, ClarisWorks, PowerPoint) and hardware (e.g., digital cameras and scanners) and keep the "technical overhead" relatively low. This allows teachers to concentrate their efforts on being thoughtful and innovative in how they integrate those in the curriculum and use them to enhance their teaching and students' learning, and opportunities to assess that learning and be reflective about their practice. In the case of a special tool like Intellitools, there seems to be enough in-district expertise, some drawn from the increasingly experienced cadre of teachers who are current or former MetroLINC teachers, to sustain its use. For those projects that "push the envelope" more in the technical area, MetroLINC project staff need to be prepared to dedicate more time in helping ensure hardware compatibility and feasibility from the outset, and to be prepared to immediately troubleshoot technical problems, either by phone, or through classroom visits.

Reasons to Participate in MetroLINC: When asked in their focus groups whether or not they would recommend other teachers to become involved MetroLINC as a Pioneer or Adapter, almost all of the teachers were enthusiastic about the value of participating in MetroLINC. The most common reason teachers gave for participating is receiving technology-related resources and support - hardware, software, lesson plans on the MetroLINC website, and technical support and training from MetroLINC staff (seventeen of the 39 written responses; mentioned by ten of the fourteen groups.) Few teachers seemed to primarily dwell on the receiving of computers per se, in contrast to teachers' comments last year. This may be due either to MetroLINC teachers receiving fewer new

computers during the current year (up to two new computers, versus receiving up to four new computers last year), or the strengthening and broadening of the kinds of technical support and resources that were offered through the MetroLINC website resources and MetroLINC training opportunities.

Table 6: Teachers’ Views of Opportunities within the Project

Reasons Should Participate	Sample Comments
Access to equipment, resources, and technical support	<i>Equipment for the classroom!</i> <i>Free software.</i> <i>Access to the development web site as a resource.</i> <i>Training opportunities.</i> <i>More technology and support made available.</i> <i>Professionalism of MetroLINC staff.</i> <i>To get some information from your Pioneer.</i>
Catalyst for learning	<i>Forces you to integrate curriculum standards with technology.</i> <i>Forces you to learn technology.</i> <i>Forced to be more creative in teaching and planning; opens up your eyes and students’ eyes.</i> <i>Encourages more project work.</i> <i>Increased technology skills.</i> <i>Try new things.</i> <i>It refreshes you. Makes the curriculum more exciting for students and teachers.</i>
Collaboration with other teachers	<i>Collaboration with colleagues, within school and on team.</i> <i>Team support and collaboration with other professionals.</i> <i>Get to know fellow teachers.</i> <i>Opportunity to network with teachers.</i>

About a fourth of the comments (nine of the 39 responses; mentioned by eight of the fourteen groups) described MetroLINC as a catalyst for their own learning: integrating curriculum standards with technology, being more creative in the classroom, and renewing their interest in teaching. Two comments captured the sense of MetroLINC as a district-wide initiative, rather than simply centering on individual teachers: “Advantages of technology are seen as adapters and can be utilized by entire school” and “The interdisciplinary aspect is a goal we should all shoot for and this encourages it.”

Regarding reasons that teachers might not want to participate in MetroLINC, about a third of the comments (eight out of 29 comments; mentioned by 7 of the 14 groups) concerned the time involved in the project, and the difficulty that teachers had finding common meeting time to meet with other teachers or to attend meetings. Several teachers suggested that design teams should be contained in a single school building, if possible.

About a third of the comments (nine out of 29 comments; mentioned by six of the fourteen groups) concerned the project requirements. Despite the depth of the application and application process for participants in MetroLINC, several teachers recommended that applicants get as much information ahead of time to fully understand the project

commitment involved (“Get all the information about what you’re actually getting for materials before you apply/commit.”; “You’ll want to see what has to be done”; “It’s hard to know what next year’s expectations are, so a commitment is hard.”).

Several groups discussed how greater training and support might be needed (eight out of 29 comments; offered by two groups), especially for those teachers with less technical background. Some teachers requested more instructional time, more hands-on experience, more structured meeting times with Pioneer at a more consistent pace throughout the school year, and a timeline where products were spread out. Only four of the 29 comments were criticisms of project support, such as delays in equipment and getting on-line; and limitations of the MetroLINC website.

In her interview, one former Pioneer summed up the advantages of MetroLINC:

I’d say MetroLINC is the biggest vehicle in the system to bring teachers together in the name of technology, to have teachers training teachers who are disseminating information sharing ideas and also an opportunity for teachers to get equipment, to get software, to get exposed to what’s new in the technology world. So MetroLINC is just really a great opportunity for teachers to learn more and get more. I think in the past when they gave away the equipment it sort of just sat there. Now that we’re showing teachers some wonderful ways to use the equipment teachers are more excited and more apt to use that equipment. It’s a great motivator.

CONCLUSIONS AND RECOMMENDATIONS

In Year 3, the MetroLINC project has clearly moved beyond being a technology infusion project in Boston and Watertown, to one in which there are more fundamental changes in teachers' professional development, classroom practices, and student learning. In contrast to Year 2, Boston teachers described a greater range of benefits and facets to the project beyond the acquisition of technological knowledge and materials, such as more critical examination of their own teaching approaches, and more fundamental changes in their classroom practices. Watertown teachers engaged in a number of innovative uses of technology in their classrooms, and articulated the ways in which those uses dramatically changed and enhanced what they normally do in their classrooms. We observed many instances of teacher collaboration within design teams, and the sense of teacher relationships and collaboration has grown this year.

Accompanying the increased depth and expansiveness of the possible teacher growth and classroom impact, come greater challenges in what the Project can address, support, and achieve. Below we list a number of observations, points of reflection, and recommendations. These points may directly apply to the Project activities for Year Four and/or to the final project year.

(Please note: For Year Four in Boston, there is a shift away from the previous Pioneer-Adapter design team model used in Years Two and Three to one in which there are two parallel streams of intensive project activity: 1) "Curriculum Model" Team Grants (largely based within a single school) in which teams of teachers develop particular curriculum model projects designed to be implemented across the district in future years, and 2) "Curriculum coach-coachee" training organized by specific subject areas and age groups. Boston teachers who are familiar with teacher productivity tools will be introduced to technology integration into classroom curriculum and asked to design some lessons of their own, thereby increasing the numbers of teachers who are able to reach the level of Adapter in Year Five. In Year Five, Boston plans to return once more to the previous Pioneer-Adapter Design team structure focusing on curriculum units. In Watertown, Year Four appears to be a more direct extension of previous MetroLINC work, with greater numbers of teachers being involved in developing and implementing particular curriculum units utilizing technology to enhance student learning, through both individual or team grants.

- The design team structure has worked well in Boston, with most pioneers offering valuable support to their adapters, and adapters looking to other members of the design team for resources and advice. A few Pioneers requested more project structure or requirements for follow-up meeting (for example, that teams meet at least once in the fall, and later in the winter), so that the pressure to organize the team was not solely left up to an individual Pioneer, given the competing demands placed on all teachers.

Teams in Boston will also need some support and structure in helping them become effective and efficient groups. In the surveys Year Four teachers filled out this past

summer, several teachers mentioned that something they hoped to gain from the year was “how to work well with a team” and “how to work better with colleagues on collective problems.” Teachers, as with many professionals, can be overly ambitious in what they hope to achieve, and may need some help in figuring out the number, scope and depth of the different components of their team project, and how work can be divided, and accomplished successfully over the year-long process. In addition to the newly required monthly reports, MetroLINC staff, through its application process, has tried to make expectations clear in what needs to be accomplished. The project should continue to support teachers to become good mentors and good team collaborators—neither skill is a given or a necessary outcome even if the desire is there. To offer leadership training or training in how to work effectively in groups, MetroLINC staff plan to work with TERC (a Cambridge-based group specializing in the use of educational technology by schools.) in the coming year.

- This year’s shift towards design teams residing within a school building did facilitate the ease with which teacher collaboration could occur, and Boston Team Grants for Year Four will take advantage of the single school structure for the team. Clearly, it remains easier to rely on existing relationships within single school, rather than to collaborate with other schools, or forge new relationships with other teachers. At the same time, the project should continue encourage some cross-building collaboration in Years Four and Five, as it will be doing in the curriculum-coaching groups, perhaps with schools in general geographic proximity and/or on the same “school bell schedule.” The project might consider some incentive and compensation which recognizes the challenge of cross-building work; e.g., cab fare to get from school to school for meetings, refreshment money for meetings, or release time so that teachers can visit each others’ classrooms. The evaluation team may want to track productive strategies adopted by the two, cross-school team grants in the coming year.

Pairs of teachers’ working on joint projects in Watertown were successful last year, as evidenced by the formation of strong collegial relationships and the production of high quality work. The new group projects in Watertown have the potential for forging further teacher collaboration and learning, but will need to convey clear expectations on how group projects will work: defining the role of the Pioneers and the nature of contact, collaboration and learning with their Adapters. Watertown might also look for opportunities to strengthen connections among teachers involved in various individual and team projects. The showcase for the district should assist with an exchange of information, as long as the timing of showcase for district does not conflict with holiday or other schedules (as it had in Year Three.) Plans for a Watertown section of the MetroLINC website should also facilitate this information exchange and collaboration.

- Cross-district collaboration between schools continues to be a challenge. One strategy might be to identify some core need of teachers that can best be addressed with cross-district contact, and bolster teachers’ desire to move beyond their own school system. One possibility is focusing on specialists in the two districts who may want to share information and advice with others in their sub-field, be it a specialist in music, foreign language, or technology, or those who primarily work with bilingual or special needs

students. For example, this past year, there were only two Pioneers who focused on music—one in Boston and one in Watertown—and unfortunately they did not have the opportunity to link up with each other. In contrast, teachers in Watertown who worked with special education students were very interested in joining training sessions involving teachers with similar student populations from Boston. Another possibility is focusing on curriculum units that center on interesting cultural or geographical issues that can benefit from sharing resources across districts, such as family history and immigration, or environmental studies of neighborhoods.

While teachers acknowledge how much they like working with people they already know, they also noted how much they enjoyed meeting new teachers with similar interests. Several teachers mentioned how much they liked the focus group session organized by the evaluation team in that it allowed them to meet by subject area, some for the first time in the project. This strategy of “like interests” will be addressed in the new structure proposed for Year Four in Boston’s team grants and curriculum coaching efforts (organized by subject area or by grade/age group), but the project should also continue to see how different team grants in Boston and the individual and team projects in Watertown can be encouraged to “cross-fertilize” and be matched up in different ways, whether it by subject area, age group, or special student population. The project might also consider how, in their dissemination efforts, conference panels might include members from both districts. Having both districts on the same MetroLINC schedule (by academic year) for the first time should also help with cross-district communication, making it easier to align final showcases, for example. However, there will be some challenges in Year Four since the nature of the year’s activities across the two districts are somewhat dissimilar from each other (Curriculum Model Team Grants and Curriculum-Coachee Training in Boston; versus Individual and Team Curriculum Units in Watertown), in contrast to Years Two and Three in which both districts focused on implementing a Pioneer-Adapter curriculum unit model, albeit with variations.

The Project is wise to continue offering a final spring showcase, to give teachers from both districts to share what they have done, learned and produced. Poster sessions appear to be a good vehicle for sharing information—its very visual nature concretely conveyed the approach of the unit and student work, and teachers enjoyed the opportunity to talk to one another about the poster. The Project might also consider some way to capture the poster sessions with digital images and text that can be shared and preserved on the MetroLINC web site, for both further referral by Year Four participants, as well as by former MetroLINC teachers, and eventually, throughout the district. There might be some advantage of thinking about the poster sessions somewhat flexibly, so that they can be called up not only by individual unit, or by subject area, but by technical application; e.g., what are different ways teachers have chosen to use PowerPoint in their classrooms, and to what ends? What kind of student products have been produced? How did teachers judge the quality of these student products, using rubrics or other scoring criteria?)

- When asked to identify areas of ways that they benefited professionally through MetroLINC this past year, teachers described a more expanded view of growth beyond that of the acquiring hardware and software, and technical know-how about software

applications, and discussed ways they critiqued and changed their own teaching approaches, broadened their content knowledge, and offered more student-centered, project-based, small-group oriented classroom experiences. This may be due in part to the more limited hardware resources offered to Boston teachers this year (offering up to two new computers, rather than four computers as in last year), the number of Pioneers who were part of MetroLINC last year, and are thus further up the learning curve in the integration of technology in their classroom and the ways they can offer support to their adapters, or that the project and the support it offers teachers have now evolved to a more developed stage. These more fundamental changes in teaching style -- such as a shift towards hands-on work in science, project work, group work, and student research on the Internet -- are exciting and powerful. They, however, also raises additional areas of teacher support beyond technical support as teachers rethink and strive to improve their teaching, areas such as pedagogical approaches; assessment and classroom management. It may be beyond MetroLINC resources to support these more fundamental areas, but somehow project staff may want to help MetroLINC teachers link up with possible information resources and sources of support, such as district workshops, relevant articles to read, or a list serve around particular educational issues and problems.

- A number of MetroLINC teachers are acquiring greater levels of expertise and experience in using technology in the classroom, and are to be encouraged to take on increasing leadership roles in their schools, districts and in the state. Project support for teachers to become coaches, lead workshops, and present at state-wide and national conferences should be continued and expanded. One Pioneer noted, in her discussion of teachers using PowerPoint for students giving classroom presentations, noted how little experience most teachers had in giving presentations in front of other adults. Thus, the project should continue to provide support for pursuing opportunities to teach other adults and give presentations, as well as acknowledge the kind of training and support needed to help teachers be successful. For example, in Year 2, a number of teachers described how useful it was to work closely with MetroLINC staff when preparing for their presentations for the Spring Showcase. For those who may shy away from public speaking, the project might consider web-site pages that can help showcase project work and lessons learned, or to facilitate on-line discussions amongst teachers using technology with their students.

The project should keep offering a variety of opportunities for pioneers and adapters to ‘move up’ system and take on greater role of responsibility, leadership, and recognition. It is a good investment on at least two fronts: it helps offer continued professional development opportunities for former MetroLINC teachers, and at the same time, utilizes well the growing talent and expertise of MetroLINC teachers to help train, inform and assist others.

- Through our classroom visits and observing the poster sessions of the Spring Showcase, our evaluation team saw many examples of student work using technology, work that addressed district and/or statewide curriculum standards. Teachers were able to describe their unit in terms of which standards were addressed, and activities were clearly linked to core subjects taught in schools. These visits and poster sessions, coupled with our

interviews, also makes evident the wide diversity of curriculum units, subjects, and student populations being addressed. On the one hand, it speaks positively about the breadth and expansiveness of the “reach” and impact of MetroLINC. At the same time, it underscores the complexity in defining a core set of student learning outcomes that can be easily tracked across classrooms, individual students, and project years, particularly as documented through standardized test scores. We suspect that across the various classrooms, there has been an increase in certain types of student work that embodies powerful and important learning, such as an increase in independent student research projects, using a variety of primary sources and other information sources on the Internet and on CD-ROM, an increase in students’ presentation of their original work using PowerPoint, and HyperStudio, an increase in emergent literacy experiences for young children and children with language challenges through Intellitools and graphic packages such as KidPix and Clarisworks. However, these gains are largely dependent on the nature of the MetroLINC unit and the skills with which an individual teacher implements the units. Thus, not only is it difficult to clearly define the treatment that students in MetroLINC classrooms are receiving, it is also very difficult to define a key set of learning outcomes in which all, or even a sizable subset of the students who have been part of MetroLINC classrooms, can demonstrate on standardized tests.

We do not wish to minimize the gains that students may make in their technical skills (e.g., learning to use word processing, or a spreadsheet). Nor do we wish to minimize the possible motivational boosts that students may experience through their use of technology (e.g., they like working at the computer, so they’re writing more and take more pride in their writing). However, if we wish to ascertain the ways in which the particular curriculum unit, or the type of MetroLINC training and support received by teachers does make a difference in student learning, we will need to make a closer look at the ways in which the use of certain technological tools do in fact enhance specific aspects of students’ learning in language arts and literacy, science, and mathematics. We have glimpsed some of the possibilities from comments made by some teachers, such as: how PowerPoint presentations can help “force” students to identify and extract main points, organize their ideas sequentially, and be succinct in expressing their ideas; how the Internet, with its endless bounty of information, forces students to be focused and precise in their question-asking, to think more deeply about what questions they have, and where their interests and curiosities lie and may take them; how graphing tools encourage students to think flexibly about data and data collection, gets them more interested in asking questions of the data and extracting information from graphs.

This coming year, the evaluation team will be specifically tracking the team grants in Boston and teacher projects in Watertown that will be concentrating on the areas of literacy and science. By exploring more deeply how these teachers see technology as enhancing student learning in specific areas, and observing on-going work with students, we can target the specific types of learning outcomes that should result from these curriculum models, and where evidence in increased standardized scores will be most likely in both districts in Years Four and Five.

The increased focus on assessment in the team projects in Year Four—how can teachers’ judge how good a student’s work is, or whether there is improvement—through rubrics and examples of student work at different levels of mastery, will also assist this endeavor.

- MetroLINC’s provision of new hardware and software to teacher participants has proven an important part of the project’s success thus far, and should be continued. The hardware and software clearly provides an strong incentive to participate, given busy schedules and existing commitments. These incentives have linked hardware and software directly to new curriculum initiatives and it continues to move teachers up the learning curve, with new challenges. Teacher collaboration and increased access to information and resources was also identified by teachers as strong benefits of the program. As the Project nears its final years and will have dwindling funds for incentives, staff might want to explore how professional development and curriculum reform efforts can be formally coupled with districts’ future distribution of hardware and software to teachers and schools.

The amount of computer hardware available in a given classroom greatly influenced what happened in that classroom. In Year Two, all MetroLINC teachers in Boston were eligible for up to four new computers, which enabled teachers to have a third of their class, or sometimes even close to half, work on computers while the remaining students were engaged in other classroom work. (Three students per computer could accommodate twelve students at a time.) In Year three, Boston teachers could receive only up to two new computers. These will work as learning stations, but can not accommodate a third or a half of the class, as seemed to be possible in Year Two. It may be difficult for Boston to reach its desired goal of four students-per-computer, as planned at the outset of the MetroLINC Project. Thus, teachers will need to be offered classroom management suggestions, models of how to best utilize two or three computers in the classroom, which raises a very different teaching model than what many teachers have done (i.e., all students doing the same thing at the same time). Teachers could also use assistance in optimal ways to use the school’s computer lab, which involves coordination and collaboration with the computer technology specialist and has all students working at the computer at one time. For some projects, this may mean parsing the curriculum unit in different ways into discrete phases, steps or tasks, or breaking down a large class project into component parts that can be tackled by teams of students. Better use of the computer lab would offer an attractive alternative for Boston teachers with two-to-four computers, and a necessary strategy for Watertown with its one-computer classrooms.

- Teachers responded positively to the Summer Institute and culminating Spring Showcase, and less so to Cafe sessions offered throughout the year. As results to teacher feedback, the MetroLINC staff in Boston will not be offering Cafe-type sessions to teachers in Year 4, but rather full day release days of training for Curriculum Model Team Grant members, as well as smaller group call-back sessions focused on the needs and interests of particular curriculum-coach clusters (organized by subject area or age group). In Year 5, if Boston does return to offering Cafe-type sessions for Pioneer-Adapter teams, it might consider offering a better balance hands-on time and discussions/information sharing between teachers; rotating locations and times for the events, and

offering the workshop on classroom management workshop early on in fall, rather than waiting until spring. Other topics include coordinating student work with each school's computer specialist, as well as an interest in designing web tours, learning of good Internet sites and resources. Teachers also appreciated when MetroLINC staff were able to visit their classrooms and helped them trouble shoot problems.

- Teachers still report technical problems of getting on-line. While the problem may be with the ISPs they are using, there may also be problems with the MetroLINC website and its interface. The project needs to continue to develop its website, both for the project participants (including threaded discussions, and private workspaces) as well as for a wider set of teachers and an interested public. Using the site to communicate and share ideas will spread the MetroLINC content and strategies more widely in the two districts and elsewhere. Using local funds, Boston has purchased a larger server, which should help with technical performance.
- It will require continuing attention to track how MetroLINC can compliment, rather than compete with, high-priority district initiatives. Towards that end, MetroLINC efforts can encourage greater integration of technology the learning objectives of these other efforts. This strategy also encouraged greater collaboration between technology staff and curriculum leaders and school reform groups. Having the professional staff working more closely together will yield more substantial outcomes for all.
- The growing bilingual population seems somewhat isolated in this project, in spite of some attempts by MetroLINC staff. Can the MetroLINC Project take a greater initiative in incorporating Spanish- or Chinese-language collaborations, special software, emergent literacy, web-sites with things related to Hispanic or Asian cultures, histories, and resources? Are there possibilities for new partnerships that can engage these minorities in schools or at home? Two of the initiatives planned for Year 4 -- working with Wheelock College on Encarta Americana focusing on social studies, and African American history; and the Differentiated Reading, focusing on special education students, bilingual students and language arts involving teachers developing summaries of core literature so that all students may participate in literature -- are worth monitoring in the coming year.
- To build a sustainable community, the MetroLINC Project needs ways to continue to support former Pioneers and keep their interest in the project sufficiently high. There are possibilities for special events, invitations to Showcases, offers to participate in conferences, and other means to keep them involved. Perhaps some special interest groups (SIGs) can be useful and worth establishing in Year Four, with expectations for continued growth in Year Five and beyond.

APPENDICES:

- I. Case studies
 - A. Westfall
 - B. Faraday
 - C. Watertown Middle School

- II. Data collection instruments
 - A. Initial survey
 - B. End-of-year survey–Boston
 - C. End-of-year survey–Watertown
 - D. Teacher interview protocol
 - E. Focus group protocol

Westfall Elementary School

Westfall Elementary school is a large school in the Boston Public School District's "East Zone." It has a student body of 840 students, which is predominantly African-American with a fair number of Hispanic students (68% African American; 27% Hispanic; 4% Caucasian; 1% Asian).

We spoke with five MetroLINC teachers at Westfall: Rina, the school's computer specialist and two-time Pioneer; two of Rina's current adapters, Laura, a 3rd grade teacher and Heather, a 3rd grade bilingual teacher; Jane, a special education/bilingual teacher of 3rd and 4th graders, who is an Adapter with a Pioneer in another school; and Vanessa, a 3rd/4th special education teacher, who was an adapter last year with a Pioneer in another school. Their experiences are described in the sections below.

Rina, is an energetic, out-going two-time Pioneer who is the sole computer specialist in the school. A veteran teacher with many years of teaching experience, she works with 650 students, and has used MetroLINC activities with all 650 students, over the course of the entire school year. Like many computer specialists, she typically meets with a number of individual classrooms in the school once a week, for 45 minutes. Rina is actively involved in many of the key initiatives in the school, not only is she a member of the ILT (Instructional Leadership Team), but is involved in the IDR (In-Depth Review) process required by the district of all Boston schools, and is the lead teacher in the Data Based Assessment work.

When asked why she became involved in MetroLINC not only for one year, but for two, she responded, "Part of it is that I like an on-going challenge, so I wanted to do something a little different. I did writing and publishing the last year, and I feel strongly about getting math integrated into all the curriculum areas. I find that to be a weak link, with the technology. And I wanted to investigate it more, and talk with people interested in it. I also really enjoyed the people I worked with; I enjoyed the other Pioneers. I've known a lot of them for a long time, and we're a very good support group for each other. There were a lot of different people this year, which was challenging, because it's easy to get comfortable in your own little domain, so it's kind of nice to be thrown out there in the world, with people who don't know as well. Plus I had a lot of people in my building, who wanted to be Pioneers, and would do it, if I worked with them. And I felt really strongly that I wanted to get technology into some of these classrooms that didn't have it. So it was a good reason to do it."

Last year, she had a team of five adapters. Even though only one of the adapters was a fellow teacher at Westfall (a resource teacher for reading and math, for 2nd-4th graders), and the four other adapters were in four different schools, they met regularly as a team throughout the school year. Furthermore, the team had shared a room at the Summer 1999 Institute with two other design teams and the large group simply "hit it off." The three design teams continued to be in contact throughout the school year, meeting several times at one of the three schools.

Rina's team of seven adapters this year included three fellow teachers from Westfall, and four adapters from four different schools. When asked how she formed her group of three teachers from Westfall, she described how, as the technology support person in the school, any time she hears of any good opportunities, she posts it in the building, and urges people to apply "since we really need to get more technology to the building. We were supposed to get 212 machines and we only have 60 something. So our target rate was really off."

She has a good sense of the variety of teachers in her school, and in many ways, serves as a "matching service" to pair teachers with appropriate kinds of technology training opportunities. "Some people, even if they had machines, they were intimidated about using them in their class. Because they didn't know about classroom management...And there are others who really want stuff, and say, "if anything comes up, let me know." So I would just go out and tell anybody, "if you're interested in this, go and sign up." And there were others that I knew I could work with personally that, like Laura, she's a good math person. And Heather, I had worked with many times, and she really wants more technology in her classroom. And she's good—if she says she's going to do something, she really does it. They are people you know you can work with really well. A few people approached me and I said, "Great." Others approached me, and I said, "it sounds like you want publishing," and they signed up for other workshops. There were some people who really wanted to be a Pioneer, but they really should have been coaches, who were coached first. So some of them are being coached this round, and that's a little more helpful for them."

When thinking back upon her MetroLINC experiences the past two years, Rina reflected on how she was able to meet regularly with her design team last year. This year the team wasn't able to do nearly as much due to a variety of new district programs, such as a literacy initiative that involved some teachers in up to 40 hours of professional training and the school's effort to implement some of the findings from their In-Depth Review from the previous year. In addition, the Developmental Reading Assessment (DRA) test loomed large, and involved many of the school specialists (including Rina) in administering it individually to each 3rd grader in the school—and effort that took over two months to do. "So instead of doing what I did for the first year—where we had standard meetings that we had planned and met as an entire group so many times and met outside, etc. I did individual tutoring. We didn't meet as an entire group the second year. This was more one-on-one, or two-on-one, or for those people who weren't in my building, a lot of e-mail. Because there was no other way to do it, because everyone was involved in these literacy training programs for the elementary level, and they just didn't have the afternoons."

Rina went on to describe the advantages of working with adapters right in her building: "If you had a person in your building, it was do-able. I don't feel I gave the quality of time to people outside the building. I think the model should be almost within the building, or within a certain geographic range, because it's much easier to get together."

(There's also the problem of some schools getting out at 2:20, while we get out at 3:40.) I was lucky because most of the people in my building had the same lunch period or planning period, or they stayed after school. So a lot of days, I told them, 'I'm going to show you how to do the unit on the web site. If you want to come in today, we could meet after school.' We'd stay for 45 minutes and go through it, and the next day, people would come in with their unit during P&D and sit at one of the machines while I was teaching, and if they had a question, they could ask me."

A few of her Adapters from last year wanted to be Adapters again, but they learned that they couldn't get another computer, and weren't interested in getting only a scanner or something else they weren't sure they needed. So she's still sending them information about web sites, as well as worksheets of interest, even though they're not officially part of MetroLINC this year. According to Rina, "The lure is still the hardware. The support is a strong lure too. They like the networking. But I think a lot of it is going on informally in schools. We've had a lot of workshops, and meetings, school-wide. But the big thing is getting the machine in your room. And once you have one, you need two. And once you have two, you need four."

Laura is quiet, self-effacing, veteran teacher who teaches a 3rd grade class of 28 students. According to Rina, Laura is a "one of the best math teachers around, and is great," because two years ago, Laura would not touch a computer, except perhaps for an Apple IIe. So she's come a long way—she has one at home now, and she has two in her classroom." Her MetroLINC unit was a social studies unit focusing on Boston between 1630 and 1776. While Laura handles "all the instruction," her students do their Internet research in the computer lab under Rina's supervision, since Laura's classroom is not networked.

The main mathematics connection in the unit is use of the timeline and the complexities of students' understanding the sequencing of events along a timeline. Laura's students also work on their timelines in the lab since it is a Mac application, and Laura's classroom is PC based. In their regular classroom, students do word processing and use KidPix to generate various writing and reports. Laura's unit went so well that Rina, as the school's computer specialist, is now using it with six other classrooms in the school, the entire 3rd grade (the four other 3rd grade classrooms aside from Laura's, including one bilingual class, and two SPED classes. When asked why she was interested in joining MetroLINC, Laura said, "I wouldn't have done it if Rina weren't here. We work well together, and I'm not going to travel from one building to another. [It's hard being a "late" school.]"

Jane, is a friendly, exuberant teacher who works with a special education/bilingual class of nine 3rd and 4th graders. Computers have been a significant addition to her classroom this past year. She primarily uses language arts-oriented software (e.g., Chicka Chicka Boom Boom; software featuring stories read aloud) with her students, to give them additional exposure to reading, writing, and the English language. Prior to this year, she had students work at a learning center listening to audio tapes using a tape

recorder while they looked at books. Jane sees the computers as offering a superior experience to children, given that the language arts software allows children to see the highlighted written text while hearing the spoken words, with the speech being particularly helpful as a model for children's learning to pronounce English words. Furthermore, she felt the computer gave her students who work with an occupational therapist, valuable practice with some of the hand-eye coordination needed for using a mouse and keyboard. She also felt that children who tended to be distracted seemed to work in a more focused fashion at the computer.

When asked who she talks to about technology in the school, she said, "Mostly Rina, since she takes some of my kids. She tells me what they're doing, and that some of them are better than her regular students." Rina has also helped her with certain projects she's taken on, such as producing a graphics-oriented train of animals, or giving her some science-oriented software when she was seeking something in science. With Jane's pioneer being at another school, communication has been difficult, especially since Jane does not have an Internet connection in her classroom for e-mail. As a result, Rina has served as Jane's surrogate "in-school" Pioneer. Rina has communicated regularly with Jane's Pioneer, and helps Jane in much the way her Pioneer would, if she were residing in the building.

Jane says that she has contact with another Westfall teacher who was a MetroLINC Adapter last year, "because she's bilingual. So I go and see what they're doing." She's met with two of Rina's current adapters, Laura and Heather, and she also has gone to see what others in her school building are doing with technology, particularly the groups that have emerging readers, and an autistic class that's using Intellitools. She feels that her contact is different this year, due to MetroLINC: "It's better, because through MetroLINC, I have something in common. They are regular classrooms, mine is ESP. And having the computer, makes me go in and ask them what they're doing, or getting some ideas. It's great...[for example] I saw something Rina was doing with timelines, so we did it with the kids, when they were born, etc."

Jane's interested in learning about Intellitools, seeing how it would benefit her students, but says, "It's overwhelming. Rina doesn't have the time to come down [to my classroom]...and there's only one for the whole school to use. I have one girl who can barely talk, but she loves the computer, but her vision is very limited so it's hard for her to read the screen. I have two kids who would really benefit from it."

Jane sees the opportunities to connect with other teachers as one of the most valuable aspects of MetroLINC. "One teacher, a speech therapist, asked me how I got my computer. She said, 'I didn't know there was a program like that, that's really nice, because I was thinking that I should buy one myself.' But a lot of times they think that there's too much work: 'they should just give [the computer] to me.' But then, you're not exposed to all the teachers. If you don't make the commitment, you limit yourself because you don't go out of the classroom. You don't see what other teachers are doing. There are wonderful things happening in other classrooms. Even here, you go to Rina's, and I am amazed what they can do with the computers."

Heather teaches a third grade bilingual class, with 26 students. Like Laura, she is one of Rina's current Adapters this year. In her classroom, students use a variety of software, including language arts-oriented software programs, and tools such as AppleWorks and KidPix. She has done a variety of computer projects with her students, including reports on famous African-Americans, essays on what they might dream for, writing "All About Me," and writing spring poems in Spanish, using the first letters of "primavera." In the area of mathematics, each of her students has produced a bilingual counting book, using KidPix with pictures, which they have donated for use in the first grade classroom. She believes that the work that the students have been doing is enhancing their reading and language arts skills, and that their writing is better and spelling is better. "Kids are checking their work, doing editing, and writing more on their own." She noted that several students who have computers at home are writing at home and printing the work out in order to bring it into school to show her.

Heather says she turns to Rina if she needs help, and that she will work in Rina's lab, and continue that work back in her own classroom. She says she found the various MetroLINC activities very helpful, and gave her some good ideas of what others do in their classroom. She says she learns best by "doing" (and felt that some of the cafes sometimes involved more sitting and talking), and asks Rina if she has any problems.

Vanessa is a special education teacher who works with third and fourth graders who are language and learning disabled. She was an Adapter last year, with a Pioneer in another school. Her project last year involved students doing research on the internet, writing a report and doing a presentation. Not being networked, her students used Rina's computer lab to do their research, but did the word processing and "putting it together" in Vanessa's room. Her students enjoyed the work, "because they could relate to it. They picked their own animal, did research on the Internet, went to the library. It had a timeline, and was a real project. My kids, the special ed kids, felt more mainstream—it was their product." This year, her class is continuing to do research reports, but she finds it rather tough, since her classroom is still not networked.

She became involved in MetroLINC because Rina encouraged her to apply; similarly, Rina encouraged her to be a district technology coach, which she also did pursue. Vanessa said that she would have chosen to be in Rina's group, but felt that there were too many people applying, and that it was too competitive, so chose a Pioneer who would not have as many people. The Pioneer she chose had been a former mentor of Vanessa's at Vanessa's former school, and they continue to be in contact. Like Vanessa, her pioneer also works with a learning disability class.

Within the school, she continues to talk about technology with Rina, whom she sees as "a resource for the entire building. She supports you in every single way." Rina encouraged her to be a Pioneer this year, but Vanessa felt that she couldn't meet the deadlines and requirements that would be asked of Pioneers. She also continues to talk with another teacher who was an Adapter last year. Interestingly, her husband was also

an Adapter last year in a different school, and she continues to talk about technology with him on a regular basis.

The MetroLINC teachers at the Westfall School exemplify the ways in which an energetic, dedicated Pioneer can serve as powerful catalyst and facilitator in a school to enhance the use and integration of technology amongst its teachers and classrooms. As the school's computer specialist who was a strong advocate for building the technological expertise and resources in her school, the Pioneer fully embraced the MetroLINC project and actively drew a variety of colleagues into the program whom she felt could benefit from, and contribute to, the program. This computer specialist also worked tirelessly in staying informed of what different classroom teachers were doing with their students, and seeking ways to support and connect her computer lab activities with what students were doing in their classrooms. Colleagues saw her as a valuable source of support and expertise, and also used their participation in the project as a personal opportunity to work with and learn from other teachers in the school, and to acquire additional technology expertise. MetroLINC also afforded the opportunity for this veteran teacher to take on additional leadership in the district, serving as a Pioneer for teachers in other schools.

Faraday Elementary School

Faraday is a large elementary school in the Boston Public School's "North Zone," near Chinatown. It has 880 students in grades K-5, and a predominantly Hispanic student body (72% Hispanic; 25% African American; 2% White; .2% Asian).

We spoke with five MetroLINC teachers at Faraday, each involved in aspects of the school's technology program: Katie, a speech therapist, was an adapter last year and became a Pioneer this year; Jean, another speech therapist, was one of Katie's adapters this year; Peggy is one of the school's two computer specialists and is a current Pioneer who was an adapter last year; Kelly, the school's second computer specialist, is one of Peggy's adapters; and Lawrence, a teacher of a first grade bilingual class, was an adapter this year with a pioneer in another school. It seems best to describe each person's approach to their technology activities.

Katie, a young, highly personable teacher, is a speech and language pathologist for the district. Faraday school is one of three schools she currently serves, and there she works with a total of 45 students drawn from five different classrooms. She has used her MetroLINC project with 30 of her students.

Last year, she was an adapter, and became very involved in the use of Intellitools (a graphics-oriented software tool with speech and text that allows teachers to create special lessons and assistive keyboards) with special needs students. Even as a new teacher and new adapter, she showed great promise as a trainer and "champion" of the use of Intellitools, and gave several presentations in the district over the past year. This year, she chose to become a Pioneer, and actively served as a leader for seven adapters. She also became involved in two programs at the "Access to Technology Center" based at a local college: teaching a five-week course on advanced curriculum use of Intellitools, and participating in a DOE grant program, Technology for Inclusion.

Katie is a member of this year's school's technology committee, and so discusses issues about technology with Peggy and Kelly, the school's two computer specialists and fellow MetroLINC teachers. When asked who else she talks with about technology, she also mentions the classroom teachers whose children Katie's works with, and "actually every teacher I've worked with I've talked about technology. How could I not?"

Only one of her seven adapters was at Faraday (a fellow speech therapist with whom she shares an office) and the remaining six adapters taught at five different schools. Last summer, we observed her working with her group at the Summer Institute, and it was clear that Katie was extremely dedicated to her group members' successful adaptation of Intellitools for use in their specific programs. She has had regular contact with all of her adapters this past year, in various ways:

Starting in the fall I had a meeting right away to get them started. And then we had another meeting last semester. And between those times it's been e-mail and phone. And then, in particular, Jean works with me here [at Faraday] so that's been easier.

...of the seven [adapters] I actually see four regularly throughout the year. And of the other three, one of them I actually spent a lot of time with her individually to help her with her project. As easy as I thought it was, for some people it wasn't as easy. She needed some extra help and that was fine. The other two have been just very independent. I've e-mailed them and talked to them on the phone. I think seven was actually too much, especially out of school.

This spring, we interviewed two of Katie's adapters who taught at other schools. Both were extremely positive about Katie as a pioneer. One of the teachers said, "Katie is God. There is a whole group of people out in the world who think Katie is God. She knows everything. ...She is the most amazing, well put-together person I know in my whole life...I talk to Katie a lot. We e-mail."

As a new teacher with only three years of teaching experience, Katie has clearly gotten as much out of this project as she has put in. Very humble about her achievements, Katie talks about how she would never have imagined she'd be able to handle public speaking, but that through MetroLINC, has had an opportunity to discover her strengths as a teacher-trainer, getting involved in several district initiatives around assistive technologies and special education, and teaching courses at a local college.

Her work as a MetroLINC pioneer is having an influence throughout her professional community. She has been involved with her own adapters, the classroom teachers whose students she assists, her speech/language colleagues, and teacher education activities at a college. MetroLINC appears to have gotten a very good return on its investment. It may be that Katie has found her niche in continued learning and leading, but she believes that MetroLINC was a catalyst for her to become a leader in her profession.

Jean, is a colleague of Katie (they work out of the same small office) and her adapter this past year. Jean is also a speech pathologist, working with early childhood, kindergarten, 1st, 2nd, and some multi-handicapped kids. She works with 38 students (8-9 teachers) all of them at Faraday, and used her MetroLINC unit with 9 of her students. When asked how she became involved in MetroLINC, she replied, "I share an office with Katie. She did the pioneer-adapter grant last year, and I watched her with the Intellitools and I thought, 'Wow! That's a really, really great thing.' So this year when she was going to be a pioneer, she just encouraged me to sign up." She has daily contact with Katie and often discusses their use of technology to solve speech, language, and learning problems.

Since their hardware is incompatible (Katie has a Mac and Jean has a PC), they have not directly shared any of their teaching materials, which Jean feels, "In a way, it's good because it's encouraged my creativity and heading off in other directions. On the other hand, it's kind of too bad because you can't share the materials." She has had her students, some of them who are non-verbal, work on a variety of language skills (tracking

from left to right, sequencing, sentence production, prepositions) in activities that utilize children's literature, such as Eric Carle's Brown Bear, or games, like Simon Says.

When asked if she's had contact with other MetroLINC teachers, she mentions Kelly and Peggy, the two computer specialists. Through Kelly, she learned more about the software program, Inspiration, and has used it with her first graders. She has not had contact with Lawrence, another MetroLINC adapter in the building who has been collaborating with a Pioneer in another school. This lack of communication, she feels, is probably due to "the fact that his is not a class that I work with and that since he's in the bilingual section, it's difficult to cross paths."

For technology questions, she goes to Katie, Kelly and Peggy. She says the projects have "really gotten me more into technology. I did some coaching...then that led to my teaching a PowerPoint class with Kelly. It's led me to improve my own computer skills."

She also feels that her use of Intellitools in the MetroLINC project both focused her therapy and energized her teaching. "Sometimes you get stuck in a rut. You find yourself doing the same thing every day...This year I've found with the technology that I've had, and the access to computers, I have had the best year that I've had in years. Sometimes by this time of the year I feel like 'It's May, I can't do it,' but I don't feel like I've run out of ideas. I feel like I can keep being creative right up until the last day of school...It's so easy to create an activity. It helps me focus my therapy in the direction of the things [the students] are working on, without spending six hours on the weekend finding the pictures in a magazine, cutting them up, and pasting them on paper."

Peggy is one of the two computer specialists at Faraday. A current Pioneer, she was an adapter with a pioneer at another school last year. Like many computer specialists, she works with over 400 students in the school, typically meeting with a class once a week for 45 minutes, and has used her MetroLINC project with all of these students. Prior to MetroLINC, her lab had 20 computers and she now has 24 computers.

Of her five adapters, only one was a teacher at Faraday, with the remaining four teachers spread over two different schools. She regarded her adapters as fairly independent, and much of their contact was by phone. "They all had a good idea of what they would do. Narrowing it down to the actual focus was, I think, maybe a problem for a couple of them...I also thought that they were for the most part super-achievers. They planned these projects, and I thought, 'it doesn't have to be this all-encompassing'...They actually did do more than I thought they could get done and it looked great...I think everybody produced projects that could really be adapted for use in other classes too."

The adapters supported each other, and did not need to turn only to Peggy for help. "I thought we were a pretty good team consulting with each other for ideas. I know that two of the teachers got together. One of the teachers was at the Griggs school and she worked with one of the teachers at the Morgan school. They felt that they could rely on anyone, not just me."

Peggy did have some contact with Katie, although “Katie has a totally different set up than I do.” Katie did load an Intellitools program on one of Peggy’s computers, which Peggy then used with a group of kindergarten students. However, in general, Peggy did not feel she had too much contact with the other MetroLINC teachers at Faraday, due to time constraints, and district initiatives for professional development. “Most of my contact was attending meetings. Everybody is so busy you know. It’s like whenever we have professional development day, it’s all planned out. It’s not like you can stop and just talk to somebody. It just feels like everybody’s rushing around constantly and you have a chance to talk to somebody only when you’re standing in line to sign out or something.”

Kelly is the second computer specialist in the school, and an adapter of Peggy’s. This is her second year at Faraday, and her third year as a computer teacher. Before that, she had done a part-time reading program for four years, and had been in a 4th grade classroom. Like Peggy, she teaches about 450 students (each is responsible for half of the students at this 800+ student school) once a week, and used the MetroLINC unit with two of her classes (total of 56 students) over the course of the entire school year. While her lab has a sizable number of computers in her lab, it is not networked like Peggy’s.

When asked how she became involved in MetroLINC, Kelly replied, “Peggy. When I arrived at the school Peggy told me she was doing an adapter program. That was my first year at the school so I didn’t get into it. But this year I dove into it. It was a great opportunity to collaborate...teach each other things and learn things...I think it’s made the contact better. This lab wasn’t here [last year], so we didn’t have a lot of collaboration or lesson planning. So the adapter project brought us together and we kind of planned out the units together.”

For her MetroLINC unit, Kelly had two of her fourth grade classes work on a project called “An Object’s Journey” in which students thought of an object of interest and did some creative writing about that object’s destination and what it might have experienced. Her project ran for about eight weeks in the fall. She used Inspiration, which she thought was great, to help students brainstorm: what kind of objects they might choose, why they would choose them, what kind of destinies they could have, what some ideas for the journeys. She felt the students learned “a lot of basic writing skills. Putting things in sequential order, paying attention to detail, grammar, rewriting sentences and fixing them.”

When she has questions about technology, Kelly says she turns to Peggy, and that they meet at least once a week, made easier by the fact that their labs are adjacent to one another’s. She feels that “this program made collaboration and team work available. Without this project, I don’t think the collaboration would have taken place as often as it did.”

She says that the “biggest problem is that we don’t have enough time to talk with homeroom teachers.” When asked whether she designs her own units, or works collaboratively with the homeroom teachers, Kelly responds, “we talk about that in our

specialist meeting that we can't do everything that the homeroom teachers want us to, because then our individuality, our creativity is gone. The question is how do we collaborate more with home room teachers?"

As far as talking with other MetroLINC teachers in the school, she says she has talked with Katie and Lawrence. She worked with Lawrence's class earlier in the year, but then his class was no longer scheduled to come to her lab after the fall. She said that in the first grade students are introduced to the computer hardware and keyboarding. Since "Faraday is a literacy-based school, I do a lot of reading and stories with children, and then I use Inspiration as a kind of foundation to do some story webs and story maps." She wishes she could have done more things with Lawrence's class, and regrets not having planned it as well as they could have.

Like Katie and Kelly, Lawrence is a relatively new teacher at the Faraday, having taught there for only a few years. He teaches a classroom of 16 bilingual first graders. He said he became involved with MetroLINC because he wanted computers in his classroom, and learned about MetroLINC from the vice principal, who suggested he become involved since he already had the technical skills, having previously built web sites and done other technology work at his former job in another school district.

Lawrence worked with a Pioneer in another school, one who had proposed a literacy-based social studies unit based on "Make Way for Ducklings." His goal was to have students write stories and then have them published on the web. His unit did not turn out as planned, however. He found that "word processing is out of the question" for his first graders, concluding that it required too high a level of skill. Thus, he had students write stories by hand, including some stories based on the Make Way for Ducklings book. Students wrote the stories in English, then they were then translated into Spanish. Lawrence then took the stories and entered them using a word processor, and bound a book of the printed work for the classroom.

Lawrence had also wanted to collaborate with a teacher in Puerto Rico, but was unsuccessful in arranging the contact. Furthermore, not having an Internet connection in his classroom, made it difficult to achieve his goal of both communicating with other teachers, and publishing his students stories on the web. "Technology wasn't really huge, because I have certain limitations. For example, I wanted to have access to the web all the time, and that wasn't possible this semester. We take turns to use the lab, and my grade was not selected to be part of the lab [this spring, when I did my MetroLINC unit].

Lawrence appeared to have minimal contact with his Pioneer (who was in another school), and turned to Peggy and Kelly if he had questions about technology. However, he seemed to feel that much of the training that they provide in the school is for teachers "who are almost computer illiterate. So the level seems to be a little low for me. And there hasn't been a lot of opportunity for me to be part of her group."

He did say that he's had some contact with another teacher who is involved in Intellitools (presumably Katie) and "she wanted me to get involved with using Intellitools with kids

who are not special needs...we haven't gotten to that point yet but it will take place in the next few weeks." He has also talked with Kelly about the Inspiration software, but in not much depth, basically knowing that it is used to make semantic webs, but not much beyond that.

Ironically, for a teacher with strong technical skills, his students appear to have had quite limited hands-on experience with the computer. Having worked with slightly older children in another school district, he seems to feel that word processing is much too hard to be attempted by his students, and simply had them write things out by hand, which he later entered into the computer in order to publish a class book. Lawrence seemed to have a very specific idea of what he wanted to accomplish, e.g., publishing stories on the web, and communicating with a teacher in Puerto Rico; and when he found out that his classroom was not networked, he did not seem to be sufficiently flexible to try anything else. He was very focused on the hardware (he says that receiving the new computers was a major factor in becoming involved in MetroLINC), and seemed very disconnected to the other MetroLINC teachers in the building, despite clear attempts from Peggy and Katie to reach out to him.

Lawrence did post his lesson on the MetroLINC web site, but has not gotten any responses. He believes that first grade bilingual education is too narrow an area to get others involved. He seemed largely unaware of other teachers in the district attempting to use software and technology with bilingual students, despite the large number of Hispanic students in his school, and in the district.

The Faraday School provides a look at how two types of specialists—speech therapists and computer specialists -- can use technology to enhance the language and literacy experiences of their students. The MetroLINC project afforded the opportunity for several young teachers new to the teaching profession to gain technological expertise, as well as take on increasing leadership opportunities in their schools and districts, as well as can renew the teaching of more seasoned teachers. At the same time, a teacher, however, can also choose not to take full advantage of MetroLINC, and remain generally isolated within his or her classroom, and less open to trying a variety of ways to successfully affect the technology experiences of students, despite the efforts of colleagues and project staff. The Faraday, thus, underscores both the promise, and challenges, of building school-wide change and teachers' professional development.

Classroom Snapshots from the Watertown Middle School

The Watertown Middle School is the sole middle school for the district, serving grades 6th through 8th. More than 600 students attend the school. While the student body is almost exclusively Caucasian, it reflects the ethnic and economic diversity of the town, with many second languages (e.g., Armenian, Greek) spoken in the district.

We spoke with five teachers at the Middle School: Michelle and Kim, two foreign language teachers who did a MetroLINC project together; Dave, an 8th grade science teacher; Kay, a Resource teacher for the 6th grade special education students; and Jennifer, a home economics/family science teacher.

Michelle and Kim are foreign language teachers in the Middle School. Michelle teaches both French and Spanish to 8th graders, while Kim teaches Italian and Spanish to 7th graders. They share responsibility for teaching 6th graders, with both teaching Spanish and Kim also handling French. Although the two teachers don't normally work together, this year they collaborated on a technology project for MetroLINC. Their project had students create a multimedia trip to Italy or France. Kim's 7th grade Italian class designed a virtual trip to the major cities in Italy and Michelle's 8th grade French class created a trip to Paris.

Following a planning process offered by the Watertown MetroLINC director, Michelle and Kim carefully planned the project requirements and structure. They designed their unit using the MetroLINC web space, including articulating their goals in the subject area, skill areas and technology, and citing the Massachusetts Curriculum Frameworks. The student projects involved a HyperStudio stack included an introduction (a description of the trip, time they left, what they visited and their return flight), along with a title page, a map (down-loaded from the web into HyperStudio), a paragraph written in the target language, or a paragraph about themselves.

Students had to go to the city, describe what they saw and describe coming home on the plane. They had to use different tenses with the time change and use prepositions accurately. They had to download 3–5 monuments or historic places or a river or boulevard and label the graphic. Students inserted pictures of themselves using a digital camera and included an audio recording their name or a whole paragraph. They also had to do a bibliography which cited Internet sites, magazines, and books. The photos of monuments they downloaded from the web and imported into HyperStudio required sizing and shaping of images. Each report also had to have a concluding page.

Students worked with the unit for three weeks in the fall, for a total of twelve days. Michelle said it took them three days to teach HyperStudio and then about two weeks working in the computer lab. "We had to finish by December. Ideally we would do it in the spring," once the students had more language. Both teachers would have preferred the MetroLINC cycle to be the school year, not starting in the middle of the year. Given

the different grades and skill levels, there were differences in the amount of French and Italian required in the text. Some 7th graders wrote in English. The 8th graders could only write in French. The classes were a nice manageable size, with Michelle teaching a group of ten students, and Kim teaching twenty students. They felt the ideal number of students would have been fifteen, for taking advantage of the seven computers in the lab which had licenses for the HyperStudio software.

As other teachers also mentioned, Michelle was nervous about having her students use the school's computer lab. "I was a wreck taking them [her students] into the computer lab. I don't consider myself a technology teacher. Lisa (the Watertown MetroLINC director) teased me about being so nervous... but if you have support for your idea and you can take a chance... We did a lot of work to prepare. Teachers [usually] are not allowed to take risks. [It's important to be able to take] calculated risks [and know that it is] OK to fall on your face. You learn from it and figure out how to make it work better."

The teachers, as well as the students, thought very highly of the project. Michelle asked the kids to do an evaluation of the unit at the end, "asking them how they liked it and what they learned. Every kid thought it was awesome. They loved the new pieces of it, and it got them away from written reports." Kim felt "the benefits are twofold. They learned a lot about technology and a lot of cultural information that they found themselves. They had to find out right away if the information they had was good and important. Usually, when kids look for information they go to the encyclopedia and write it all down. Here they had to differentiate the trivial from the important." Michelle added, "They had to write in their own language (not copying off web page). Teachers have to be more cognizant [being able to differentiate] what's from the web and what is their own work. Teachers need to be instructed more to recognize it and remind kids... they won't learn it if they don't put it in their own words."

Michelle started the unit two weeks before Kim. "Doing it different weeks was a good idea," Michelle said, "I knew the pitfalls and Kim helped me." To which Kim replied, "Mine went better because I went after her!"

Kim and Michelle viewed their partnership very positively. They referred to Kim as the more proficient in technology and Michelle as being more creative (with the curriculum ideas). They felt they complimented each other, making "a good working pair." It was a collaborative effort and it worked really well. They were both aware of their strengths and weaknesses. As Kim expressed, "Michelle has great ideas and I would do them. Michelle is more artistic. She did most of the poster work [for the MetroLINC presentation]. We each used our strengths and we each learned from each other."

They believed that the success they had with this project is due largely to their collaborative relationship. During their interview, it was evident how much they appreciate each other and enjoyed working together. They commented how they normally never get to see each other. The collaboration was initiated by Michelle, and Kim made a point of telling us how unusual this was at their school.

The collaboration was that much more special because they were of different generations of teachers. Being a young teacher, Kim was pleased to have this working relationship with Michelle, who has been teaching for over 20 years, especially given the school culture in which she saw a lack of sharing and collaborating across the generations.

They are proud of what they have accomplished, and are actively sharing their work with their peers. Within the district, Michelle reports that some other foreign language teachers are interested in learning to do their unit, and that she will be working with one of the second year teachers. At a department presentation with the high school, “We got a positive response. They were in awe over it—overwhelmed. [But] they teach AP...[so they are busy] but kids have to do a final project. This is two and a half weeks. They questioned what is the value of doing it. It is a lot of time out of the curriculum.”

This past summer, Michelle co-taught the HyperStudio course with the MetroLINC Director and received rave reviews. This fall, Michelle and Kim will be speaking to educators in other districts and at professional organizations, including a presentation with EDCO (a local teacher training organization), and teaching a four hour class at MFLA (Massachusetts Foreign Language Association). While they are a little nervous about presenting, they commented that they have never seen anything as good on technology and foreign language at this conference.

Dave is a young, energetic science teacher in his second year of teaching at the Middle School. He is responsible for teaching five sections of general science to eighth graders, and has over a hundred students. His MetroLINC unit built upon an on-going project he has with Boston College’s Watershed Institute concerning a field study of the Charles River. Ecological study of local environments is an area of particular interest for Dave. Unfortunately due to the sizable number of topics he’s required to teach according to state guidelines, Dave was unable to devote the significant amount of classroom time needed for this investigation as part of this regular classes. “I feel under the gun to get my students ready for the MCAS. There are over 100 general content areas [that need to be covered]. I know the project supports the state frameworks. I have been doing chemistry, electromagnetic radiation, biology...water density...but there is not so much [in the frameworks] on animals.”

Consequently, Dave offered this field study project as a voluntary, after-school activity. Seventeen students signed up, drawn from different classes, including even some high school students. “Rather than just the “A” kids, any kid can participate. We had some special education kids this fall.” They make the 12-minute walk to the Charles River, and collect information on insects and birds, setting insect “pit traps” and taking field notes on birds they see. In addition to bringing field equipment and their science journals, Dave has added a digital camera and a video camera to help document what they do in the field.

Dave feels that incorporating the technology had the added benefit of encouraging students to join the program. Of his students, eleven are boys and six are girls. “Some were just here for the video camera and digital camera...The girls are more interested in

field ecology, the bugs. The toys got the boys.” They will go out into the field about a dozen times this year.

Back in the classroom, Dave projected the digital images so that they can talk about what they’ve found. “I want students to realize the incredible diversity of animal and bird life [around them]. I want to make them aware of a variety of tools they can use to collect data—making a report using their own data, collecting data yourself and using tools to make life easy.” Students share their data with a school in Cambridge and are also in the process of producing a web page “with river images and some of our data on it.” Students have also produced a report that they will present at an annual conference in the spring, and four-to-five students will accompany Dave to present the paper. “Ultimately, in the long term, I’d like to bring it back into the classroom...to do a long-term ecological survey, that is on-going where students work as data collectors.”

Seeing himself as a convert to technology, Dave does use his computer with his regular classroom of students. “Every day I use the computer...I can display work...pull up weather maps. We can discuss real-time events, [such as] why there is rain here and snow an hour away. It helps bring the real world into the classroom.”

Through MetroLINC, Dave also received a series of water quality probes. During the Summer Institute, he brought in two other teachers from Watertown, one of whom was his mentor last year. “We used the probes for three days. We tried to make sense of the equipment. They are fairly complicated to use [with the computer software] and I needed time to work through using them.” This year, Dave has helped his mentor with technology. This teacher is now working on the Washington, D.C. Math and Science Trail as part of the 8th grade field trip, and is hoping to develop a web page to uplink information from D.C.

Dave feels “I definitely have stronger contacts because of MetroLINC. I spent the summer aligning the science curriculum with the state frameworks...I’ll share what I have with him [my mentor] and he can pick my brain. It also helped me connect with Margaret [another teacher in the district]. We did an online course on the application of the web. We have a technology focus in our relationship...[And now] three more people in our building have signed up to[be part of MetroLINC next year.]”

Kay is a resource teacher for 6th graders who are special education students. Her MetroLINC project has been to make homework assignments available over the Internet. Kay developed this project from the perceived need that her special education students have organizational problems, often leaving their homework assignments at school.

For many of her students “there is always confusion about homework. They’re either distracted, they don’t feel like writing it down, or their handwriting is so poor that it is just not written down. It’s not legible...So one of my responsibilities is to sign students out at the end of the day...and making sure that the child wrote down what the homework

assignment is for that particular class. Even though I do this, the kids sometimes leave their [homework] agendas in school. So they go home and the mom says, 'What's for homework?' 'Oh. Uh, we have no homework' or 'I don't know. I left my agenda in school.'...The parents want to help out their children, but they feel that they just can't because they don't know what is going on at school. The communication is broken between the home and school, so the responsibility is up to the child to have all the materials. But many times they just don't. So I thought, 'what can I do to empower the parents?' So I thought of doing a web page where I would post daily assignments and notes, or anything that's relevant to the child's homework."

Kay conscientiously used her new laptop computer to take notes about homework assignments right in the students' classroom. She took a web course on how to design a web page, and offered a web page in which students and parents could look up assignments by clicking on a particular subject area (e.g., math, science, geography, reading, English), and each day of the week. She devoted about 45 minutes each day to updating this information. Kay, unfortunately, ran into some technical difficulties when it was implemented. She would submit the information to the webmaster in the high school, but there might be a day or two delay before he was able to post the information, given other demands upon his time. As a result, parents would log on and receive homework assignments that were a few days old, but not the one for the current evening. Just a week before we interviewed her, Kay had gone to the district's director of technology and had presented the problem. They arrived at a solution where Kay can now post the message herself immediately as an e-mail message, as opposed to through the webmaster. This works well for most of the assignments, but seemed to pose some problems for math assignments in which special arithmetic font sets are needed.

Kay has gotten some positive feedback from parents, who have been very appreciative about the web site. She put a counter on the web site, and gets about 30 hits a night (although she does not feel this number is highly reliable). While she has 24 students on an individualized education plan whom she serves in particular, she found students from the regular education population were also logging on, some of whom might be having some difficulty in school but not serious enough to be on an education plan. By serving a broader audience of students, Kay sees this as helping her special ed. students, who are sometimes reluctant to seek special help because "they feel, 'I'm dumb. I need her help.' But then they see that everyone else is coming up for help so they don't mind doing it. So although it was intended for the 24 students whom I service, it has been for the whole cluster...about 95 students....Students can easily log on and it sort of fosters independence on their part...In addition to this, I have a voice message for students on the telephone. I know I have students who don't have computers at home."

Kay has not had much contact with other MetroLINC teachers in Watertown, with her main contact being the MetroLINC director in the district. She does not feel it has changed her relationship with the classroom teachers with whom she works. However, it has had some impact on one teacher, a special education person for the seventh and eighth grade who now wants to design a web page with similar purposes. Despite her technical

problems, she feels “it was a great project. If it weren’t for MetroLINC I would not have done this.”

Jennifer teaches middle school family and consumer sciences (grades 6, 7, and 8). Jennifer has been teaching for thirty years and, she believes that, during the 90’s, everything changed for home economics teachers. They became family and consumer sciences teachers and the emphasis changed from sewing and cooking to health and family. While she had been doing project based instruction when she taught sewing and other areas, “My whole curriculum changed, I couldn’t figure out how to do projects in the new curriculum.” For Jennifer, MetroLINC, in conjunction with Watertown’s ongoing training in project-based instruction (IFAS - Instruction for All Students, sponsored by MassInsight), “puts it all back in the hands of the students.”

Jennifer works on a rotation with classes, having a group of students every day for 30 days. To fit within the time frame of her rotations, her MetroLINC unit takes three weeks from start to finish. The project uses Stop and Shop’s PeaPod online shopping service as part of a family budgeting, and nutritional meal planning project for family and consumer sciences

Jennifer provided students, in groups of two, with invented family profiles based on real families. Each profile described the family members and the family budget. The task for the groups was to plan nutritional meals and create a shopping list for a week’s worth of food while staying within the prescribed family budget. Students used Pea Pod to research nutritional information and find prices on foods. Using the shopping cart feature of the web site they could work with staying within the budget while maintaining the nutritional quality of the meals.

The students handed in meal plans based on food guide pyramids. They planned for breakfast, lunch and dinner. They reviewed their meal plans, looking for nutritional gaps, and then used the PeaPod database to assess nutritional data. Students typed up menus, and printed the contents of their shopping carts from PeaPod. This first research phase took about 1 1/2 weeks. In the second phase (also 1 1/2 weeks), students created HyperStudio cards on one or two nutrition topics (for example, explaining the different kinds of carbohydrates). They then had a fair showcasing the HyperStudio stacks of both classes involved.

Jennifer did the project with two classes (25 students each) in the first rotation, and with an additional class in a subsequent rotation.

She views the learning outcomes as four-fold. Students learn to research nutritional data, to work with unit prices, to use HyperCard, and to learn about budgeting and nutrition in a real world setting. She said, “the kids loved it. They realized how the components fit together.” She doesn’t feel she could do such a project with traditional methods. “I used to try, but it was too difficult getting parents to take kids to the grocery stores to do the research.” PeaPod gave students access to real time, real world information in the classroom. Furthermore, it allowed each kid to build their own shopping list and save it.

MetroLINC served as a catalyst for Jennifer. When joining MetroLINC, “I still didn’t really have anything in mind. It forced me to come up with a project and refine it. Jennifer felt that MetroLINC has helped her to pull together ideas and resolve her struggle with making her curriculum more project-based. “It pushed me to really get going. I really decided to do it, and I really got a lot out of it.” She plans to continue to use the unit next year as well.

For each of the teachers participating in these MetroLINC activities, there is a clear sense that their efforts were well-received, valuable and valued, and made a difference for them and their students. Most operated independently, some found a colleague to work with, all sought assistance when they needed it. All the teachers saw the challenge and rose to the occasion and all would appreciate and benefit from more technology and more support for their technology activities. The environment of the middle school supported this experimentation and colleagues appreciated seeing the accomplishments of the teachers and successes of these efforts with students. While working alone or with a colleague, these teachers demonstrated leadership in curriculum, in the use of technology, and in pedagogy. Their experiences need to be more widely shared and their colleagues in the middle school and in the high school will benefit from these experiences.

July 6, 1999

Dear MetroLINC Teacher:

Congratulations on being selected as one of the teachers participating in MetroLINC this coming year! We, Rockman Et Al, are the group responsible for evaluating the project, and examining the ways in which Boston and Watertown teachers carry out MetroLINC activities in their classrooms and districts. And, for that, we need your help.

When answering this questionnaire, think back to the way you were teaching, prior to your participation in the MetroLINC Challenge Grant. This questionnaire is designed to gather information about how you approached instruction with your students last year. There will also be a brief follow-up questionnaire at the end of the coming school year. We are asking for phone numbers (school and/or home) and email address, so that we can contact some of you for brief interviews during the school year to learn about your experiences and accomplishments.

Please complete this questionnaire with your honest and thoughtful responses and comments. If there are questions that you do not wish to answer or that do not apply to you and your

circumstances, please write “not applicable” or N/A in the space provided. Confidentiality is important to us, and no names or personally-identifying information will be used in reporting the data.

The information we are requesting is very important—to the project and to the funders. Please take the time—about 20 minutes according to our estimates—to complete the questionnaire and return it to the Institute staff.

Thank you for your help.

ROCKMAN *ET AL*, The MetroLINC Evaluation Team

[If you have questions, please contact us at 800-410-2820, or saul@rockman.com]

Name: _____
Last First

School: _____

Please provide your work and/or home phone number in the space below. Over the coming school year, we would like to schedule a 15-minute phone interview with some of you, at your convenience, to talk to you about your participation in MetroLINC.

home phone number work phone number email address

Please provide the last four digits of your social security number for data entry purposes:

Personal and Professional Background Information

1. How many years have you been teaching?
 - 1-2 3-5 6-10 11-14 20+

2. What courses are you currently teaching? (Please include grade level.)

3. Which other school reform or curriculum reform projects are you working on?

4. What motivated you to participate in MetroLINC? (Check as many as apply)
 - I wanted the opportunity to exchange ideas with my peers.
 - I wanted the change to learn new technologies.
 - I wanted to broaden my knowledge of curriculum.
 - I wanted to learn more about instructional design and curriculum development.
 - I am interested in school reform issues.
 - I was intrigued by the innovative approach of the project.
 - I was required to do so by my school or district.
 - I wanted to get equipment for my classroom.
 - I wanted to earn a stipend.

5. How did you learn about MetroLINC?
 - Presentation by MetroLINC staff
 - Recommended by a colleague who participated in MetroLINC
 - Attended a showcase or other MetroLINC event
 - Read an e-mail, flyer, or other announcement
 - Through a professional development workshop
 - I was invited to participate by administrator, MetroLINC staff, peer, etc.
 - Other _____

Teaching Style and Classroom Management

1. About how often do you have meetings with other teachers to discuss and plan curriculum or teaching strategies?

- never every other month once a week
- once or twice a year once a month two or three times a week

2. To what extent do you currently use the following instructional strategies and methods in your classroom?

Strategies & methods	Level of use*					
	0	1	2	3	4	5
lectures	0	1	2	3	4	5
small-group instruction	0	1	2	3	4	5
group or individual projects	0	1	2	3	4	5
portfolio assessments	0	1	2	3	4	5
whole-class activities	0	1	2	3	4	5
hands-on activities	0	1	2	3	4	5
individualized learning	0	1	2	3	4	5
interdisciplinary projects	0	1	2	3	4	5
student-centered activities	0	1	2	3	4	5

Little			somewhat			very
1	2	3	4	5	6	7

6. How comfortable do you feel using technology in the classroom?

very			somewhat			very
uncomfortable			comfortable			comfortable
1	2	3	4	5	6	7

more project-based instruction	1	2	3	4	NA
more effective use of technology with students	1	2	3	4	NA
more student-centered classroom environment	1	2	3	4	NA
increased networking with colleagues	1	2	3	4	NA
greater integration of technology in curriculum	1	2	3	4	NA
other (please specify):	1	2	3	4	NA

1= none; 2 = a little; 3= some; 4= a lot; NA = not applicable

2. Which of the following do you feel are some of the barriers to changing your teaching practice? Please check all that apply.

- lack of time
- inadequate time for planning and implementation
- my instructional style is already successful
- lack of necessary technical skills
- change is difficult
- no funding/inadequate resources
- no administrative support for change
- no peer/colleague support for change
- other _____
please specify

V. Student Learning

1. As part of their MetroLINC classroom experience this past year, to what extent do you think your students acquired knowledge and skills in the following areas? (Circle one for each area)

Areas	Level of Student Growth				
	1	2	3	4	NA
knowledge of subject area	1	2	3	4	NA
inquiry and research skills	1	2	3	4	NA
more project-based learning	1	2	3	4	NA
cross-disciplinary work	1	2	3	4	NA
technology skills	1	2	3	4	NA
collaboration skills	1	2	3	4	NA
writing skills	1	2	3	4	NA
presentation skills	1	2	3	4	NA
self-esteem	1	2	3	4	NA
other (please specify):	1	2	3	4	NA

1= none; 2 = a little; 3= some; 4= a lot; NA = not applicable

4. What do you view as the primary subject area involved in your MetroLINC unit? (check one only)

- language arts science mathematics
 social studies technology other (please specify)
-

5. For the MetroLINC unit you developed for use in your classroom, what best describes the total time period your students engaged in these activities this past year?

- 1-3 weeks three months five or six months
 4-6 weeks four months all school year

6. What best describes the frequency in which an individual student in your classroom engaged in this MetroLINC unit?

- daily 2 or 3 times a week once a week
 once every 2 weeks once every 3 weeks once a month

VI. Assessment of MetroLINC Project

1. How helpful did you find the following MetroLINC activities and services?

Activities and Services	Level of Helpfulness				
	1	2	3	4	DN
1999 Summer Institute	1	2	3	4	DN
9/28/99 Call-back session (getting started)	1	2	3	4	DN
1/11/00 & 2/15/00 Call-back session (curriculum posting)	1	2	3	4	DN
MetroLINC cafe on 11/9/99 (BPS Curriculum web site)	1	2	3	4	DN
MetroLINC cafe on 1/5/00 (Troubleshooting)	1	2	3	4	DN
MetroLINC cafe on 3/9/00 (Technology Classroom Management)	1	2	3	4	DN
MetroLINC cafe on 4/6/00 (Web Pages using Netscape)	1	2	3	4	DN
MetroLINC web site	1	2	3	4	DN
Contact/communication with MetroLINC support staff (Alice Santiago, Laura Junior, Jack Casey, cluster support person)	1	2	3	4	DN
Contact/communication with your Pioneer	1	2	3	4	DN
Contact/communication with other Adapters on your design team	1	2	3	4	DN
Contact/communication with members of other design teams	1	2	3	4	DN

1= not at all; 2 = a little; 3= some; 4= a lot; DN = did not attend/use

2. Since the completion of the Summer Institute (July 1999), how often did you meet or have communication with other members of your design team?

- never every other month once every 2 weeks
 once or twice this year once a month one or more times a week

3. What recommendations would you make to improve the MetroLINC project?

6. Any other comments or thoughts you'd like to share with us: (use back of sheet)

Thank you very much.

THE METROLINC TEACHER SURVEY

Name: _____
Last First

School: _____

NOTE: As part of our continuing study of MetroLINC and the teachers and students involved, we would appreciate your completing this questionnaire. Your honest responses and thoughtful comments will help us better understand what MetroLINC teachers experienced this year, and ways MetroLINC might be improved. Confidentiality is important to us; no names or personally-identifying information will be used in reporting this information. Completing the questionnaire should take approximately 20 minutes. Thanks for your help. --- Rockman et al, MetroLINC evaluation team

I. Personal and Professional Background Information

1. Are you currently involved in any other school reform, curriculum reform or technology projects, besides MetroLINC? If so, please describe:

2. The number of students you teach this year: _____

3. The number of your students using technology through your MetroLINC project: _____

II. Teaching Style and Classroom Management

1. About how often do you have meetings with other teachers in your subject area to discuss _____ and plan curriculum or teaching strategies?

- never every other month once a week
 once or twice a year once a month two or three times a week

2. To what extent do you currently use the following instructional strategies and methods in your classroom?

<u>Strategies & methods</u>	Level of use*					
	0	1	2	3	4	5
lectures	0	1	2	3	4	5
small-group instruction	0	1	2	3	4	5
group or individual projects	0	1	2	3	4	5
portfolio assessments	0	1	2	3	4	5
whole-class activities	0	1	2	3	4	5
hands-on activities	0	1	2	3	4	5

individualized learning	0	1	2	3	4	5
interdisciplinary projects	0	1	2	3	4	5
student-centered activities	0	1	2	3	4	5
teacher-centered activities	0	1	2	3	4	5

*0=never; 1=once a month or less; 2=a few times a month; 3=weekly; 4=a few times a week; 5=daily

3. To what extent do you use the following assessment activities with your students?

Activity	Level of use*					
	0	1	2	3	4	5
written homework assignments	0	1	2	3	4	5
short-answer tests	0	1	2	3	4	5
essay tests	0	1	2	3	4	5
class participation	0	1	2	3	4	5
portfolios	0	1	2	3	4	5
conferences	0	1	2	3	4	5
projects	0	1	2	3	4	5
teacher-developed materials	0	1	2	3	4	5
packaged (ILS, SRA, etc.)	0	1	2	3	4	5

*0=never; 1=once a month or less; 2=a few times a month; 3=weekly; 4=a few times a week; 5=daily

4. To what extent do you use the following teaching resources in your classroom?

Resource	Level of use*					
	0	1	2	3	4	5
textbooks	0	1	2	3	4	5
computers	0	1	2	3	4	5
classroom visitors	0	1	2	3	4	5
on-line telecommunications	0	1	2	3	4	5
camcorder	0	1	2	3	4	5
videodiscs	0	1	2	3	4	5
field trips	0	1	2	3	4	5
CD-ROMs	0	1	2	3	4	5
video and/or ITV	0	1	2	3	4	5
other print materials	0	1	2	3	4	5
school library	0	1	2	3	4	5
teacher-developed materials	0	1	2	3	4	5

*0=never; 1=once a month or less; 2=a few times a month; 3=weekly; 4=a few times a week; 5=daily

III. The Availability and Use of Technology

- Do you have a home computer? yes no
- Approximately what percentage of your students have computers at home? _____
- How skilled are you personally in using computers? (Please circle.)

Little			somewhat			very
1	2	3	4	5	6	7
- How skilled are you in using on-line technology and information services?

Little			somewhat			very
1	2	3	4	5	6	7
- How comfortable do you feel using technology in the classroom?

- _____ more project-based instruction
- _____ more effective use of technology with students
- _____ more student-centered classroom environment
- _____ increased networking with colleagues
- _____ greater integration of technology in curriculum
- _____ other _____
please specify

2. Which of the following do you feel are some of the barriers to changing your teaching practice? Please check all that apply.

- lack of time
- inadequate time for planning and implementation
- my instructional style is already successful
- lack of necessary technical skills
- change is difficult
- no funding/inadequate resources
- no administrative support for change
- no peer/colleague support for change
- other _____
please specify

3. In what areas did you think your students have profited most? (rank only the three most important: 1=first; 2=second; 3=third)

- _____ knowledge of subject area
- _____ inquiry and research skills
- _____ more project-based learning
- _____ cross-disciplinary work
- _____ technology skills
- _____ collaboration skills
- _____ writing skills
- _____ presentation skills
- _____ self-esteem
- _____ other _____
please specify

4. What ways, if any, do you see yourself continuing some of your MetroLINC work next year?

5. What do you feel the strengths and weaknesses of the MetroLINC project have been? Do you have any suggestions for how the MetroLINC project could be improved? If so, please describe.

6. Any other comments or thoughts you'd like to share with us:

Thank you very much.

MetroLINC Teacher Interviews, Spring 2000

1) What made you decide to participate in MetroLINC? Who encouraged you? What did they say that led you to apply?

2) You worked with a group to develop and implement a curriculum unit. What impact did the unit have on your students?

How did you conclude that those were the outcomes?

3) (Information exchange/Networking. Within School.) Of the teachers in your school, whom do you talk with about the use of technology with students?

When you need assistance about using technology, who do you talk with?

Which teachers come to ask you questions about your MetroLINC unit or about computers?

What kind of things do you discuss?

4a) (Information exchange/Networking. Across Schools) Do you have any contact with other MetroLINC teachers from other schools? If so, who, and what kinds of things do you discuss?

4b) (For Cross-District teachers): I understand that you were involved in one of the cross-district projects with Watertown teachers. Tell me about that

Were there things you wished would have occurred that didn't?

What could have made the project gone more successfully?

5) (Evaluation of MetroLINC training and support; Professional development and support) Did you attend any of the MetroLINC events or cafes this past year? Did you find them helpful? (why or why not?)

What did you think of last summer's workshop?

Have you used the ML web-site? In what ways? Has that been helpful?

Have you had any difficulty in accessing the site or using any of the elements of it? What problems did you have? Were there some things on the website that were not successful?

6) If others in your school asked about MetroLINC and what difference it made to your teaching and to students' learning, what would you tell them?

What has the MetroLINC project done for you this past year -- Have there been any specific kinds of professional rewards or benefits for you, as a result of participating in MetroLINC?

What have the difficulties and challenges been?

What could ML do to help you in the coming years?

**MetroLINC Teacher Discussion
March 2000
Rockman et al., MetroLINC evaluation team**

Names of people in group: _____ (recorder)

Main subject area of MetroLINC unit: _____

Directions: Go around the group and have each person introduce him/herself: name, school, grade(s) taught, whether or not a "regular" classroom teacher or responsible for certain subject matter specialty; and one or two sentences ONLY that briefly describes their MetroLINC unit.

As a group, discuss each of the following three questions. Try not to spend more than 10 minutes on each question. Time permitting, discuss the fourth question as well.

1) Think about your use of your MetroLINC unit with students this past year. Were there any changes in the kinds of teaching strategies you used in your classroom while implementing this unit? If so, please describe.

2) What do you feel has been the main educational benefit to your students from participating in MetroLINC? What have students learned or gained from being involved in your MetroLINC unit?

3) What do you see as the biggest area of professional growth that you experienced from being a MetroLINC teacher?

4) (time permitting) Would you recommend to other teachers that they might want to become a MetroLINC Pioneer or Adapter? Why or why not?

Reasons should participate:

Reasons might not want to participate: