# NCLB Technology and a Rural School: A Case Study

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*The requirements of the No Child Left Behind Act of 2001 (NCLB) have presented special challenges and opportunities for rural schools (Reeves, 2003). Researchers have suggested that one way rural schools may be able to overcome these challenges is through an increase in the level of technology integration in their school (Collins & Dewees, 2001). This case study reports on one school's attempt to use grant resources funded through NCLB to integrate specific instructional technologies to facilitate increased student achievement. Through interviews and observations, the roles, attitudes, and difficulties of teachers and administrators in implementing a technology initiative in a rural middle school were observed, examined and discussed. Emerging themes included issues related to teacher ownership of the technology, teacher feelings of power and participation, differing goals of teachers and administrators, technical difficulties, school wide support, and changes in school culture.*

## Introduction

Additional assessment, reporting, and student testing requirements of the No Child Left Behind Act of 2001 (NCLB) have presented challenges for schools and districts across the United States. While all states, districts, and schools face challenges that require them to adjust the structure and delivery of instruction in their schools, the small population and isolation of rural schools can make change even more challenging (Hodges, 2002). Some researchers have suggested that one way rural schools may be able to overcome these challenges is through an increased utilization of technology in their schools (Collins & Dewees, 2001; Hodges, 2002). Schools may struggle not only to implement and integrate technology into their curriculum, but also to acquire funds they can allocate toward the purchase and maintenance of technologically-enhanced instructional strategies (American Association of School Administrators [AASA], 2002). Fortunately, the high cost of technology and the potential educational impact of technological resources have led to federal and state grant initiatives to facilitate the implementation of educational technology in schools (Herr & Brooks, 2003). This study examines one school's attempt to utilize grant funds to integrate specific instructional technology strategies in order to increase student achievement and meet the requirements of No Child Left Behind.

### *Rural Schools*

Schools in rural areas make up nearly 42 percent of all schools in the United States and represent 30 percent of students in the country (U.S. Department of Education [USDE], 2002). A rural school is defined as a school in a community whose population is less than 25,000 people (Mathis, 2003). These schools face many challenges due to their unique characteristics, including: geographic isolation, declining enrollment, small population, limited funding, and lack of access to services (Reeves, 2003). Further compounding the challenge is the frequent use of funding formulas that allocate funds to districts on a per-pupil basis. These formulas are often used by federal and state agencies to distribute money to schools and put rural schools at a disadvantage as they attempt to supplement their budgets (Hadderman, 1999). The availability of funding for rural schools often impacts their ability to access programs, services, and training opportunities, and may play a role in their inability to build technological capacity to comply with the standards set forth in the NCLB Act (Reeves, 2003).

*Technology and Teacher Attitudes*

Teacher attitudes toward technology influence the level of technology integration in schools. In order to increase student opportunities to use technology, teachers need to be better trained to use a wide array of technology strategies with students (USDE, 2004). According to the National Center for Educational Statistics (NCES), less than 20% of teachers reported feeling very well prepared to use technology in their classroom instruction (USDE, 2002). Heath et al. (2000) suggest two factors that influence teacher attitudinal change toward technology integration: (1) a willingness to change, and (2) the control structure of the school environment. Allowing teachers to see the potential benefits of technology for themselves and their students may help facilitate an attitude of willingness to change. Additionally, maintaining a power structure in the school that allows teachers the freedom to move from one stage of technology integration to the next in a supportive and non-dictatorial manner allows teachers to feel empowered to introduce technology into their instruction. Heath et al. (2000) also found that professional development and training in technology enabled many teachers to integrate technology effectively. Technology funding linked to No Child Left Behind supports this premise by requiring that 25 percent of all funds awarded be allocated to teacher professional development and technology (AASA, 2002).

The nature of rural schooling and teacher attitudes toward technology are factors that must be considered as schools look to provide an education for students that optimizes learning opportunities and provides cost-effective instruction. The potential impact of technology to influence student achievement and school performance in this "age of accountability" for schools may make technology integrated learning strategies cost effective and productive options for rural educators. Currently, the literature does not include research that focuses on interventions specific to rural settings or case studies of rural technology strategies to promote student achievement and compliance with NCLB or other Federal accountability initiatives.

## Purpose of Study

The purpose of this study was to better understand how technology could change attitudes and practices at a rural middle school. Specifically, we focused on two research questions: (1) How did the formal implementation of technology teaching strategies in a rural school affect teacher and administrator attitudes toward technology use/integration? (2) How did this formal integration of technology impact school culture and morale?

## ***Setting***

Community School District (pseudonym) was comprised of four elementary schools, one middle school and one high school and had a total district enrollment of approximately 3,000 in a county with a population of 17,000. The focus of this case study was the middle school environment because NCLB technology funds were used to plan instructional technology activities in this particular building.

NCLB legislation includes Title II, Part D, "Enhancing Education Through Technology." The goal of this portion of the bill was to provide funding to states for technology training and infrastructure for schools designated as "low achieving" or schools with a high population of students classified as economically disadvantaged. Its aims were to produce teachers and administrators who were technologically literate and to demonstrate technology integration in planning and instruction by the year 2006 (Fletcher, 2003). In Community School District's state, nineteen schools were funded in 2003-2004 academic year.

*Implementation*

Community School District's technology coordinator and assistant superintendent applied for the NCLB grant funds in order to meet the goals of: (a) A 10-point increase in 7th and 8$^{th}$ grade students passing the state English/Language Arts test, (b) The use of a minimum of three new technology-integrated teaching strategies by teachers during the 2003-2004 school year, and (c) A grade level increase of average student performance on the reading portion of the Standards-Based Adaptive Measure Test (SAMS) (Technology Coordinator, 2003).

The district purchased forty-five laptop computers with the grant funds they received. Thirty of the computers were used for a mobile student lab that could be used only by those teachers participating in the grant. The additional fifteen computers were provided to approximately half of the building's teachers for personal and professional use. Teachers were chosen for participation based on their ability to attend a summer workshop, and represented both core (language arts, math, science) and other content areas (music, family and consumer sciences). Non-participating teachers still had access to a desktop machine provided to them in their classroom and access to shared media center of Macintosh computers.

Participating teachers were required to use three software programs during the school year. At least once a quarter, teachers used Inspiration™ software to allow the graphic organization of student-generated ideas for writing assignments (Inspiration Software, 2004). Additionally, once a quarter, teachers used Socratic Seminar™ with the expectation that student writing skills would improve across the curriculum as measured by a rubric-scored periodic writing prompt (Technology Coordinator, 2003). Teachers were also required to use PLATO™ computer-based courseware twice each week to promote reading across the curriculum. Each program was chosen by administrators

based on quantitative research studies of their effectiveness (NCLB had designated each of these programs as effective based on their "scientifically-based research" criteria), and previous positive experiences with the software (Brush, 2002; The Institute for the Advancement of Research in Education (IARE) at AEL, 2003).

Not all students participated in the technology activities. Teachers were asked to identify one class as their target class for using the software. Often these classes were their smallest classes of the day. Teachers then used the software products with those classes at the prescribed intervals while continuing with regular instruction to other sections of the same course. The intention was that other students would act as a control to measure learning differences later in the semester on both the SAMS test and district writing prompts. A few students (estimated at less than 5) were using the software in more than one class during the week.

Professional development activities, including a summer workshop and regular professional development workshops, were initiated to assist teachers in integrating the hardware and software resources into their teaching. The training included workshops regarding the use of the laptops for teacher planning, the use of PLATO™, Socratic Seminar™, and Inspiration™ software with students, and the development of technology rich, standards-based lessons. Each workshop included time for teacher collaboration and planning.

## Method

### *Participants*

The thirteen participants in the study were a convenience sample of teachers and administrators from Community Middle School. Interviews began with administrators who were gatekeepers to other participants. A snowball sampling method was used in which the initial participants recommended other personnel to interview. These participants were derived from three groups: (1) teachers participating in the technology training and using the software in their teaching, (2) teachers who did not participate in the grant but who taught in the same building, and (3) administrators who planned, supported or were responsible for managing the technology resources and/or the learning activities of the middle school. Participating administrators included the local building principal, assistant superintendent, district technology coordinator, building media specialist, and district technology assistant. Participating teachers were representative of various levels of teaching experience and included two language arts teachers, two reading teachers, two social studies teachers, two science teachers, one mathematics teacher, and one special education teacher.

## Methodological Framework

The study was conducted as a multiple, qualitative case study of administrators and faculty working in Community school district. The study examined how a broad implementation of varied instructional technology techniques would impact a school community. For the purposes of this study, qualitative research was defined as that which "…seeks answers to questions that stress how [sic] social experience is created and given meaning" (Denzin & Lincoln, 2003, p. 13). Also, for this research study, a case study was defined as "a phenomenon of some sort occurring in a bounded context" (Miles & Huberman, 1994, p.25).

### *Data Sources*

Data included interviews, observations, and artifacts that were collected over approximately one month during the spring term (approximately six months after grant-related activities were initiated). Thirteen semi-structured interviews were conducted, audio taped and transcribed. During some interviews, participants also shared artifacts (e.g., reports, agendas, student achievement data) in order to supplement their answers. These artifacts provided additional information to verify other sources. In addition, two participants agreed to allow a researcher to observe their teaching with technology. The researcher recorded field notes of teacher and student behavior and instructional activities. Finally, through frequent visits to the school, researchers were able to make informal observations about the school culture that proved helpful in interviewing personnel and understanding how this initiative fit within the overall school environment.

### *Procedures*

During the first weeks of the spring semester, the research team contacted the State Department of Education for information about districts currently using NCLB technology grant funds in their school. Community School District was chosen based on its rural location, and the technology coordinator and assistant superintendent were contacted via email and asked to participate in a forty-five minute interview about their technology initiative. The interview took place in an off-site central administration building. After the initial interview, the administrators agreed to participate in the broader study. Three weeks later the technology coordinator was interviewed again using a semi-structured interview protocol, and also asked to recommend teachers and administrators who would be able to provide insight about the program. She recommended contacting the building principal of Community Middle School. The building principal was interviewed, and he recommended additional school personnel who might provide insight into the technology initiatives occurring at the school. The list of additional participants was generated in this manner.

Each subsequent interview was completed by a single researcher, recorded on audiotape, and transcribed in its entirety. Thirteen interviews were conducted using this method over approximately one month, generally occurring during planning periods in the teachers' classrooms.

Two teachers agreed to allow their classes to be observed while they were using the technology resources obtained via the grant. During the observations, the researcher took notes, but did not collect any video or audiotape data. The researcher made general observations about the classroom, teacher and student behavior, and classroom activities.

## Data Analysis

Data were analyzed using standard coding procedures as suggested by Gall, Borg and Gall (1996), Denzin and Lincoln (2003) and Carspecken (1996) where repeated ideas were grouped to identify emerging themes. Once these themes were identified, they were classified into relevant categories for later interpretation and use in supporting the findings of the researchers. Two researchers transcribed and coded the interviews and compared results for relevant coding. The researchers met to discuss their coding schemes and resolve any differences in interpretation. Notes from the observations were compared with the themes identified in interview transcripts. These observations served to triangulate or verify the internal validity of the findings (Gall, Borg, & Gall, 1996). Complete transcripts, field notes, and themes generated by the two researchers were discussed with the other research team members who had conducted interviews to confirm coding and reconcile any ambiguities in the transcripts.

## Results and Discussion

After comparing data accumulated from interviews, observations, and related documents, six themes emerged: teacher ownership of the technology, teacher feelings of power and participation, differing goals of teachers and administrators, technical difficulties, school-wide support, and changes in the school culture. Each of these themes is described in more detail below.

### *Teacher Ownership of the Technology*

Data indicated that teachers felt ownership of the technology (particularly the laptop computers). They used their computers for both personal and professional tasks. Teacher comments reflected comfort with at-home use of the technology. As one teacher explained, "I can get on the Internet sitting in my recliner at home with my feet propped up." Being able to take the computer home gave teachers a greater sense of ownership and they found themselves using the computer for non-school related tasks. For example, the teacher who felt so "at home" with the computer also used it in other capacities: "You can just take it with you wherever. I am teaching a Sunday School class and I am using Inspiration. Starting this Sunday, I am taking a projector and my laptop and my class is going brainstorm some things and use Inspiration in Sunday School." Another participant was using computer applications for her home business.

These examples demonstrated one of the informal goals of the administrators in applying for technology funds. As the technology coordinator shared, "Our goal was to get teachers comfortable with technology and until they have something in their hands… that they can feel is theirs, they tend not to be comfortable." The social studies teacher related, "It's definitively changed my own [attitude toward technology]. I used to not use computers hardly at all, as far as instruction and stuff like that… As far as the school itself, I think a lot more teachers are becoming more familiar with technology."

Teachers related that time to learn with the laptop was an important factor in assisting them to use the technology. As one teacher shared, the workshop allowed her time to set up the computer into a usable form. "I thought the most useful part was having time to get to use the laptop and start storing things that you could use in class during that four-day session. I really used that a lot… And usually that is the kind of thing that you put off because it takes so long to do and you are teaching. So that was wonderful I thought." A language arts teacher shared, "The best part of our summer training was having time with your new computer, because that is how you learn." The social studies teacher used the extra time given to him to use the Inspiration™ software for his own graduate coursework. He said, "That is one thing, if the teacher doesn't feel comfortable using it; they are not going to use it."

### *Teacher Feelings of Power and Participation*

Data demonstrated that teachers had numerous concerns over the design of the technology activities and felt they were not involved in the overall planning of how the new technology was used. Several teachers voiced concerns over the grant design and the fact that they had little input regarding which students would participate or what technology resources were selected. During the summer workshop, the participating teachers collaborated to schedule one group of students to participate in the intervention in all of their classes. Once school started, the teachers found that administrators had determined the intervention would be implemented in a different way. This led to concerns among teachers regarding the validity of the intervention results. As one teacher explained:

> I don't think that we will have anything to prove anyway because we were supposed to have just one group of kids that we're tracking and looking for improvement by using this technology and we are supposed to see improvement in reading. I would be really surprised if we had five kids in common between the three teachers on our team that are doing it, which is going to be statistically nothing. We are not going to be able to do anything. I mean this is like, our concern is, we are doing this whole big grant, and we are not going to have these things measurable and I don't think we are. And I don't think we will have anything that we can draw conclusions from.

Another participating language arts teacher said "I wish that the 'be-all and the end-all' of the success of a program did not rest on test scores." A third teacher voiced frustration by saying "I don't think that it is set up very scientifically and I don't know how accurate the data and the results are going to be. I hate that because I think if it would have been done in an organized fashion, maybe get someone else to organize, but it would have been a lot more meaningful." The principal did not seem aware of teacher frustrations or activities that could counter the intervention when he said, "But the nice thing is, everybody that decided to participate—it seems for the most part—the enthusiasm has continued."

Teachers who saw the benefits of the programs were frustrated that they could not use the software for all classes. A math teacher stated, "I don't like the fact that you are trying something and its cool and it works for your class and you are not supposed to use it with your other classes." She was later observed teaching a math unit on Inspiration™ to all of her classes because it worked so well in her target class. Other teachers felt that since they were only using it with one class, it put those students at a disadvantage. The science teacher expressed her frustration, "The fact that we could only use things with one class, we have felt constrained. You have these good ideas. You might use it for longer, but then this class is so far behind. I honestly think it has had a negative impact on the science instruction in my class." In addition to the teacher concerns, the researchers noted there were other interventions occurring in the school to improve test scores with the same groups of students. Inspiration™ had been previously available at the school and teachers had been trained in its use for two years prior to the implementation of the grant. Teachers not participating in the grant were using the software with their students as well.

Despite their concerns, many teachers maintained positive attitudes towards the technology initiatives and believed that they would prove beneficial in the long-term—particularly *after* the constraints posed by the grant were eliminated. As one teacher stated, "I say it's going to have a good impact farther down the road, I am just trying to get my feet wet." Similarly, a second teacher stated: "I really think it's a wonderful gift. I think we will be so much happier next year because I don't think we will have these stipulations." Another participant showed a similar attitude, when she said, "As part of our agreement, we had to incorporate three things into our lessons in one class. I have been frustrated by that because if it works you want to do it with everyone, you know. But next year, I'm in." These attitudes and behaviors had the potential to cause conflict with administrators attempting to examine more long-term effects of the technology initiatives.

**Differing Goals of Teachers and Administrators**

One of the more interesting themes that emerged from the data was the differing goals and objectives of the individuals involved in planning and implementing the technology in Community Middle School. Teachers saw the technology as a valuable addition to the school with the structure of activities as a necessary but temporary nuisance. The administrators saw the influx of technology as a way to fix a school that had experienced scheduling and administration problems in past years and could refocus teachers on standards and improving test scores.

Administrators felt the grant would stress the importance of standards to the teachers. For example, the technology coordinator raised the question, "It would be interesting to find out if they [the teachers] think that the PLATO™ lab has taken away from their ability to teach the standards that they are suppose to be teaching. And I know what their answers are going to be and it's not going to be helpful to our grant." When asked what he thought was the best part of the grant for teachers, the principal responded: "It lets them realize how important the standards are. And that this software was purchased to focus on standards." The technology coordinator also expressed the need to focus on standards. For example, when asked about barriers to using the technology, she said "You can teach the science standards with PLATO™ and still be teaching the reading component at the same time. And if the complaint is that they cannot do that, then my answer is that we need more professional development—to teach them how to do that."

While the different administrators discussed the importance of stressing the content standards with the technology activities, data indicated that teachers did not view the standards as a necessary component of using the available technology. As stated earlier, many teachers were

participating but also waiting until a time when they thought they would be able to use the technologies as they wished.

*Technical Difficulties*

Teachers' struggles with technical difficulties may have hampered their efforts to learn about and effectively incorporate the laptops into their teaching. During the summer workshop, the network would not support PLATO™, and a scheduled hands-on training session with company representatives was reduced to a simple demonstration of the software's capabilities. The social studies teacher expressed his frustration," We could not get the server up … we couldn't practice it while she [the trainer] was here. We were just listening to it, we could not do it ourselves which really hampered us."

Teachers also experienced day-to-day technical problems. During the observation of a language arts class, the researcher noted that four of twelve students were unable to log into the computers to be able to use the PLATO software. After nearly a half-hour, the media specialist was finally able to get all of the students logged in.

Other difficulties may have been related to delays in the training schedule. For example, teachers were not trained on the Inspiration™ software until well into the fall semester. During another observation, a mathematics teacher spent several minutes trying to draw a figure in Inspiration™. During this time, students were observed becoming increasingly disengaged.

Technical difficulties can be a considerable barrier to teachers using technology in a classroom. As Peck, Cuban, and Kirkpatrick (2002) state: "Teachers reported that server crashes and technological malfunctions doomed many lessons and forced them to construct and repeatedly resort to backup plans. As sporadic failure seemed even more routine, they just stopped using what they increasingly considered unreliable technology (pg 53)." As this literature suggests, sustained technical difficulties could be a major factor undermining the success of the technology initiatives at Community Middle School.

*School-wide Support*

In addition to the summer workshop, there was just-in-time support available throughout the school year. The media specialist and an instructional technology assistant were characterized by the technology coordinator as "…kind of our built in, come and help me out-just in time-one-on-one-teacher training type person." The media specialist worked closely with the district level staff and provided one-on-one teacher training. She would sometimes guest-teach classes or sit down one-on-one with a teacher to help them overcome technology problems. The media specialist realized the importance of her role when using technology: "And I know that, unless you have someone there who can fix problems, teachers will quickly become frustrated and won't use it any more, they give up. They just won't use it." She viewed herself as a problem solver who helped teachers whenever they struggled with the technology.

The portability of the laptops may have made this "just in time" assistance easier to implement. One teacher explained that when she had a question, she took the laptop with her. "So a lot of the time, if I have a quick technology question, I will just pick up my laptop and go sit and 'What do you do here?' 'How do you get this?" The researchers observed these behaviors when they saw teachers moving laptops around the classroom during their planning period to work on problems and plan classes.

*Changes in School Culture*

In addition to formal support, teachers also helped each other use the technology. Teacher comments indicated that the technology activities provided opportunities to collaborate. Teachers in the laptop program worked together to solve similar problems and asked each other for help. A teacher who was a novice in computer technology stated, "It gets me around the building a little bit more so I can talk to my colleagues that I haven't seen for awhile." One teacher related how she worked with less experienced teachers to get their grade book software working properly. Another teacher noted an increase in communication. "Email has probably increased 500% in the building, where teachers will communicate. I think communication is better on some level. So yeah, I think that improved that. And the collaboration, Mary is on the other team, she'll say that is a good idea, and maybe she will want to try that with her team."

Teachers also mentioned technology resistant colleagues who started using technology after receiving a laptop. One teacher said, "We have two science teachers, who didn't ever use technology and they had their kids in the computer lab this year. I think this may be because they agreed to take the kids to PLATO™ so then they have gotten more comfortable and have moved to our Mac lab to do other things." Another teacher who had limited experience with computers related, "Technology, I didn't like it very much—I like it a lot more now." A social studies teacher changed his attitude about allowing his students to use technology after being given the laptop. In an interview he said, "I used to not use computers at all, as far as instruction and stuff like that. A lot of time in my research projects that my students would do, I would ask them not to use any computers."

Teachers not involved in the grant benefited from shared information from their colleagues. A non-participating coach began using a spreadsheet to keep track of students' weight training with the help of a participating teacher. Two non-participating teachers were interviewed and neither of them felt isolated or discriminated against because they were not given a laptop. A non-participating science teacher remarked, "there are always opportunities coming along," and he hoped he might be able to participate in the next

initiative. The teachers and administrators who were interviewed were pleased that the school had received the technology funding and seemed to recognize that the positive benefits for the school and its students outweighed the challenges they were facing in implementing their plans.

## Implications

The results of this study may provide insight for future NCLB-related technology initiatives. One important finding from this study was that teachers wanted to be included in decisions involved with the grant and felt that they were not included in the design of the evaluation activities. Heath et al. (2000) stress that teacher control is vital to the success of new initiatives.

In addition, student-outcomes are difficult to measure in such a short period of time. The importance of formative and summative assessments is vital in this respect. For example, this grant relied heavily on teacher perceptions of student success as formative assessment and a pre and post SAMS test as a summative assessment. Teachers had no clear measure on whether student achievement was impacted during the year, particularly with regard to the state's high stakes standardized tests. Teachers did not seem well trained on using reports generated from the programs to track student success. Only one teacher referred to these reports during interviews. Better formative assessment may help with teachers' understanding of the connection between the software and student achievement and, in turn, help them participate in meeting the goals of the grant. Those involved in administering the grant program were aware of the data that the software programs could provide, but there was no structure to use it in a formative manner.

The results of this study further indicated that the technology initiatives were successful in increasing teachers' comfort level when using technology for instructional purposes. Teachers reported using the technology made available to them in new and different ways. Teachers adapted their lesson plans to utilize technology in order to meet various components of their coursework. Teachers looked forward to using the technology in the future.

As mentioned earlier, Heath et al (2000) suggest two factors that influence teacher attitude-change toward technology integration: (1) having a willingness to change and (2) the control structure of the school environment. The results of this study provided evidence of a willingness to change as shown by teachers who had not used technology in the past. However, data also demonstrates that teachers felt powerless in the planning and implementation of the interventions. By increasing teacher's ability to provide input into the grant implementation process, schools may be able to increase the number of teachers embracing these technology strategies as part of their regular teaching practices.

While not generalizable to all rural schools that implement formal technology strategies, this case illustrates several trends that are found in the literature focusing on technology integration. For example, Wang, Johnson, & Pisapia (1994) found that providing time and "just-in-time" assistance is important in supporting teachers' adoption of new technologies. In addition, as Reeves (2003) discussed, funding can be a tool to assist a school in complying with new requirements, such as legislation. As federal guidelines change for rural schools under NCLB, they may find themselves implementing more technology initiatives to secure available grant funds, increase test scores in targeted areas and promote new methods of assessment (Jordan & Jordan, 2004).

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