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Three Years of the New Mexico Laptop Learning Initiative (NMLLI): Stumbling Toward Innovation

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This article presents qualitative results of the first three years of the New Mexico Laptop Learning Initiative (NMLLI). Results suggest that teachers, students, and their communities support this initiative to improve student learning. Descriptive statistics were used during year two to further understand how the laptops were being used by students. During year three of this study, indepth interviews/focus groups and observations were used at one school to add depth to understanding the NMLLI. Overall, teachers report more creative, customized, collaborative lessons; students are more interested in school and focused on their work; parents have increased involvement with their student's education and communication with the school. Teachers also claim to have benefited from training and were interested in more indepth support to advance their teaching with technology skills.

In New Mexico, the trend driving education is the fusion of economic development. That is, education is framed with economic development to create consensus among legislators, constituents, and business leaders—to formulate a manageable plan of appropriating state funds in New Mexico

public schools for laptop computers and wireless technologies. The New Mexico Laptop Initiative was proposed by Governor Bill Richardson in 2003 to improve student learning and to advance the ideals of substantive educational reform. Research supports this approach to improving learning:

Networked technologies offer schools access to unprecedented amounts of information and students and teachers can communicate with peers and colleagues that would otherwise be impossible. Multimedia tools allow students to express more complex ideas in more sophisticated ways. Research has clearly shown that, under the right conditions, opportunities created by technology enhance the learning experience (Keane, Gersick, Kim, & Honey, 2003, p. 27).

Numerous studies conclude that effective use of technology improves writing skills, critical decision-making, problem solving, and learner motivation (Center for Applied Special Technology, 1996; Cohen & Reil, 1989; Honey & Henriques, 1996; Mabrito, 1992; Moore & Karabenick, 1992; Naiman, 1988; Olaniran, 1994; Silvernail & Harris, 2003). Positive effects on student achievement are reported in a study when reading and writing are no longer exercises to be graded, but rather authentic experiences for communication (Maddux, Johnson, & Willis, 1997).

The Internet has become, and will become much more so, the conduit where education in public schools transfers the crux of curricula. The Internet is an indispensable research tool where information from libraries and databases are linked, and from where public schools will inevitably connect and disperse curriculum resources.¹ Research involving the integration of technology specifically with the Internet has suggested the Internet positively enhances curriculum (Gibson & Oberg, 2004; March, 2004; Meyen & Bui, 2003; Scheidet, 2003). The augmentation of curriculum and knowledge acquisition may be employed through a plethora of tools such as graphics and video, perhaps making traditional methods of teaching through the text obsolete.

The NMLLI is not only a response to the impact of technology in curriculum, in addition it is a response to global competitiveness. Thomas Friedman (2005) has described how India and China, in particular, have ventured in the production of technology. Speculation in the technology market included, in many ways, the cooperation of educational systems and the realignment of governmental systems to define the proper conditions for

technology production (Friedman). Recent senate testimony suggested that competition in the public schools on a global level is a national security interest due to its potential impacts on the United States economy. The testimony also recognized the intense global competition emanating from China and India (Education in Global Competitiveness, 2006). However, more troubling are the admonishments of Friedman as he suggested that the competitive advantage of these countries is their higher populations and potential to graduate large quantities of technologically literate intellectuals. What this means is that countries such as China and India are producing large pools of high-skilled and low-wage workers (Friedman, 2005).

There is a matrix of ramifications for the United States if it cannot produce the amounts of technologically literate intellectuals it needs to sustain its market base and global leadership in technology production. Therefore, the NMLLI responds to a hypercompetitive global context. While the primary focus is the improvement of education, it is supported by the need to increase the potential for public school students to affect their socioeconomic existence, and to develop a local infrastructure with a large pool of high-skilled workers able to compete on a global scale.

The project is not without its critics. The intended outcomes of the initiative, cites a recent study, which were an improved education system have not been sufficiently quantified. The report also questions the validity of qualitative studies in the field that have suggested positive results of laptop projects in the United States. The report maintained:

[In a] synthesis of some 50 articles noted above [concludes that few studies have offered “research-based evidence that determines the true effectiveness of the programs.” More often, these studies rely on self-reported survey data about such factors as student motivation, engagement, or organizational skills that the researchers did not attempt to quantify. (NM Legislative Education Study Committee, 2006, p. 8)

Quantifying laptop initiatives is a complex undertaking. Should the emphasis be on technology skills or test material? Quantifying economic impacts of technology initiatives perhaps will be equally complex. Quantitative data as mentioned in the previously cited report would be most appropriate in cases where hybridization occurred between technology standards and curriculum standards. Year-to-year standard test scores may not be appropriate. In New Mexico, a new statewide reporting system, the Student and

Teacher Accountability Reporting System (STARS) is now being implemented (New Mexico Legislative Education Study Committee, 2006). It is unclear as to the type of data the STARS system will be used to report. The New Mexico Public Education Department has also requested that schools begin to collect additional data. If this information indeed is collected, it is undeterminable whether it will be subject to public scrutiny.

Currently, reliable evidence is emerging from qualitative interviews and focus group data, survey data, and financial data from laptop initiatives. The alleged self-reported survey data has been useful for demonstrating a sociocultural trajectory. For instance, described next are survey results for three schools participating in the laptop initiative in relation to the frequency of Internet and computer use in the classroom. It describes a cultural transformation underway in teaching and learning.

The NMLLI has had its share of challenges and risks. It is the position of the researchers that the potential benefits to the students outweigh the risks and challenges in the NMLLI. For educators and politicians, more important than the idea of economic development, should be the justification that students learn to use computers to keep pace with the digitization of society. In other words, learning modernized computer systems should be necessary as a means for students to sustain themselves, whether the economic infrastructure is improved or not improved. Even increasing the *possibility* that public school students learn to be self-sustaining individuals should be enough ethical justification for modernization.

Financial Support for the NMLLI

The implementation of the initiative may be identified by phases of appropriation. The pilot phase of the program for six schools was \$1.7 million. With this appropriation in FY 2004, 740 students received laptops. The same appropriation funded an additional 561 laptops in 10 schools, for a total of 1,301 laptops. In FY 2005, 2,894 laptops were distributed as part of a \$4 million appropriation, and then 756 students and teachers received laptops in FY 2006 as part of a \$1 million appropriation. At the end of FY 2006, roughly 5,000 laptops had been distributed as a result of governmental appropriations. The latest appropriation of \$2 million occurred in FY 2007; however, it is unclear as to the number of laptops to be purchased and disseminated (NM Legislative Education Study Committee, 2006).

This is the total of governmental appropriations, \$8.7 million. Additional appropriations have been distributed to specific school districts supporting infrastructure of the initiative (NM Legislative Education Study Committee, 2006). Further, supplementing the initiative were local expenditures supplied by school districts to upgrade insufficient infrastructure. Substantial quantities of laptops were also purchased by the school districts citing equity issues. Therefore, the laptop initiative became the impetus for a broader distribution of laptops that has not been quantified (Rutledge & Durán, 2004a).

NEW MEXICO LAPTOP LEARNING INITIATIVE: TECHNOLOGY INNOVATION

In the 2003–2004 school year, the NMLLI provided 717 seventh-grade students and 80 of their teachers at six exploration sites in New Mexico with laptop computers. This initiative was funded by an appropriation of \$1.7 million from the 2003 New Mexico Legislature. The school districts and accompanying schools funded in this first year of the laptop initiative were:

Community	School	Students	Teachers
Albuquerque	Southwest Secondary Learning Center	24	4
Chama	Chama Middle School, Tierra Amarilla Middle School	50	10
Gallup	Tohatchi Middle School	105	10
Hobbs	Highland Junior High School	277	25
Las Cruces	Cyber Middle School	255	31

Figure 1. NMLLI districts and schools from year 1

This pilot project was implemented by a partnership of organizations dedicated to improving public education in New Mexico. These partners and their contributions include: Governor Bill Richardson and the New Mexico State Legislature, who jointly authorized and supported this project; New Mexico Public Education Department, which was in charge of implementing this program; Schools and districts; Students and their families; Regional Educational Technology Assistance (RETA) program at New Mexico State University, which provided professional development for teachers on their laptops and evaluated this program; and hardware and software providers such as Dell and Microsoft.

METHODOLOGY YEAR ONE

Qualitative methods used in the first year to evaluate the pilot project included focus groups, interviews, observation and examination of student work, lesson plans, and policy documents. Administrators, technology personnel, and teachers participated in focus groups or in individual interviews at each school site. The data from focus groups and interviews represent principals and other administrators from five sites, technology personnel from five sites, and technology support personnel (10) and teachers (18) from the six sites (Rutledge & Durán, 2004a, 2004b).

Type of Design

Data was collected using phenomenological in-depth interviewing. The phenomenological perspective asserts that humans have inimitable consciousnesses (Patton, 1990). The research sought to represent a credible description of how a particular technology initiative—the NMLLI—unfolded with phenomenological methods, and subsequently, it sought to define areas for further study. Specifically, the investigation was guided by the request for proposals. The questions for administrators, teachers, and technology personnel were developed with the use of the RFP, and the guiding questions were directed by the implementation of the initiative. The research sought to find consensus with the Maine’s Learning Technology Initiative differentiation in the operationalization of the initiative.

This investigation offered a transdisciplinary approach in that it combined phenomenological in-depth interviewing with a textual analysis of policy documents and curriculum pertinent to the implementation of the initiative. The textual analysis of policy was used to structure the questions for the participants. In addition to the research context, the work of the students that resulted from the use of the laptops verified the teachers’ positions.

DATA COLLECTION PROCEDURES

Site Location

Site location for the interviews was determined by the New Mexico Public Education Department in a local community college. It took place during a larger workshop specifically designed for the NMLLI, and conducted by

the Literacy, Technology, and Standards Unit of the New Mexico Public Education Department. Further interviews were held at school sites state-wide.

Purposeful Sampling

The sampling method for selection of the participants was maximum variation sampling. Seidman (1991) suggested using maximum variation sampling when small sample pools are available for phenomenological in-depth methods. Patton (1990) and Creswell (1998) also recommended purposeful sampling and the maximum variation method. In the case of the NMLLI, there were a limited amount of persons with substantial knowledge of the policy and the way in which the policy was composed. Persons that worked on the project at the administrative level, at different epochs in its inception had insider information relevant to the study. This is the widest extreme available in the participant pool and these persons had specific characteristics as far as their abilities to inform the study.

Collecting Data

To reflect the experience of the participants in the interviews the format of Seidman (1991) was followed. In one sense however, the interviews departed from the three 90-minute interview structure. Instead, a single 90-minute interview was used due to time constraints, which is a considerable departure from the original methodology. In the process of establishing access with the participants, concerns arose over the extensiveness of the interviews. As a result, the interview series as indicated by Seidman (1991) was not followed. The format for the three-interview series was condensed into a single interview.

Methodology Year Two

Qualitative methods used to evaluate this project included focus groups, interviews, and observation and examination of student work and lesson

plans. The data from focus groups and interviews represents principals and other administrators from the RGPS NMLLI middle school sites. Descriptive statistics were used to further understand how the laptops were being used by teachers who reported development of creative, customized, collaborative lessons, and observations that students are more interested in school and focused on their work.

Methodology Year Three

After a series of interviews, spanning over several months, a total of six educators from Cyber Middle School participated in focus groups. This focus on one middle school intended to understand how educators underwent the technology adoption process. In this case, educators were asked to share their experiences, stories as well as successes and obstacles with the Laptop Learning Initiative that was implemented in Cyber Middle School for the duration of the academic years of fall 2003 through spring 2006.

FINDINGS—YEAR ONE

The results from the evaluation of the pilot project, represented three months of usage in schools and districts that received the laptops. Qualitative results of the first year of the New Mexico Laptop Learning Initiative (NMLLI), as in Maine (Silvermail & Harris, 2003), suggested that teachers, students, and their communities supported this initiative to improve student learning. Teachers reported more creative, customized, collaborative lessons; students were more interested in school and focused on their work; parents increased involvement with their student's education and communication with the school. In addition, community businesses demonstrated interest and support for this program by offering discounts on computer services and products for participants (Rutledge & Durán, 2004a). Administrators, teachers, and students started out strong as they stumbled toward this innovative teaching practice.

Teachers and Teaching

Teachers were able to make the traditional teaching experiences more detailed and rigorous for students through technology integration. Additionally, as one teacher described, the effect of teaching and learning with the laptops assisted the students in reaching toward a higher level of intellectual complexity: "I can see a growth in my seventh grade students, in their methods of expression, and I think a lot of that comes from reading the source material. They are acquiring that genre of expression and it is beginning to show up in their writing."

Teachers reported using the computers for a variety of activities where modern applications of technology have become common. One teacher described using laptops for research projects:

Students were involved in a project that I formed with some other teachers for a frog dissection. In this project we connected a microscope to one of the laptops...the students were able to share this project with their parents and also with some of their peers by creating and sending pictures through the Internet and saving them on their laptops.

More technologically complex applications of teaching with laptops were reported as a means for teachers to create and deliver student assignments. In these applications, teaching is customized for New Mexico students and the products can be used to enhance future curriculum. An example from a teacher is:

My students are reading *My Side of the Mountain* [and] had to do a report on survival, so they burn [on CD-rom] their reports. They are in groups, so all of them are on one CD. It is easier [than] to have to shuffle papers. They are also doing their spelling work, and they have access to a printer, so they can type up their homework and turn it in to me.

Comments from three of the 18 teachers expressed how technology augmented their teaching practices. NMLLI teachers in consensus described during interviews and focus groups how their teaching practices were enhanced, because the laptops encouraged and demanded higher-order

thinking skills through the learners' demonstration of assigned writing and reading (Rutledge & Durán, 2004a, 2004b).

Students and Learning

In interviews teachers and administrators indicated an increased intensity of student participation because of the laptop initiative. An example of increased participation cited by participants was that students were reportedly using laptops in nontraditional learning areas, which previously did not exist. Technology augmented nontraditional learning spaces outside the classroom. With this intensity, traditional teaching ceases when the child leaves the classroom and a hands-on mode of learning continues until the next classroom session. The only limit of this self-learning is time.

Teachers at each of the initial school sites reported students using laptops in locations other than their classrooms—in some cases accessing the wireless connection from outside the school walls on weekends. Further, students were reported to use the laptops for activities other than classroom assignments, such as listening to music, watching DVDs, or surfing the Internet. These activities are positive in that they support functions vital to audio, visual, and research digital literacies (Tyner, 1998). As students play, they are immersed in the learning process. The job of the teacher is realized by *teaching the process* and not middle-managing the details of the learning. One teacher commented “It [the laptop initiative] has actually been a motivator for the students also to *improve themselves*” [emphasis added], and “It seems like they are taking more responsibility toward their own learning.” This immersion into technology, by way of the laptops, moved learning to not only inside but to outside of the school building.

The introduction of learning technologies into the classroom by way of laptops is congruent with a model of education that creates spaces for students to further their learning anytime and anywhere. Specifically, laptops in the classroom encourage the development of a wide array of digital literacy skills (such as document development and internet management) as previously mentioned, and they help teachers focus on the process of teaching *how* to learn, which allows students to immerse themselves in the act of learning (Rutledge & Durán, 2004a, 2004b).

Parent and Community Support

Traditional modes of instruction have impacted students by the introduction of technology; and in addition, parents and siblings have benefited while computers were presented in the homes of the students in the context of homework. The implementation of technology became a communal perspective as learning was a shared experience in the households' of the students.

From a parent and community perspective, the NMLLI introduces digital literacy over other segments of society. One teacher described family members:

Parents are more involved and their siblings are more involved. This laptop is not being exclusively used by the students, but their siblings are using them at home, and I think that it is increasing the interaction between students and parents. A lot of them are sharing, and like a lot of them have to take their pre-lab home, and they have to go over it with their parents. So what was really neat was the dialogue, and the parent would say "Oh, you know, I remember when I did this."

In this sense, members of households throughout the exploration communities were increasing their technology literacy. Parents appear to have an increased interest in their child's schooling as a result of the laptop initiative. Almost every site noted burgeoning parent interaction. In school meetings related to the implementation of the NMLLI, nearly all children were accompanied by parents.

Other layers of community involvement occurred in the publicizing of NMLLI by local businesses such as newspapers, television stations, Internet providers, and radio stations. From one school, the technical supervisor stated:

They [the public] are very supportive of the kids, and then we are getting it out of the community also through the newspaper and radio. So it is something that we have been kind of patting ourselves on the back. Everybody is real excited that we have been chosen. So it has really...brought a lot of positive things.

Several community businesses have supported the NMLLI through discounted services such as reduced internet service and by supplying server space.

The cost savings from these donations are measurable; what cannot be measured is the greater freedom of choice for students as a result of increased intellectual development in a technologically literate way (Rutledge & Durán, 2004a, 2004b).

Professional Development

Teachers had positive attitudes about honing their technology skills through preparing activities and instructions on their laptops. Many teachers reported that their current experiences with computers inspired an interest in learning more about how to combine technology and teaching practices through professional development opportunities. One teacher observed:

We all need to improve....One of our teachers is really apprehensive about technology, but he was right in the middle of the frog dissection, and he was impressed with what was going on. And he was learning from the kids, and we learned from the kids. And even before the laptop initiative, we took that class, a class on computer repair maintenance because we knew there was a need for us to be techno-literate.

At the other end of the spectrum, some teachers were exceedingly savvy about technology and its applications to their curricula. In a similar vein, these teachers called for additional training opportunities in advanced technology. One administrator expressed intentions to continue professional development:

We want our teachers to work on developing CDs with virtual tours of places in the state of New Mexico with narrative and historical background. But we also want our teachers to be paid for that. If the laptop program would pay for that, we would share what our teachers develop.

Additionally, several colleges and universities positively affected NMLLI by supplying facilities for professional development. However, professional development as it pertains to NMLLI is in its infancy. Some exploration sites were still planning their professional development activities at the time

the interviews and focus groups took place. By the end of year one, the NMLLI supported that professional development should positively affect the delivery and instruction of digital curricula (Rutledge & Durán, 2004a, 2004b).

Summary—Year One

We have described many of the positive learning experiences during year one of the NMLLI that support a view of laptop integration as a panacea to learning opportunities for urban and rural settings, we cannot overlook the concomitant problems of laptop integration. For example, teachers, technology support staff, and administrators were consumed with managing a major influx of computers without sufficient maintenance personnel due to budgetary constraints; rural areas posed other infrastructural challenges, such as, insufficient electrical wiring in the school buildings to support the electric supply of the laptops, and in many cases, the students living in less economically developed parts of New Mexico did not have access to or could not afford electricity, telephone connections to support modem dial-up, and ISP costs. Principals, in particular, struggled with keeping the laptops functioning, the wireless access connected, and encouraging teachers to integrate technology into their teaching.

FINDINGS—YEAR TWO

Qualitative results of the second year of the NMLLI in Rio Grande Public Schools (RGPS) suggest that teachers, students, and their communities continued to support the initiative to improve student learning (Rutledge & Durán, 2005a, 2005b). In the 2004-2005 school year, one school district, RGPS through the NMLLI provided more than 900 students and over 80 teachers at four middle schools with laptop computers. The RGPS schools funded in this initiative were:

School	Students	Teachers
Organ Middle School	220	21
Nieve Middle School	232	19
Cyber Middle School	179	17
Santo Domingo Learning Center	30	4

Figure 2. NMLLI in Rio Grande Public Schools from year 2

The findings in year one were repeated with similar results, however, the focus of the researchers had become more oriented, and some novel issues surfaced. Some schools or teachers began to clearly define their policies, which included using the laptop as a tool for classroom management. Policies emanated from AUPs, administrators, and even in the classroom. The punishments were also wide-ranging. A second finding was that teachers' classrooms were drastically transforming. Teachers described how lectures in their classes had decreased by having more resources to use in their classrooms. In addition, classroom activities had become increasingly complex by use of the laptops. Teachers began to implement various multimedia experiences that integrated conventional lessons. In the second year, survey data was included as an indicator of the frequency of classroom use of the laptops. Teacher professional development met many challenges; however, the teachers were aware of the challenges and their attitudes toward learning how to integrate technology into their classrooms remained positive overall.

Teachers and Teaching

During year two, teachers reported using the computers for a variety of activities in which they could involve seventh-graders through technology in ways that were unexpectedly uncommon. Two teachers described using laptops as part of classroom management; another teacher explained how the laptops increased the familiarity of basic programs, and decreased the amount of class time normally provided to learn particular computer applications as a result of extended access to the computer:

Some of our kids who go to lunch detention, if they have the laptops they would ask the principal if they could take their laptops out and do their homework.

Usually I have management issues with my special education students. I did not have the management issues. The only issues were the laptops, "Miss, I can't turn it [my computer] on."

The impact was tremendous. What the kids learned was phenomenal. For example, I teach technology. I would take a week and a half to

teach them how to make a simple graph, in Excel. With the laptops it would take a class period because they were familiar with the computer and they knew what to do.

More technologically complex applications of teaching with laptops were reported as a means for teachers to create and deliver student assignments. In these applications, teaching was customized for New Mexico students and the products can be used to enhance future curriculum. In the previous example, a teacher that cited the familiarity of computer applications garnered through the extended use of the computer, that is, the implementation of one-to-one computing in the classroom. In the following vignette, a teacher described how teachers and students benefited from multimedia that enhanced the subject matter thereby relieving the tedium of lecture: "When I learned how to do a Webquest, I did a Webquest with my students, which they tremendously enjoyed instead of me standing up there and lecturing. They could just go and explore. They never gave me a problem."

Many teachers observed that their teaching was enhanced, because the laptops encouraged and demanded higher-order thinking skills through the learners' demonstration of assigned writing and reading. One teacher described the effect of teaching and learning as the students reach toward a higher level of intellectual complexity: "I can see a growth in my seventh grade students, in their methods of expression, and I think a lot of that comes from reading the source material. They are acquiring that genre of expression and it is beginning to show up in their writing."

Additionally, teachers were developing communities of learners amongst themselves. They would take advantage of the professional development they had participated in and were working together to improve their teaching:

They [teachers] were all getting together and trying to problem solve the problems they were having and then helping each other out on the things they had researched or things that they had learned. They would go and tell the other teams how to do it and I would have less problems (technical problems) coming into my room.

Overall, the teachers, as a by-product of the NMLLI, found themselves working together more often and in a more focused ways than they had in the past. Prior to the NMLLI, the teachers' teaming activities were well organized and concentrated on student learning but the laptops have created

a renewed approach to interacting with students. The teachers often commented on their continued efforts to improve their own technology skills and their understanding of integrating technology, for student learning, to their classes.

Students and Learning

Student participation continued to increase because of the laptop initiative. This continued participation is because technology augmented nontraditional learning spaces outside the classroom. With this initiative, traditional learning ceased when the children left the classroom and learning continued until the next classroom session. Two teachers commented on the increased engagement in the learning process: “My students don’t do their homework at all. This was the first time I’ve ever had them go home and they would come back so excited that they had to show me their homework. It was amazing.” “They tend to give me more and are more creative with it.”

Interviewees at each school reported students using laptops in locations other than their classrooms, and, as in year one, students used the laptops for activities other than classroom assignments, such as listening to music, watching DVDs, or surfing the Internet. These types of technology integration into the classroom were often commented on by teachers.

We all taught *Roll of Thunder Hear my Cry*. We found this wonderful Webquest. A lot of the things we wanted to do also with that novel. We also brought in things we had done before, just paper and pencil, and we had our librarian recreate it for us and she put part of that Webquest plus what we had included on our Nieve library hot list. So, kids were able to go right into there and work off of that.

These activities are considered important in that they support functions vital to audio, visual, and research digital literacies.

Survey Results

Some results of a survey given to participating laptop initiative students at the three middle schools (Organ, Nieve, and Cyber) indicate that students

were able to increase not only their contact with technology but how it could be used in a variety of situations. Overall, the students' responses to yes/no questions and a frequency of computer use question reveal a shift in how students use computers in their academic endeavors.

- Do you use the Internet in your classroom?

	Pre-NMLLI	Post-NMLLI
Organ M.S.	45%	90%
Nieve M.S.	55%	98%
Cyber M.S	38%	92%

- Do you know how to be safe when using the Internet?

	Pre-NMLLI	Post-NMLLI
Organ M.S.	84%	90%
Nieve M.S.	88%	92%
Cyber M.S	71%	81%

- How often do you use any computer to complete assignments? Percent of students indicated below.

	Pre-NMLLI	Post-NMLLI
Organ M.S.	Daily – 14.6%	Daily – 47%
	Weekly – 38.5%	Weekly – 30%
Nieve M.S.	Daily – 55%	Daily – 50%
	Weekly – 7%	Weekly – 41%
Cyber M.S	Daily – 15.8%	Daily – 53.8%
	Weekly – 14.5%	Weekly – 34%

As students work and play on the laptops, they are immersed in the learning process. The job of the teacher is realized by *teaching the process* and not middle-managing the details of the learning. One teacher commented:

Peer help. I loved the peer help. It was amazing because they helped their next door neighbor. All of the sudden I have the tech savvy person who says I already know how to do that, I'll help you out. And, they went right over there and helped them. I didn't have to do

that work either (solving technical problems) because they were like, “Miss, I can do that, I can help him,” and “This is more game like for them.”

This immersion into learning, through the laptops, was considerably more consistent and thoughtful. Additionally, the continuation of laptop technologies in the classroom adds to a learning environment that allows student learning to become ubiquitous and flexible. Laptops in the classroom, during the second year, developed broader understanding of digital literacy skills (such as document development and internet management) as previously mentioned, and helped teachers guide their students in learning *how* to learn (Rutledge & Durán, 2006)

Parent and Community Support

Not only have traditional students been affected by the introduction of technology in the schools, but parents and siblings at home also benefit from NMLLI. In this sense, members of households throughout the exploration communities are increasing their technological literacy. Parents appear to have an increased interest in their child’s schooling as a result of the laptop initiative. Almost every site noted burgeoning parent interaction. In school meetings related to the implementation of NMLLI, nearly all children were represented by parents.

Schools reported that parent interaction increased with complementary technological innovations, such as the ability, in several schools, for parents to access assignments, grades, and student attendance records. Assignments were also directly affected by parents because students were taking their laptops home, where parents would interact with students about assignments.

Professional Development

Teachers had positive attitudes about honing their technological skills through preparing activities and instructions on their laptops. Many teachers reported that their current experiences with computers inspired an interest in

learning more about how to combine technology and teaching practices through professional development opportunities. One teacher observed:

We're learning...at workshops. We're meeting with our teams designing units, designing lessons. We got our laptops, this year, in November or December and it was like "Use them, let's see how you use them."

The seventh grade teachers really worked hard at trying to get the curriculum. Some of them did not want it. But, by the end, they were all enthused. In fact, one of the teachers came to me on the last day of school, "I never thought I'd get that hooked to computers so fast."

At the other end of the spectrum, some teachers were exceedingly savvy about technology and its applications to their curricula. However, they encountered some frustrations with the technical aspects of managing the system

We seemed to be down a lot. A lot of it was wireless. You couldn't get it in this hall and they [technology support] would try to change the hall and some other hall went down. I think that's what most teachers are frustrated with. They are not frustrated with putting in laptops into their classroom, they're frustrated with making sure it's up and able to work, the tech problems. That's where I see most of the frustration coming from. It's not open, I can't do it [the planned lesson] then your plans are completely changed. You always have to have that plan B.

Many problems related to technology integration are the lack of technical knowledge of maintaining the functionality of the laptops. Often teachers were confounded by the technical aspects of using the laptops for teaching and learning. However, there were often problems that they learned to manage and resolved in a timely manner.

Summary—Year Two

For NMLLI teachers, teaching in a digital society poses challenges that emerged through the NMLLI. As one administrator noted: “[There] is a need for more, and so what we want to do now is not so much the initial investment, it’s created a whole new list of wants and needs, that I think that we could go into a whole new list.”

The introduction of new technologies will produce new apprehensions for teachers and students. Specifically, some challenges are:

- Implementing sufficient infrastructure such as wireless access points, phone lines, and technology maintenance support.
- Introduction of additional professional development that targets the specific technology skill levels of the teachers.
- Implementing a manageable Appropriate Use Policy (AUP).
- Implementing a streamlined system for teachers to request access to websites used for instruction in a way that is timely.

It is important that these apprehensions be acknowledged and addressed, but as teachers maintain a focus on the positive effects of student achievement the NMLLI provides valuable learning opportunities.

FINDINGS—YEAR THREE

For one school district in particular, the NMLLI had provided more than 900 students and over 80 teachers at four middle schools in Rio Grande Public Schools (RGPS) with laptop computers. Teachers from Cyber middle school in RGPS provided their insights into a local level of laptop implementation. Teachers were provided access to laptops and to professional development, and asked to implement the initiative; however, their knowledge of the implementation remained largely unacknowledged. Teachers suggested that a mode of communication between state officials and themselves was lacking in the initiative. Teachers’ perceptions of the changes in curriculum delivery were not as transparent as compared to the

practices integrating technology that educators have developed over the last three years. Perceptions of teachers from this school indicated that computers had permeated modern society to the degree that learning skills relative to computers was an essential part of teaching and learning.

Teachers and Teaching

Consistent with the actual LLI document, the LLI was an initiative initiated by Gov. Bill Richardson and the New Mexico state legislature. Based on the experiences of all the 7th grade educators of Cyber Middle School the LLI was mostly mandated from a top-down approach. All of the participants unanimously agreed as to how this was a rather top-down process. Although the details as to how they recollect the beginning of the initiative are not identical, their stories are all fairly consistent.

Helen: I was first involved because the school was chosen as one of the few by the Governor. On the first year initiated, the program our school was chosen and I kind of...I thought it was a really exciting opportunity so I jumped onto the band wagon here at *Cyber* because I felt I really wanted to be a part of that.

As we can appreciate from the narrative, the way the LLI became a material reality for Cyber Middle School was that they were chosen to be a part of the pilot program initiated by the LLI legislature and continued to participate for three years. Although the LLI was a top-down imposition of technology adoption for Cyber Middle School, it did not meet any resistance but rather instead provoked a great deal of enthusiasm and excitement

Alaina: We needed to be able to sit down as a group this is how we want to do it or someone higher up needed to have this set in place you know you just can't write a grant and send it out and that is basically what I felt happened they wrote it they said here you go, go with it and in was a nightmare.

It appears to be the case that top-down models are not as effective as many believe them to be. According to Alaina, an initiative as this one would have greatly benefited from feedback and suggestions by those affected the most

by this kind of change in pedagogy. The common phenomenon of the diminished amount of teacher involvement attests to both my theoretical framework and literature of critical pedagogy analysis of technology adoption. This is to say, technology adoption serves as a constant process of imposition spearheaded by government policy influenced by the lobbying of technology producing corporations.

Students and Learning

The introduction of technology in education inevitably transforms teaching and learning practices. The adoption of technology in the classroom setting equivocally altered the way Cyber Middle School educators engaged in their pedagogy. The interpretations of their teaching styles demonstrated variations of their teaching practices which in turn produced scales of consciousness relative to the modifications and engagements of pedagogy. During the process of the interviews, some of the educators at Cyber Middle School would automatically assume that their pedagogy was unchanged. Emily: “I don’t know that it changed my teaching style...”

For the most part, when Cyber Middle School educators were asked how the LLI changed their pedagogy, some of them would claim that it had not changed much. This could be explained for several reasons. For instance, there might have been a potential climate for educators to change or modify their pedagogy, through the use of technology in the classroom however, the numerous technical problems with the technology itself served as a deterring factor in the modification of pedagogy. Yet, for educators who had some experience with technology, incorporating it into their current pedagogy was relatively easier. The utilization of webquests suggests that they had some knowledge on inquiry-based learning with computers.

One teacher, who had stated earlier that she felt the laptops did not change her pedagogy, became a visionary as to how an ideal technology classroom set up would function.

Emily: I honestly think that you could use it if all of that [curriculum] was in place and teacher[s] knew what they [were] doing you could probably use it 100% of the time. They could take exams on it, they

can create power points...if we live[d] in a perfect world, yes, we could use it 100% of the time.

According to Emily, if technological curricula and infrastructure were properly put in place without the perplexities, teachers were forced to encounter on a day-to-day basis, technology use in the classroom could be a constant instead of complementary. Ultimately, those educators who were engaged in the use of technology as an organic process of critical thinking tended to use technology as the medium for inquiry-based activities. In this sense, these educators tended to confirm that the application of technology in their educational setting altered their pedagogy in positive ways.

Parent and Community Support

Through the process of the research, it became apparent that technology adoption is something to be desired for the expectations of a society that demands it. For many educators in this study, technology adoption is something that should occur due to the fact that society in general is heavily embedded with technology. As a microcosm of society, educational settings should reflect the material conditions and characteristics of society in general.

When asked, many of the educators expressed how they felt that technology is more than ever a way of life for their students. They feel that technology has become an all pervasive force in today's society, Emily: "[T]echnology and computers are their life, it's not a typewriter anymore like it was in my days...if we can help them now, then they are going to be so much ahead, I mean it's just such an opportunity because that is their life. It truly is their life."

Not only is technology their life, it was expressed that for their students to survive in the real world they would need a minimum of computer literacy and digital skills. The teachers understood the need for students to develop their digital skills, and therefore, their perceptions rationally reflected the transformation occurring as a result of technology.

In addition, parents also tended to support societal and educational transformation as they attended the meetings in some of the school districts.

Participating schools and districts reported nearly 100% attendance of parents for various meetings related to the initiative. Administrators and teachers reported positive dialogues with parents pertaining to the initiative. Some parents were concerned with the liability of students for the possible destruction of the laptops. By and large, the parents were supportive of the efforts of the initiative as they saw it as a considerable opportunity for their children to obtain a modernized form of education.

To meet the challenges posed by the 21st century, such as the rapid political, economic, and societal transformation, a profound collaboration is required from the entire community. Indeed, the NMLLI succeeded in the efforts of collaboration from a multitude of stakeholders. It was a single initiative, but it must be used as a mechanism for building more complex educational technology initiatives. Perhaps one day technology initiatives and educational initiatives will be synonymous, that is, educational initiatives will carry the impression that technology will be implemented and that our culture will collectively believe that computers are needed in every corner of society.

Similarity to Maine's Laptop Initiative

The findings of this investigation generally agree with those of Maine's Learning Technology Initiative (Silvernail & Harris, 2003). The implementation plan for NMLLI reports that the Maine initiative resulted in more in-depth lessons based on more up-to-date information. Maine reported increased use of technology in the classrooms and in student work. Students were more involved in their learning. And the use of laptops could save schools money as laptops come to replace other materials.

Recommendations and Summary of All Three Years

To enhance the influence of any laptop initiative, we recommend the following as a response to challenges in infrastructure, professional development, and Appropriate Use Policies.

Organize workshops. Workshops would promote sharing solutions to common problems in addition to sharing classroom innovations. We found significant differences in infrastructure at the exploration sites: larger districts had more technology experience, resources, and infrastructure than smaller districts. People were willing to help others, but no formal mechanism promoted this sharing. Additionally, a network of schools could cooperate in troubleshooting and professional development. Although some differences in technology between larger and smaller districts could be addressed with improved communication, other differences require additional financial resources.

Additional professional development. Although the New Mexico Department of Education provided a sound base of technology-related professional development, some teachers were interested in moving beyond technology fundamentals into topics such as multimedia education projects in collaboration with their students. This enthusiasm for expanded technological capabilities needs to be supported with expanded professional development.

Establish an appropriate use policy (AUP). The AUP documents were interpreted in a multitude of ways by teachers, administrators, and parents. Laptops present many issues revolving around copyright and fair use of material. Because laptops can be personalized with images, music, and other information, an AUP is required that recognizes this facile exchange of information. A sensible AUP should allow and encourage students to develop critical thinking skills about the information they access, download, and share with peers.

CONCLUSION

This study suggests that New Mexico's students benefited from the introduction of technology to classrooms through the New Mexico Laptop Learning Initiative. This program has the potential to become a critical educational investment for New Mexico. As long as students are intrigued with the idea of learning, unaided and without the demands of overly prescriptive curricula, the NMLLI is consistent with our model of education.

Although this analysis of the NMLLI considered the Maine (MTLI) evaluation as a reference point to formulate the assessment boundaries of this

investigation, there were many points of departure because of New Mexico's unique priorities, problems, methods of cultural expression, and structural relations. There is no concrete method of separately analyzing teachers and teaching, students and learning, and school and community perceptions because they intrinsically maintain a unique symbiosis. This study, rather, sought to critically observe these phenomena and to seek the social, cultural, and political effects the NMLLI has had and will have as a tool for the education of New Mexico's teachers and students in the process of stumbling toward innovation.

References

- Center for Applied Special Technology. (1996). *The role of on-line communications in schools: A national study*. Retrieved October 23, 2003, from <http://www.cast.org/>
- Cohen, M., & Reil, M. (1989). The effect of distant audiences on students' writing. *American Educational Research Journal*, 26(2), 143-159.
- Creswell, J. W. (1998) *Qualitative inquiry and research design: Choosing among five traditions*. Newbury Park, CA: Sage.
- Freidman, T.L. (2005) *The world is flat: A brief history of the 21st century*. New York: Farrar, Straus, and Giroux.
- Gibson, S., & Oberg, D. (2004). Visions and realities of Internet use in schools: Canadian perspectives. *British Journal of Educational Technology*, 35(5), 569-585.
- Honey, M., & Henriques, A. (1996). *Union city interactive multimedia trial: 1993-95 summary report*. CCT Report Issue No. 3. Retrieved October 23, 2003, from <http://www.edc.org/CCT>
- Keane, J.T., Gersick, A., Kim, C., & Honey, M. (2003). Toward a sustainability framework: Lessons from the literature and the field. In N. Dickard (Ed.), *The sustainability challenge: Taking edtech to the next level* (pp. 27-43). New York: The Center for Children and Technology. Retrieved August 5, 2007, from http://www.benton.org/publibrary/sustainability/sus_challenge.html
- Mabrito, M. (1992). Computer-mediated communication and high-apprehensive writers: Rethinking the collaborative process. *The Bulletin*, 55(4), 26-30.
- Maddux, C.D., Johnson, D.L., & Willis, J.W. (1997). *Educational computing: Learning with tomorrow's technologies* (2nd ed.) Boston: Allyn and Bacon.
- March, T. (2004) The learning power of WebQuests. *Educational Leadership*, 61(4), 42-47.

- Meyen, E.L., & Bui, Y.N. (2003). Online academy: Content validation through a juror process. *Journal of Technology and Teacher Education*, 11(3), 443-454.
- Moore, M.A., & Karabenick, S.A. (1992). The effects of computer communications on the reading and writing performance of fifth-grade students. *Computers in Human Behavior*, 8, 27-38.
- Naiman, D.W. (1988). *Telecommunications and an interactive approach to literacy in disabled students*. New York: New York University. (ERIC Document Reproduction Service No. ED316995)
- New Mexico, Legislative Education Study Committee. (2006). Staff report. *7th grade laptop initiative: Legislative finance committee (LFC) review*. Santa Fe, NM: Author.
- Olaniran, B.A. (1994). Group performance in computer-mediated and face-to-face communication media. *Management and Communication Quarterly*, 7(3), 256-281.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed). Newbury Park, CA: Sage.
- Rutledge, D., & Durán, J. (2004a). *New Mexico laptop learning initiative: Research and evaluation March 2004 to August 2004*. Santa Fe, NM: New Mexico Public Education Department.
- Rutledge, D., & Durán, J. (2004b, April). *Research and evaluation of the New Mexico laptop learning initiative Fiscal 2003-2004: Focus groups and interviews with school administrators, teachers, IT administrators and key personnel involved in pilot project*. Network of Champions 2004 – 21st Century Skills: Moving Towards Success. Workshop conducted by Literacy, Technology, and Standards Unit of the New Mexico Public Education Department.
- Rutledge, D., & Durán, J. (2005a, March). *The New Mexico laptop learning initiative, its discourse practices and the digital divide*. Paper presented at the Society for Information Technology & Teacher Education International Conference, Phoenix, Arizona. Retrieved August 5, 2007, from http://www.editlib.org/index.cfm?fuseaction=Reader.ViewAbstract&paper_id=19153
- Rutledge, D., & Durán, J. (2005b, April). *Research and evaluation of the New Mexico laptop learning initiative Fiscal 2004-2005: Focus groups and interviews with school administrators, teachers, IT administrators and key personnel involved in expanded laptop initiative*. Network of Champions 2005 – 21st Century Skills: Moving Towards Success. Workshop conducted by Literacy, Technology, and Standards Unit of the New Mexico Public Education Department.
- Rutledge, D., & Durán, J. (2006, March). *New Mexico laptop learning initiative: The second-year impact on one school district. Quantitative results from one school district participating in the New Mexico Laptop Learning Initiative*. Paper presented at the Society for Information Technology & Teacher Education International Conference, Orlando, FL. Retrieved

Association for the Advancement of Computing In Education Journal, 15(4)

August 5, 2007, from http://www.editlib.org/index.cfm?fuseaction=Reader.ViewAbstract&paper_id=22431

- Scheidet, R.A. (2003). Improving student achievement by infusing a web-based curriculum into global history. *Journal of Research on Technology in Education*, 36(1), 77-94.
- Seidman, I.E. (1997). *Interviewing as qualitative research*. New York: Teachers College Press.
- Silvernail, D.L., & Harris, W.J. (2003, March). *The Maine learning technology initiative: Teacher, student, and school perspectives—Mid-year evaluation report*. Gorham, ME: Maine Educational Policy Research Institute.
- Spellings, M. (2006, February 9). *On the role of education in global competitiveness*. Testimony before the United States Senate Committee on Health, Education, Labor, and Pensions 109th Congress.
- Tyner, K. (1998). *Literacy in a digital world: Teaching and learning in the age of information*. Mahwah, NJ: Lawrence Erlbaum.

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Note

1. Currently, several substantial projects involve the formation of large databases or information-bases targeted for the use of instructional purposes in schools, nationally and internationally. One of these projects is the National Science, Technology, Engineering, and Mathematics Educational Digital Library (NSDL), which is involved in creating a network of technology resources for teaching science, technology, engineering, and mathematics (STEM) for access by universities and K-12 education.