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The Effects That A One-To-One Laptop Initiative Has On Student Academic Performance And Achievement

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THE EFFECTS THAT A ONE-TO-ONE LAPTOP INITIATIVE HAS ON STUDENT ACADEMIC PERFORMANCE AND ACHIEVEMENT

by

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This dissertation meets the standards for appearance, conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

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Signature Allen Burgard

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ABSTRACT

The purpose of this study was to determine how a one-to-one laptop initiative in a small, rural North Dakota school effected student academic performance based on the perceptions of participating students, teachers, and parents. Existing Northwest Evaluation Association Measure of Academic Progress student test results also were used to determine if the laptop initiative had any significant impact on student achievement in reading, language arts, and math. The primary focus of the study was based on pre-existing data regarding students', teachers', and parents' perceptions of academic performance versus academic achievement. Perceptions of academic performance were utilized by the researcher primarily as a result of availability of the data and the various uncontrollable variables when attempting to measure student academic achievement.

There were 79 junior and senior students and 16 classroom teachers who participated in a one-to-one laptop initiative during the 2006-2007 school year. The pre-existing data were analyzed to determine frequencies and percentages which were presented in narrative and tabular format. A chi square test for independence measured significant differences that resulted from student, teacher, and parent responses. Finally, a t-test measured significant differences in laptop students' MAP test scores in comparison to other North Dakota junior and senior students who took the MAP test in both the fall and spring of the 2006-2007 school year.

Results from the surveyed data indicated that the laptop initiative enhanced student classroom engagement, motivation, and organization, along with improved research, writing, and editing skills, based on the perceptions of participating students, teachers, and parents. Student grades and the amount of time spent on homework experienced minimal gains based on the data analysis. The study also measured student achievement in the content areas of language arts, reading, and math. Laptop students experienced significant gains in math test scores in comparison to other North Dakota junior and senior students during the academic year of project implementation. However, test results indicated that junior laptop students experienced significant negative differences in reading and senior laptop students experienced significant negative differences in language arts when comparing MAP test scores to other North Dakota juniors and seniors.

CHAPTER I

INTRODUCTION

The availability of technology for instructional purposes has grown dramatically since the early 1990s. Today's students will experience jobs requiring the advanced use of technology. As stated by the Laptops for Learning Task Force (2004), over 100 million young people born between 1976 and 2000 will grow up with the Internet and digital technology. The ratio of student to computers in American schools continues to decline every year. Meyer (2001) reported that the ratio of computers to students in 1997 was 7 to 1. By the year 2000, this ratio declined to a ratio of 5 to 1.

Internet access has been instrumental in the implementation of technology in the classroom. The United States Department of Education statistics demonstrated a sharp increase in the amount of schools with Internet access from 1994 to 2003. The study reported that in 2003 nearly 93% of the instructional classrooms had Internet access in comparison to only 3% in 1994. Statistical data provided by the United States Department of Education showed that the availability of computers and Internet access has increased in schools across America in the past decade (U.S. Department of Education, 2005).

Access to home Internet usage also grew rapidly. By the year 2001, over 82% of the students from the ages of 5 to 17 in non-poverty homes had access to the Internet.

Unfortunately, the rate for Internet access in poverty stricken homes was only 47% (DeBell & Chapman, 2003).

One might question whether classroom technology integration has increased at the same rate as the availability of the technology. The integration of technology in the classroom is dependent upon school districts' opportunities and barriers. Past methodologies of teacher practices may be the greatest barrier in technology integration for student learning. In a study conducted by The Pew Charitable Trust, it was found that the educational use of the Internet occurs mainly "outside of the school day, outside of the school building, and outside the direction of their teachers" (Levin & Arafeh, 2002, p. 4).

In the Pew report, 39% of surveyed teachers with computer and Internet access indicated substantial use of the computer for instructional materials while 34% reported using the computer for administrative tasks. Only 10% reported using the computer or the Internet for lesson development, research, or best practices in classroom instruction. Over 99% of the classroom teachers surveyed reported access to a computer and Internet access in their classroom (Levin & Arafeh, 2002).

Opportunities are provided by technology to offer an instantaneously rich curriculum that can engage students in learning. In a 1997 technology report to the President of the United States, it was stated that "investments in hardware, software, and infrastructure will be wasted if teachers are not prepared and supported to integrate technology into classroom instruction" (Sandholtz & Reilly, 2004, p. 488). It seems apparent that simply increasing the availability of computers in the classroom may not

increase the instructional use of the computers. Sandholtz and Reilly suggest that professional development along with the availability of computer hardware and software are the key components for technology integration in the classroom. Smerdon et al. (2000) list the following barriers that limit teachers' use of technology in the classroom:

- not enough computers,
- outdated, incompatible, or unreliable computers,
- lack of good instructional software,
- Internet access is not easily accessible,
- concern about student access to inappropriate materials,
- lack of release time for teachers to learn, practice, or plan ways to use computers or the Internet,
- lack of time in schedule for students to use computers in class,
- inadequate training opportunities,
- lack of administrative support,
- lack of support regarding ways to integrate telecommunications into the curriculum, and
- lack of technical support or advice. (p. 91)

The availability of classroom computers, professional development, instructional software, and instructional leadership seems to be key components that result in effective technology integration in the learning environment of the classroom. Many local school districts and states have addressed these issues by implementing one-to-one laptop initiatives. Maine has been a leader in establishing one-to-one laptop initiatives for all

students in grades 7 and 8. One third of high school students in Maine will have laptops by the 2004-2005 school year (Bonifaz & Zucker, 2004). The researchers also identified the other states that have supported and continue to study laptop initiatives, including Michigan, New Hampshire, New Mexico, Texas, and Vermont. The single largest school district to implement a laptop initiative was Henrico County in Virginia. By the year 2003, over 23,000 students in grades 6 through 12 had access to a personal laptop on a 24/7 basis (Gulek & Demirtas, 2005).

Rockman et al. (1998, 2000) suggested that successful laptop initiatives experience positive student and teacher outcomes. These student outcomes include:

- Laptop students spend more time engaging in collaborative work than non-laptop students,
- Laptop students participate in more project-based instruction,
- Laptops lead to more student writing and to writing of higher quality,
- Laptops increase access to information and improve research analysis skills,
- Laptop students become collaborators (interact with each other about their work),
- Laptop students direct their own learning,
- Laptop students report a greater reliance on active learning strategies,
- Laptop students readily engage in problem solving and critical thinking,
- Laptop students consistently show deeper and more flexible uses of technology,
- Laptop students spend more time doing homework on computers.

The teacher outcomes reported by Rockman et al. include:

- Teachers who use laptops use a more constructive approach to teaching,
- Teachers who use laptops feel more empowered in their classrooms,
- Teachers who use laptops spend less time lecturing.

Lowther and Ross (2003) found similar results involving the first year pilot study at Crossriver School District. The study involved a controlled and experimental group of 5th, 6th, and 7th grade students. Lowther and Ross's research showed significant effects favoring laptop student skills in project-based learning, independent inquiry, higher-order instructional feedback, teacher-as-a-facilitator, cooperative learning, and use of the computer for instructional delivery. The researchers also found that students with laptops demonstrated superior writing skills in comparison to non-laptop students. Research seems to support many positive variables that strengthen student performance in the categories of writing, project-based learning, cooperative learning, learning engagement, homework, and problem solving (Gulek & Demirtas, 2005; Lowther & Ross, 2003; Rockman, 2003; Shapley et al., 2006).

Purpose of the Study

Laptop initiatives have been a relatively new phenomenon in K-12 education in America. The literature review suggests that students participating in one-to-one initiatives will improve their academic performance in writing, attendance, student behavior, project-based learning, and higher-order thinking skills (Lowther & Ross, 2003; Rockman, 2003). The literature also suggests that continued research needs to be conducted to measure student academic achievement in the core content areas of

reading, language arts, and mathematics (Great Maine Schools Project, 2004; Rockman, 2003).

The purpose of this study was to examine how a laptop initiative in the 11th and 12th grade effected student achievement and student academic performance over an academic calendar year at a selected small, rural North Dakota high school. The two variables in this study were the perceived student performance skills based on pre-existing survey results from student, teacher, and parent participants and the pre-existing Northwest Evaluation Association Measure of Academic Progress (NWEA MAP) test results from laptop students at Northern Cass School District.

Research Questions

The following research questions were used to facilitate this study:

1. What effects does a laptop initiative have on student academic performance based on the perceptions of participating junior and senior students?
2. What effects does a laptop initiative have on student academic performance based on the perceptions of participating teachers?
3. What effects does a laptop initiative have on student academic performance based on the perceptions of parents?
4. What impact does a one-to-one laptop initiative have on the instructional practices of participating teachers after one year of project implementation?
5. How do the perceptions of parents, teachers, and students differ regarding the impact of the one-to-one laptop initiative on student academic performance?

6. What effect will a one-to-one laptop initiative for students in 11th and 12th grade at Northern Cass have on student achievement based on Northwest Evaluation Association Measure of Academic Progress test results in the content areas of reading, language arts, and math in comparison to other 11th and 12th grade North Dakota students?

Significance of the Study

While the research seems to indicate that one-to-one laptop initiatives impact student learning in many ways, it is unclear what direct impact they have on student achievement in reading, language, and mathematics. Researchers who conducted the Great Maine Schools Project (2004) study concluded that there were no significant differences between standardized test scores of laptop and non-laptop students. However, findings from the study did indicate that participating students seemed to develop stronger writing and problem solving skills and were better prepared to master future challenges in college or work than non participants. Supporting evidence also was found by the researchers who conducted the 2006 evaluation of the Texas Technology Immersion Pilot Project. It was concluded that there were no significant effects on standardized test scores in reading or math between participating and controlled schools in the study. Researchers stated that participating schools had, in fact, slightly lower scores than comparison schools (Shapley et al., 2006). Rockman (2003) supported the researchers of the Texas Technology Immersion Pilot Project in stating,

> Our research group has been studying ubiquitous computing programs for the past 10 years. . . . We consistently find substantive impacts on teaching, and

> learning, on teachers, and students, yet we continue to have difficulty tying full-time access to computers to the outcomes of standardized tests currently in use. Our belief is that, while computers are powerful interventions for both students and teachers, what they do is yet to be tested. (p. 1)

In contradicting literature to Rockman (2003) and Shapley et al. (2006), Gulek and Demirtas (2005) conducted a study that demonstrated that students who participated in the laptop initiative in Harvest Park Middle School in Pleasanton, California, earned significantly higher test scores and grades for writing, English-language arts, mathematics, and in overall grade point averages. Stevenson's (1998) study at Beaufort County School District showed that positive gains in state standardized achievement tests were reported primarily for minority students and also for students who qualify for free and reduced meals. Stevenson concluded that the "use of the laptop computers as notebooks is associated with sustaining and improving academic achievement among groups of students who historically have not been as successful in the school process" (p. 15). Stevenson indicated that students on free and reduced lunch who participated for two years were the only group of students to exhibit actual gains in achievement levels. Alarmingly, by the end of the second year, these students were scoring better on standardized achievement tests than non-laptop students who did not qualify for free and reduced lunch (Stevenson, 1998).

Research studies, such as those previously noted, provide conclusive literature in the performance benefits that laptop initiatives produce with students at the middle and high school levels. The specific performance areas include writing, school attendance,

behavior, attitude towards school and homework, and critical thinking skills. However, research studies seem contradictive on gained academic achievement levels students experience while participating in laptop initiatives in specific core academic areas of reading, language arts, and math.

Schools and states across America are beginning to implement laptop initiatives to improve technology integration and student achievement in the classroom. Costs associated with this implementation are high. It is believed in the education field that technology enhanced student classroom performance and academic achievement in the core academic areas. Limited research has been conducted to solidify the theory that laptop initiatives enable instructors and students to benefit from the applied technology. Therefore, a dissertation study to determine student performance levels and academic benefits of a fully integrated laptop initiative in a small, rural North Dakota school will provide literature and research to educators across America.

Delimitations

The study was conducted at the Northern Cass School District with only 11th and 12th grade Northern Cass students, faculty, and parents utilizing existing testing data and surveys. The district was in the first year of piloting a laptop initiative in the school term of 2006-2007 with only 11th and 12th grade students participating in the laptop initiative on a 24/7 basis. Northern Cass is the residing district of the researcher. Uncontrolled biases may have surfaced based on the connectivity to the school district, participating students, teachers, and parents.

Northern Cass School District attempted to measure the impact on student academic performance by analyzing survey results based on the perceptions of participating students, teachers, and parents. These data are limited by the fact that there was no attempt to control the novelty effect on students using laptop computers during the first year of project implementation.

The study occurred over the course of one calendar school year. It may be imperative to continue the research to determine the long-term outcomes of a laptop initiative on the students' classroom and academic performances.

The study was limited to only 79 participating students. Northern Cass School District elected to pilot only grades 11 and 12 for the first year of the laptop initiative. The limited number of students presents a relatively small sampling of participants to measure the outcomes that occur in the described research question.

Definitions of Terms

For the purpose of this study, the following definitions apply:

Information Communication Technology (ICT) Literacy: The need for students to develop learning skills that enable them to think critically, analyze information, communicate, collaborate, problem solve, and make decisions (Kay & Honey, 2005).

One-to-One Laptop Initiative: An environment in which students use computing devices, such as wireless laptops or tablet PC computers, in order to learn anytime and anywhere with the focus of the paradigm shift on how instruction is delivered to transform independent student learning (Solomon, 2005).

Northwest Evaluation Association Measure of Academic Progress (NWEA MAP): State-aligned computerized adaptive tests that accurately reflect the instructional level of each student and measure growth over time (NWEA, 2004-2006).

RIT Scale: RIT-Rasch Unit, honoring George Rasch, the Danish mathematician who developed the underlying theory for this type of measurement. The RIT Scale is a curriculum scale developed by NWEA that uses the individual item difficulty values to estimate student achievement. Advantages to the RIT Scale are that it can relate the numbers on the scale directly to the difficulty of items on the tests and it is equal interval. Equal interval means that the difference between scores is the same regardless of whether a student is at the top, bottom, or middle of the RIT Scale, and it has the same meaning regardless of grade level (NWEA, 2004-2006).

Student Achievement: For the purpose of this study, student achievement is defined as a measure of the students' academic growth based on the RIT scores measured by the Northwest Evaluation Association Measure of Academic Progress. A pre- and post-test assessment was used to determine growth.

Student Performance: For the purpose of this study, student performance is defined as student, teacher, and parent perceptions regarding students' interest in schoolwork, quality of schoolwork, grades, homework, motivation, organization, and the students' writing and research skills.

24/7: Laptop accessibility for students 24 hours a day, 7 days a week.

CHAPTER II

LITERATURE REVIEW

This chapter contains a summary of information obtained from a review of literature pertinent to this study. The chapter is organized by seven major topics. The first section is focused on the evolution of technology in education followed by the need to integrate technology in schools today. The third section discusses the influence that technology has on student achievement and performance. Our global workforce has acquired a demand for Information Communication Technology (ICT) Literacy, which will be defined in section four. Section five discusses the barriers both schools and classroom teachers face in the integration of technology in classrooms, and section six provides an overview of one-to-one laptop initiatives in schools and states across America. The final section in Chapter II provides an overview and describes the process of implementation in relation to the study of Northern Cass School District's laptop initiative.

Evolution of Technology Instruction and Integration

Change may have been the greatest indicator in the revolution of technology integration in education. The launching of the Soviet satellite Sputnik in 1957 created national interest in education reform. Modern communications that included radio, film, television, and computers offered an information-rich society. Schools had to compete

for student attention since they were no longer the primary means of information (Molnar, 1997).

Early usage of computers was primarily found at college institutions and utilized in the math and science departments as a problem solving tool replacing the slide rule. Harvard was the first institution to utilize the computer MARK 1 in 1944 followed by the University of Pennsylvania in 1946 (Levien, 1972). Donald Bitier began PLATO, which was the first large scale integration of computers in education. This project consisted of several thousand terminals serving undergraduate education and elementary school reading in Urbana Community College and several college campuses in Chicago (U.S. Congress, 1982).

John Kemeny and Thomas Kurtz were some of the early pioneers in transforming the role of computers from solely research to an instructional aide. They created the universal computer language BASIC (Peterson, 1983). Other inventors continued to enhance computer usage in education that included Seymour Papert from MIT developing the program language LOGO that soon became the computer literacy program for elementary schools (Papert, 1980). Papert had a vision that students should use computers as a tool for learning and enhancing creativity. Many people believed this theory to be impractical since the cost of computers was too expensive in the 1960s. Papert's vision became a reality and today he is considered one of the world's experts on utilizing technology as a means to achieve student learning (Papert, 1980).

Cost was a major deterrent of computer usage in schools. However, in 1975, a revolution of the low-cost microcomputers began to evolve. Personal computers began

to appear in business offices, classrooms, libraries, laboratories, and even homes. The once luxury of the computer was transpiring into a necessity for business and learning applications (Molnar, 1997).

Meyer (2001) reported a ratio of 19.2 students per instructional computer in 1992 in comparison to 4.9 students per instructional computer in 2000. Smerdon et al. (2000) conducted a survey that consisted of 2,019 full-time teachers in the 50 states and the District of Columbia. Their survey results indicated that 99% of public school teachers had access to computers in 1999. Eighty-four percent of the teachers had classroom computers. Surveyed teachers indicated they were more likely to use computers and the Internet when the computer is located in their classroom.

The ratio of students to instructional computers with Internet access continued to decline in a 2005 report by the U.S. Department of Education. The report indicated a ratio of 3.8 to 1 instructional computers with Internet access in public schools. This was a decrease from the 12.1 to 1 ratio reported in 1998 and a decrease from the 2003 report which reported a ratio of 4.4 to 1 (U.S. Department of Education, 2005).

Early trends of computer usage in the classroom during the 1980s consisted of drill and practice among students (Becker, 1983). Becker indicated that the drill and practice typically consisted of questions that automatically adjusted the level of difficulty to match student responses. Computer programming was another method of instruction. Teachers seemed to emphasize learning about computers versus learning about content (Becker, 1985).

The first assessment of computer competence was conducted by the National Assessment of Educational Progress (NAEP) in 1985-1988 (Martinez & Mead, 1988). The authors indicated that the students performed well on questions related to identifying computer parts, but performed poorly on questions that pertained to computer applications that included word processing, graphics, databases, and spreadsheets.

In the early 1990s, the computer programming declined while an emphasis of computer usage for learning content was evolving. Drill and practice remained to be the preferred method of computer usage among elementary schools (Sutton, 1991). Fulton's (1997) research found a gradual change in the drill and practice to emphasis on problem solving and in-depth learning. The survey was conducted on more than one million 1996 high school graduates who took the Scholastic Achievement Test. Results indicated that 72% of the students used a word processor for English courses, 51% of the students utilized computer literacy, 27% of the students used computers for math problems, 24% for computer programming, and 9% of the students reported no computer usage. Fulton compared the 1986 NAEP student survey results with the 1996 SAT student survey results and recognized that student computer usage in word processing climbed from 32% to 72% in the period of 10 years. The surveys also demonstrated a decline in computer programming over the decade from 44% to 24%. Researched literature from the surveys conducted demonstrated a paradigm shift in computer usage.

The Internet drastically increased the computer usage at school and home during the late 1990s. Availability of Internet access paved the way for student and teacher Internet usage both at home and in the classroom. The U.S. Department of Education

(2005) indicated that in 1994 only 35% of classrooms in K-12 settings had computers with Internet access. This number increased to nearly 100% in the fall of 2003.

Technology availability and productivity changed drastically from the early 1980s through the 21st century. These changes were influenced by many variables that included technology access, software, curriculum, professional development, and the transformation of instructional practices to enhance student learning (Fulton, 1997; Meyer, 2001; U.S. Department of Education, 2005).

The transformation of technology usage and application in the classroom is described very well by the following:

> What do students need to know and do with technology? Unlike the more stable content and goals we have for other areas of school study, technology continues to change and evolve; with these changes come ever-new goals for how technology should serve *learning*, and what students should know about technology. A review of the "prevailing wisdom" about appropriate technology use since the early 1980s takes one down an ever-turning road that includes programming in BASIC, then with LOGO; and on to drill and practice applications on integrated systems; word-processing and curriculum-specific tools like history databases, simulations, and microcomputer-based labs; then multimedia; the Internet; and now Web page design. While there may be some logic to this progression, the reality is that, just as educators get their arms around one approach, with the attendant investments in software, training and possible

curricular readjustments, the messages about appropriate technology use changes. (Fulton, 1997, p. 12)

The primary form of student learning from computers is what Murphy et al. (2002) describe as discrete educational software (DES) programs, such as integrated learning systems (ILS), computer-assisted instruction (CAI), and computer-based instruction (CBI). These software applications are also among the most widely available applications of educational technology in schools today, along with word processing software, and have existed in classrooms for more than 20 years (Becker, Ravitz, & Wong, 1999).

Technology integration in school classrooms continued to change and evolve. Past practices by teachers were often influenced by what educators thought technology integration should look like. Continuous changes in technology created challenges for education to identify a standard of implementation in regards to technology (Fulton, 1997). Discussion for universal technology standards in education did not appear until 1994 (Dugger, 2005). The International Technology Education Association (ITEA) funded by the National Science Foundation developed a document discussing the "power and promise of technology in our lives today" (Dugger, 2005, p. 1). This document was entitled *Technology for All Americans: A Rationale and Structure for the Study of Technology.* The document served as a valuable tool to identify what students should know and be able to do to achieve technology literacy. From 1996 to 2000, *Standards for Technological Literacy (STL): Content for the Study of Technology* was developed, reviewed, published, and disseminated. The ITEA developed a vision that all students

can and should become technologically literate. In early 2000, the National Academy of Science submitted a written statement supporting the STL standards. Until this time, educators were on a roller coaster ride as they attempted to adjust to the constantly changing definitions and the instructional model involving technology in education (Dugger, 2005).

The International Society for Technology in Education (ISTE) soon followed the ITEA with their National Educational Technology Standards (NETS) in 1998. These standards designed by a broad range of stakeholders defined what students needed to know about and what to do with technology. In 2006, the ISTE began working on the next set of standards for education. These standards will focus on student creativity, innovation, communication, collaboration, research, critical thinking and problem solving, along with technology operations and concepts (International Society for Technology in Education, 2000).

Need to Integrate Technology Into Education

Tapscott (1998) cites that 88 million offspring of baby-boomer adults spend a majority of their time on computers or playing video games. The author suggests that today's media-literate students watch less television than their parents did since TV lacks interactivity.

The National Commission on Excellence in Education (1983), in their report *A Nation at Risk,* identified three deficiencies at a time when the demands for highly skilled workers were needed. These deficiencies included:

- Computers and computer-controlled equipment are penetrating every aspect of our lives–homes, factories, and offices.
- One estimate indicates that by the turn of the century millions of jobs will involve laser technology and robotics.
- Technology is radically transforming a host of other occupations. They include health care, medical science, energy production, food processing, construction, and the building, repair, and maintenance of sophisticated scientific, educational, military, and industrial equipment. (p. 1)

The report also stated that American high schools should equip graduates with the computer skills to:

- Understand the computer as an information, computation, and communication device;
- Use the computer in the study of the other Basics and for personal and work-related purposes; and
- Understand the world of computers, electronics, and related technologies. (p. 3)

Twenty years later the No Child Left Behind Act of 2001 (NCLB) recommended that all 8th grade students be technology literate and referenced technology as an important source for supporting teaching and learning in American schools. The government report, *A Nation at Risk,* and education policy NCLB provided a clear indication on the importance of technology in the process of learning academic content

and to communicate and manage information efficiently (Culp, Honey, & Mandinach, 2003).

The United States is facing increasing competition in the global economy. This competition will involve mastery of new technologies with emphasis in mathematics and science. It is the responsibility of educators and law makers to ensure that our young people are adequately prepared to meet these challenges. Technology has changed the world outside our schools and is now changing the teaching and learning environment within our schools. Students themselves are a cause of this change with their technology savvy skills and the age of the Internet (U.S. Department of Education, 2004).

From the extensive research conducted by Culp et al. (2003), they found three reoccurring themes for the investment in educational technology. These three themes are "1) Technology as a Tool for Addressing Challenges in Teaching and Learning, 2) Technology as a Change Agent, and 3) Technology as a Central Force in Economic Competitiveness" (pp. 9-10). In addressing challenges in teaching and learning, the authors identified key opportunities frequently cited in their research included "helping students collect and make sense of complex data; supporting more diverse and process-oriented forms of writing and communication; and dramatically broadening the scope and timeliness of information resources available in the classroom" (p. 9).

Culp et al. (2003) reported that technology used as a change agent can transform classrooms from lecture-driven instruction to constructivist, inquiry-oriented classrooms. The authors cite economic competitiveness to improve student decision making skills,

increase citizen participation, and support a modern workforce while narrowing the digital divide.

In another study, Sivin-Kachala and Bialo (2000) reviewed 311 researched reports to determine the effectiveness of technology on student achievement. Their study indicated that when students have learning opportunities with technology-rich environments, considerable gains were made in all subject areas. Students also demonstrated improved attitudes toward learning and increased self-esteem.

Influence of Technology on Student Achievement and Performance

Improving student achievement and performance seems to be the primary focus when identifying the need to integrate technology into the classroom. With the passage of No Child Left Behind (NCLB), the federal government has placed major emphasis on student achievement (U.S. Department of Education, 2001a). Since improving student achievement and performance is the desired outcome, it may be relevant to define or identify student achievement and student performance. The School Technology and Readiness Report (CEO Forum, 2001) defines *student achievement* as "the attainment of articulated objectives for students, measured through a variety of identified instruments that result in excellence and the ability to thrive in the rapidly changing world" (p. 34). School districts have experienced tremendous pressures to be accountable for student performance and achievement. Thus, efforts to implement technology into classrooms and schools must provide evidence that the technology is improving student performance and achievement (North Central Regional Educational Laboratory, 2005).

Student achievement and performance has been a common thread by researchers in describing the importance of integrating technology in the curriculum (CEO Forum, 2001; Culp et al., 2003; North Central Regional Educational Laboratory, 2005; Sivin-Kachala & Bialo, 2000). Educators and policy makers emphasize measuring student achievement and performance. No Child Left Behind Act of 2001 is a federal law with a designed framework on how to improve student performance of America's elementary and secondary schools while ensuring that no child is trapped in a failing school (U.S. Department of Education, 2001a). The U.S. Department of Education (2001a) provided strategies to increase student performance that included (a) increased accountability for states, school districts, and schools; (b) greater school choice for parents; (c) greater flexibility for sates and local educational agencies in the use of federal education dollars; and (d) emphasis on reading especially for younger children. Increased accountability has been the means to assure increased student achievement. School districts and schools that fail to make adequate yearly progress towards statewide designed proficiency goals are subject to improvement by corrective action and restructuring measures aimed at meeting the state standards.

The No Child Left Behind Act of 2001 (NCLB) has placed a major emphasis on student achievement and performance and utilizes the means of measurement through Adequate Yearly Progress (AYP) to assure that the desired outcomes are being met. Individual states are responsible for designing the performance standards along with a method of assessment to measure student achievement and performance. "Under *No Child Left Behind*, educators are expected to consider the results of relevant scientifically

based research–whenever such information is available–before making instructional decisions" (U.S. Department of Education, 2003, p. 1).

While NCLB federal policy requires that school districts implement scientific-based instructional practices and programs to enhance student achievement and performance, Marzano (2003) lists five school-level factors in sequence of importance that impact student achievement. These five factors include:

1. Guaranteed and viable curriculum
2. Challenging goals and effective feedback
3. Parent and community involvement
4. Safe and orderly environment, and
5. Collegiality and professionalism. (p. 15)

These factors discussed by Marzano have many of the same characteristics mandated under the NCLB federal policy.

Research and government policy seem to suggest that curriculum, accountable and measurable goals, parent involvement, a safe school environment, and professional development are the derivatives that impact student achievement and performance in education. School reform recognizes the importance of technology integration to achieve student performance and achievement (CEO Forum, 2001; National Commission on Excellence in Education, 1983; North Central Regional Educational Laboratory, 2005; U.S. Department of Education, 2004).

Researchers, policy makers, and educators seem to emphasize *enhancing student achievement and performance* as the main objective when implementing technology into

the curriculum. The Student Technology and Readiness Report (CEO Forum, 2001) stated that student achievement must be improved in order for American students to compete in the global economy. In order to accomplish this goal, the United States must ensure our education institutions prepare students to thrive in the future. The report indicated that technology can benefit student achievement. However, in order for technology to improve student achievement, it must focus on specific measurable objectives. "In addition, students must demonstrate higher levels of motivation and engagement when using technology, which also contributes to improved achievement" (p. 6).

Global Demand for ICT Literacy

Influence from federal legislation and the need to prepare students for a global workforce is a primary indicator for technology integration in classrooms across America. In the last decade, technology has moved into our everyday lives. It has influenced the way we learn, work, and live.

Technology literacy skills for our students and nation seemed apparent by former United States Federal Reserve Chairman Alan Greenspan in his remarks in *The Role of Education During Rapid Economic Change.* Greenspan (1997) states,

> One of the most central dynamic forces is the accelerated expansion of computer and telecommunications technologies, which can be reasonably expected to appreciably raise our standard of living in the twenty-first century. In the short run, however, fast-paced technological change creates an environment in which the stock of plant and equipment with which most managers and workers interact

> is turning over more rapidly, creating a perception that human skills are becoming obsolete at a rate perhaps unprecedented in American history. I shall endeavor to place this most unusual phenomenon in the context of the broader changes in our economy and, I hope, to explain why education, especially to enhance advanced skills, is so vital to the future growth of our economy. (p. 1)

Many different terms have been used to describe what students need, such as technological literacy, digital-age literacy, and 21st century skills. Technological literacy is defined as "the knowledge about what technology is, how it works, what purposes it can serve, and how it can be used efficiently and effectively to achieve specific goals" (Burkhardt et al., 2003, p. 17). Digital-age literacy includes basic, scientific, economic, technological, visual, information, and multicultural literacy and global awareness (International Information Communication Technology Literacy Panel, 2002).

Educational leaders, nationally and internationally, are beginning to come together around a new common definition of what students need to know. This common definition is Information Communication Technology (ICT) Literacy. Technology literacy reflects the need for students to develop learning skills that enable them to think critically, analyze information, communicate, collaborate, problem solve, and make decisions. This concept recognizes that technology is essential to obtain these learning concepts (Kay & Honey, 2005). Students today will require new abilities to achieve and develop 21st century skills. In today's economy, students will have to locate information quickly, analyze information, evaluate digital information for accuracy, and apply information to solve problems. These 21st century skills include digital-age literacy,

inventive thinking, effective communication, and high productive abilities ("Technology Counts," 2001).

Casonato and Morello (2002) have recognized how technological and business changes have been brought about by the Web and wireless communication and have transformed how people work. This change dictates how employee performance is measured and how working objectives are established. Working environments are switching from an employer centered world of predefined employee activities to a worker centered environment in which employees design their own assignments. Combined technical skills with work experiences, leadership roles, team building, and knowledge are included in the framework of employment.

> In the last decade, technology has moved out from the periphery of our lives into the everyday, becoming a pervasive part of how we live, work, and learn. Networked communications and computer technology have transformed the modern workplace dramatically, touching nearly every profession and job category, from auto mechanic to office clerk. Skills once confined to a geeky few are now basic requirements for the mainstream many. As a result, the need to prepare students not only to participate but to excel in this technology-enriched world has begun to influence the thoughts and decisions of more and more teachers, parents, and policymakers. Such preparation is critical not only to individual students' success, but also to our nation's global competitiveness. (Kay & Honey, 2005, p. 2)

Roschelle, Pea, Hoadley, Gordin, and Means (2000) provide four fundamental characteristics of how technology can influence how children learn in the classroom: (a) active engagement, (b) participation in groups, (c) frequent interaction and feedback, and (d) connections to real-world contexts. The authors also suggest use of technology is more effective as a learning tool when embedded in a broader education reform movement that includes improvements in teacher training, curriculum, student assessment, and a school's capacity for change.

Business communities are a driving voice calling for students to develop technology literacy skills. The Internet will be one of the technologies in a learning environment on which students live and work (Becker, 1996). In relation to Kay and Honey's (2005) six technology literacy skills for the 21st century, the Secretary's Commission on Achieving Necessary Skills (1991) lists five skills necessary for employment in the workplace. These skills include (a) resource allocation skills–handling time, money, materials, space, and staff; (b) interpersonal skills–working on teams, teaching others, serving customers, leading, negotiating, and working well with people from culturally diverse backgrounds; (c) information skills–acquiring and evaluating data, organizing and maintaining files, interpreting and communicating, and using computers to process information; (d) systems skills–understanding social, organizational, and technological systems, monitoring and correcting performance, and designing or improving systems; and (e) technology skills–selecting equipment and tools, applying technology to specific tasks, and maintaining and troubleshooting technologies. It is evident that the essential employment skills defined by the Secretary's

Commission on Achieving Necessary Skills include communication and technology literacy skills. Thus, it appears that a relationship can be drawn with the Information Communication Technology (ICT) Literacy skills defined by Kay and Honey and the essential business skills needed in the workplace as described by the Secretary's Commission on Achieving Necessary Skills.

Partnership for 21st Century Skills (2003) has recognized a widening gap that is forming between the knowledge of skills students are receiving and the necessary skills students need to succeed in the increasingly technology-driven global workplace. In the first step to bridge this gap, NCLB requires that states demonstrate that every student is technologically literate by the time they finish 8th grade, regardless of race, ethnicity, gender, social economic status, location, or disability (U.S. Department of Education, 2001b).

While NCLB has established an 8th grade technology literacy requirement, it fails to identify the skills and knowledge students need, the methodologies to teach these skills, or the assessment tool to assure accountability (Kay & Honey, 2005). The researchers suggest that the U.S. Department of Education needs to take a lead role in adopting a national standard for ICT literacy. It is the hope of the authors that Congress will modify current policy to include a complete ICT standard and accountability mechanism.

Technology Integration Barriers

Government, businesses, global economy, and the workplace have called for the need for schools to develop student communication and technology literacy skills

(Kay & Honey, 2005; Secretary's Commission on Achieving Necessary Skills, 1991; U.S. Department of Education, 2001b). Yet, schools across America have failed to recognize the new ways students communicate and access information (Levin & Arafeh, 2002). The researchers explain that there is a disconnection between how students use the Internet for school under teacher supervision and how they use the Internet in their daily lives. Levin and Arafeh (2002) state that "students' educational use of the Internet occurs outside of the school day, outside of the school building, outside the direction of their teachers" (p. 4). The researchers blame school administrators, not teachers, for setting the tone for Internet and technology integration for student learning in schools.

Teachers are usually allowed to choose whether they utilize technology in the classroom. Few schools or building level principals assess instructional practices on the basis of technology integration. An Office of Technology Assessment study (U.S. Congress, 1988) showed that many teachers lack the computer expertise to effectively utilize computers for student learning. This study of 50 colleges and universities revealed only 29% of students preparing to be teachers felt ready to teach with computers. Another report by the Office of Technology Assessment (U.S. Congress, 1995) indicated that teacher preparation experience in most colleges provide limited knowledge of the ways technology can be used in their professional practice.

A major emphasis in regard to professional development involving technology integration has been placed on fundamental computer operation and standard software application based rather than curriculum based (Sandholtz & Reilly, 2004). It is presumed by educational institutions that knowing technology is the first step in

utilization and application. This assumption seems evident by the early technology standards established by states and organizations. The federal government has also taken the role of providing funds to K-12 schools rather than colleges of education. This practice may address current needs, but fails to influence teacher preparation or quality over the long term (U.S. Congress, 1995).

Cuban (2001) finds that students and teachers use new technology far less in the classroom than they do at home. Most classrooms that do use technology are unimaginative. Cuban argues that most classroom computers are expensive toys that sit in the corner and collect dust. The author cites top-down pressure from parents, school communities, and business leaders has led placement of computers in the classroom without teacher involvement. Limited technical support from schools and commercial educational software that fails to align with existing curriculum have resulted in limited technology integration in the classroom. Becker and Ravitz (2001) argue Cuban's findings. They state that when teachers have sufficient computer resources of five or more computers in their classroom with computer skill and experience, a majority of teachers will utilize computers productively. Their usage will typically be word processing, but will also involve other learning-based software or Internet resources. Other factors that will influence computer usage in the classroom includes extending classroom periods of 50 minutes to longer blocks and allowing teachers to instruct fewer subject areas.

Becker and Ravitz support Cuban in findings that computers are not the central vehicle of instruction. The researchers conclude that most classroom activities involving

computers are skill-based instruction about computers in occupational courses such as business or vocational education. For effective computer integration that results in student learning, it is important to note that teachers must have "adequate technical expertise, adequate classroom access to computers, and a philosophy that supports meaningful learning around group projects" (Becker & Ravitz, 2001, p. 14).

Many questions remain concerning effective technology integration into the classroom to enhance student learning and achievement. Questions such as:

1) How often are students using the Internet or other computer resources to learn?
2) Are youngsters using school computers that can handle large amounts of data and employ sophisticated communication tools? or
3) Are students working with obsolete machines that belong in a junkyard rather than a 21st-century classroom?
4) Do some schools have the technical support necessary to keep machines running while others do not?
5) Are teachers in one district getting better training to understand how to use technology to enhance learning, while teachers in another district are left to themselves to figure it out? and
6) Do all kinds of students–low achievers and high achievers, minority and white children, girls and boys, well-to-do and poor youngsters–benefit equally from the technology available in schools? ("Technology Counts," 2001, p. 1)

Margaret Honey, director of the Center for Children and Technology, indicates that many schools have adequate computer supplies but fail to use them in effective ways to close the digital divide or enhance student learning. Honey states, "You don't just put technology into schools or into homes and expect miracles to happen. The technology is only as good as the program that surrounds it" ("Technology Counts," 2001, p. 1). A statistical report by Smerdon et al. (2000) revealed one third of surveyed teachers felt well prepared or very well prepared to use computers and the Internet for classroom instruction. Of these same teachers, those who reported well prepared were more likely to use technology than teachers who felt unprepared in classroom technology integration.

Byrom and Bingham (2001) maintain leadership as the single most important factor effecting successful integration on technology in schools. The researchers conclude that effective leadership is true at all levels that include state, district, and school. They note that states which have successful technology programs have visionary governors, legislators, and department of education staff who are committed in the use of technology for student learning. Mergendoller, Johnston, Rockman, and Willis (1994) support Byrom and Bingham's findings citing leadership as the key for successful implementation of technology. They identify the principal's role as critical in promoting technology and the superintendent for diffusing technology district wide. The researchers identify four important leadership tasks for technology integration that include (a) obtaining resources, (b) buffering the project from outside interference, (c) encouraging staff, and (d) adapting standard operating procedures to the project.

An effective technology plan is the second essential ingredient identified by Byrom and Bingham (2001) followed by a patient process for effective technology integration. The researchers noticed that a correlation exists between technical support and schools that demonstrate progress along the continuum of technology integration. Schools that receive the most attention experience the greatest progress.

Byrom and Bingham (2001) found that regardless of the circumstance, there are some teachers who embrace change while others continue to resist change. However, the researchers note that there are research-based practices and common-sense strategies to implement that will entice teachers to use technology. Some common-sense professional development practices suggested by Byrom and Bingham include (a) begin with teaching and learning, not with hardware and software; (b) use teachers as mentors and coaches; (c) avoid wasted time in training if teachers don't have the resources, opportunity, or support needed to apply new knowledge and skills; and (d) recognize that professional development is ongoing and comes in many shapes and sizes.

It may be an assumption by many educators that cost and lack of computers is the primary barrier which limits technology integration in the classroom setting. However, statistical research has demonstrated a tremendous increase in computer and Internet access in schools across America. The ratio of students to instructional computers with Internet decreased from 12.1 to 1 in 1998 compared to 3.8 to 1 in 2005 (Greene, 2006).

One may argue that statistical data demonstrate that computer availability is not considered a barrier when implementing technology for effective student learning and achievement. Thus, one must cite literature in identifying (a) instructional leadership at

the district, state, and federal level; (b) professional development; (c) inadequate teacher preparation; (d) effective planning; (e) teacher resistance to change; and (f) technical support as the major barriers for failing to effectively integrate technology to enhance student performance, achievement, and learning (Becker & Ravitz, 2001; Byrom & Bingham, 2001; Levin & Arafeh, 2002; Mergendoller et al., 1994; Sandholtz & Reilly, 2004; U.S. Congress, 1995). Many researchers signify leadership is the primary component for effective technology integration to enhance student performance and achievement (Byrom & Bingham, 2001; Levin & Arafeh, 2002; Mergendoller et al., 1994).

Laptop Initiatives in Education

It is apparent from the literature review that the availability of technology in the classroom has sharply increased since the early 1980s in American schools. Not only has computer availability increased, but computers with Internet access have simplified accessibility for classroom teachers (Greene, 2006). Researchers have presented a strong argument that computers alone will not increase the usage in classrooms. A study conducted by Windschitl and Sahl (2002) on a one-to-one laptop computer school demonstrated that the availability of laptops will not influence effective instructional practices when implementing technology to improve student learning. The researchers found that, even when students had their very own computers, two out of the three teachers observed failed to use technology in alternative ways from the traditional teacher-centered approaches. Cuban (2001) suggests that computer to student ratios

have declined considerably and teachers continue to fail to utilize the technology effectively.

Research has clearly indicated that, with the global demands of society, there is a need for educators to prepare students with the appropriate technology literacy skills for the 21st century (Casonato & Morello, 2002; Kay & Honey, 2005; Partnership for 21st Century Skills, 2003). Some states and school districts have recognized our global society as the age of information, communication, and technology literacy. In the charge to meet the global *ICT literacy* demand for the 21st century, these states and schools have implemented one-to-one laptop initiatives. While some researchers conclude that increasing the availability of computers will not necessarily increase computer usage in the classroom, Cuban (2001) and Windschitl and Sahl (2002), among others, have found that increasing the availability of computers on a scale of one-to-one will increase usage (Lowther & Ross, 2003; Rockman et al., 1998, 2000).

Rockman et al. (1998, 2000) is an independent research organization in San Francisco that conducted a three year evaluation of Microsoft's Anytime, Anywhere Learning Program. Each student in the "Laptop Program" acquired a laptop computer loaded with Microsoft Office software, and their teachers received training on how to integrate technology into the classroom. Over 450 students and 144 teachers participated in the three year laptop initiative study (Rockman et al., 2000). Some of the findings from Rockman et al.'s study contradicted previous research that suggests computer accessibility does not influence classroom integration. In fact, Rockman et al. (1998) found that

> seventh grade Laptop students used computers as much in a day as Non-Laptop students used them in a week. Tenth grade Laptop students used computers in school more than two hours per day, over nine times as much as the Non-Laptop students. When we combine school-related use of the notebook computers in and out of school, we find that middle school students spend almost two hours per day–and high school students spend more than three-and-one-half hours per day–using computers for academic work. In laptop program pioneer schools, it appears that the notebook computer and applications software have become indispensable tools for accomplishing the work of schooling. (p. 7)

As the three year study transpired, Rockman et al. (2000) found that non-laptop students closed the margin of computer access both in the classroom and at home. However, laptop students continued to demonstrate a deeper understanding of the flexible uses of technology than the non-laptop students. Laptop students also revealed a greater confidence in computer usage in various applications and utilized computers for a greater variety of tasks.

Lowther and Ross (2003) found similar evidence that student computer usage increased sharply when involved in a 24/7 one-on-one laptop initiative. Computer literacy skills and usage of word processing both showed significant differences in comparison to laptop and non-laptop students. Internet and CD Rom referencing also showed greater usage by laptop students but the difference gap was identified as nonsignificant by the researchers.

One may question how effectively would businesses function on a computer ratio of one computer per five business associates. As Rockman (2003) states about laptop initiatives,

> It's one of the most compelling school-change interventions we have seen in decades, but it isn't about laptops—it's about what students do when they have full-time access to powerful tools, the same tools found in offices and on the desks of professionals in all fields. These tools are the same ones needed to accomplish the work of school: tools for writing, conducting research, simulating problems, manipulating formulae, making presentations, and organizing information. (p. 1)

Rockman's work has been inspirational in recognizing the skills that laptop initiatives have provided for students in problem solving, communication, self-management, research, and organization. The researcher notes that these acquired skills are closely tied to the necessary skills for the 21st century. However, Rockman (2003) states that "administrators and board members who insist on a specific test score gain as the return on investment are, more likely than not, going to be disappointed" (p. 25). Many state standardized tests are not administered with computer technology. Writing portions of the state standardized tests require paper and pencil composing and editing. Rockman (2003) argues that "the same technology tools on their standardized assessments that they use for their everyday work will more closely match the assessments with the 21st-century skills students are learning" (p. 25).

Many statewide laptop initiatives have evolved in the past few years. States that include Maine and Michigan have implemented laptop initiatives in specified grades, while Texas and Florida have implemented grant project initiatives targeting specific school districts and demographics (Great Maine Schools Project, 2004; Laptops for Learning Task Force, 2004; Shapley et al., 2006). Large fiscal notes are attached to these educational reforms resulting in many policy makers, educators, and researchers to closely monitoring the outcomes of these initiatives.

The Texas Technology Immersion Pilot was the most recent large scale laptop initiative implemented in the fall of 2006. The state invested nearly $14 million in federal Title II Part D monies for high-need middle schools in a competitive grant process. The Texas Center for Educational Research conducted the assessment for the program. The implementation framework consisted of a laptop computer for both classroom teachers and students on a 24/7 basis (Shapley et al., 2006). Major findings of the study revealed positive reforms in leadership support, teacher proficiency and productivity, student proficiency and productivity, and improved student satisfaction and behavior. Surprisingly, the study failed to find significant gains in student achievement on reading and mathematics scores for participating students (Shapley et al., 2006). The findings from the Texas Technology Immersion Pilot seem to develop a direct correlation with Rockman et al. (2003) when he suggested that it will be difficult to measure significant gains on student achievement when using current standardized tests.

Maine may have been known as the leader in statewide laptop initiatives when Governor Angus King convinced state legislatures to purchase 33,000 laptops for

students and 3,000 laptops for teachers from a $37.2 million contract with Apple. The initiative equipped all 7th and 8th grade students with their personal Apple iBook computers (Kahney, 2002).

The Great Maine initiative, as reported in a study at Piscataquis Community High School, found many of the same results as the Texas Technology Immersion Pilot. The report concluded that positive impacts were measured on improving student computer skills, increased access to educational resources, increased student motivation and interest in school, and enhanced the interaction between students and teachers. Once again, the study failed to provide evidence that the laptop initiative improved student achievement although most student and teacher perceptions suggested improvement. However, the researchers do believe continued research must be conducted to measure the effects laptop initiatives have on student achievement (Great Maine Schools Project, 2004).

While it has been difficult to find measurable student achievement increases resulting from laptop initiatives at the statewide or local district levels, Henrico County School District in Virginia has recognized noticeable gains in their standardized test scores. In 2000, only 60% of their K-12 schools were accredited in accordance to Virginia Standards of Learning Criteria. In 2003, all 100% of the district's schools were accredited, including 40 elementary schools, 11 middle schools, and 9 high schools (Laptops for Learning Task Force, 2004). Henrico initially deployed 24,000 laptops to students in grades 6 through 12 and 3,300 laptops to its entire teaching and administrative staff in the year 2000. Before implementation of the laptop initiative, the

district identified goals and learning objectives in the quest of preparing students for the 21st century by providing meaningful instruction and to improve academic performance. The district was mildly surprised by the substantial academic gains that were made on state standardized tests. School officials attributed much of this success to the laptop initiative (Henrico County Public Schools, 2007).

Literature has demonstrated that laptop initiatives have prepared students with the 21st century skills needed for the global society. Statewide and district wide laptop initiatives demonstrated increased student motivation, writing skills, computer literacy skills, and effective organization and processing skills (Great Maine Schools Project, 2004; Laptops for Learning Task Force, 2004; Lowther & Ross, 2003; Rockman et al., 1998, 2000). Measuring student achievement through state standardized assessments has been difficult since state assessments are conducted with paper and pencil versus utilizing the technology skills laptop students have acquired (Rockman et al., 2003). Although most school districts have failed to recognize student achievement on state standardized tests, Henrinco County is one school district that has demonstrated exception to the norm with a consistent growth in student test scores and reaching 100% school accreditation.

CHAPTER III

METHODOLOGY

Laptop Initiative at Northern Cass School District

Northern Cass School District is located in Cass County, North Dakota. The districts of Dakota and Cass Valley North were consolidated into one district to form Northern Cass in 1997. Northern Cass School District is geographically located in the middle of the communities of Argusville, Arthur, Grandin, Gardner, Hunter, and Erie. Arthur is the largest community with a population of 412. The rural school is located 25 miles northwest of Fargo, North Dakota. Northern Cass is unique since the closest town is nine miles away.

Enrollment at Northern Cass School District is 510 students in grades K-12. All students are located in one building with grades K-5 in the lower level and grades 6-12 in the upper level of the building.

The primary economic industry is agriculture and agriculturally related businesses. Patrons living in Northern Cass School District are employed in the various communities or commute to Fargo for employment.

In 2004, the Northern Cass School District developed a vision regarding technology integration. The vision entailed enhancing student academic performance through the use of technology (one-to-one laptop initiative). A technology team of over

25 school and community members that consisted of students, administration, staff, parents, community patrons, and school members researched the concept of implementing a one-to-one laptop initiative at Northern Cass School District. The technology team recognized the need to establish specific goals providing purpose and need for the suggested project. The team identified three primary goals:

1. Students and teachers will utilize technology in the regular classroom to improve and strengthen student achievement in all curricular disciplines.
    a. It was identified by the technology team that student achievement must be the primary goal to continue to meet adequate yearly progress on student standardized achievement tests.
2. Students will graduate from Northern Cass School with proficient technological skills that will prepare them for their post secondary education and to compete in the global labor force.
    a. Northern Cass wanted to provide students with the technology skills to be successful in post secondary education and future careers.
3. To enhance the economy of our region.
    a. Northern Cass recognized that quality schools impact the economy of a community.

Once Northern Cass established the desired goals for the initiative, they divided the technology committee into teams to study different components of a laptop initiative for successful implementation. The technology team was divided into (a) research, (b) physical plant preparation, (c) user policy, (d) grade implementation, (e) funding,

(f) curriculum, (g) professional development, and (h) computer usage in the classroom. The team spent six months conducting research on the different components identified essential for successful integration. Monthly meetings were held with the entire team to report findings and assign additional research tasks. Team members also visited Oak-Land Junior High School in Stillwater, Minnesota. Oak-Land was in their second year of implementation of a one-to-one laptop initiative.

Once all the data were collected, the technology team prepared a project plan addressing all eight components identified for successful implementation and presented the plan to the Northern Cass School District in April 2005. The board unanimously approved the plan. After the April 2005 board meeting, the laptop initiative at Northern Cass was implemented.

In the fall of 2005, 15 classroom teachers received Tablet PCs to begin phase II (professional development). Northern Cass selected a Tablet PC over a standard laptop to allow for the versatility of note taking and organization. Laptop teachers spent the entire 2005-2006 school term receiving training in the use of hardware, software, and the transformation of instruction practices to enhance student learning through technology. Monthly three-hour time blocks were utilized in the professional development phase. The laptop team that consisted of teachers, the technology coordinator, and administration identified three key areas on how technology can enhance student learning. These three areas included (a) teachable moments, (b) student and teacher organization, and (3) project-based learning (higher-order thinking skills). The framework for professional development aligned with the established themes, which

provided direction and structure to the professional development component. Participating laptop teachers received over 40 hours of professional development and training before students received their computers.

During the summer of 2006, Northern Cass installed the backbone for wireless connectivity throughout the entire school. Nexus Innovations was instrumental in assisting in the SharePoint server installation and designed the webpage classroom environment. The webpage classroom environment was designed specifically to meet the instructional and learning needs for Northern Cass teachers and students. The secured classroom webpage enabled both students and teachers to share and exchange classroom documents, pictures, videos, and threaded discussions with ease and flexibility. Classroom productivity was enhanced greatly by utilization of the SharePoint server.

During the fall of 2006, all participating parents and students attended an open house training session. The training demonstrated proper care for the computers, computer functionality, and reviewed the district user policy designed specifically for the laptop initiative. After the required training session, each junior and senior at Northern Cass received their new Tablet PC.

The laptop initiative at Northern Cass remained focused on the three original described learning objectives: (a) teachable moments, (b) student and teacher organization, and (c) project-based learning. Students and teachers have utilized the teaching and laptops as a learning tool in all classrooms to achieve the desired objective in enhancing student learning and to develop independent learners.

Initially, teachable moments seemed to provide the greatest impact on student learning during the early phase of the initiative. Immediate Internet access enabled classrooms to utilize the teachable moments through the vast array of information provided by the World Wide Web. Classroom lessons would spiral through the immediate resources available. Students soon became independent learners while teachers changed their instructional practices to facilitators. Students became both the teacher and the learner in this classroom environment.

Organization and structure evolved through the use of Microsoft Office applications and the SharePoint server. Many students saved and organized classroom notes on their computers with tools provided through Microsoft Student and Microsoft Office OneNote. Students utilized research and note taking features offered by OneNote and maximized the pen features in the Tablet PCs. Most classrooms eliminated paper and pencil documents and exchanged all assignments electronically.

It was acknowledged at a professional development workshop that laptop teachers wanted to transform their instructional practices through project-based learning to achieve higher-order thinking skills in student learning. Northern Cass laptop teachers recognized that content, knowledge, and subject information are global. The teacher is no longer the expert in the classroom. It was a mission for Northern Cass laptop teachers to become the classroom facilitator in student learning. They recognized that students have the largest source of data available at their fingertips. It also was noted that students needed guidance and direction when filtering on-line information for reliable content. It was the school's vision to utilize technology to enhance student

learning. Through this process, it was recognized that both the student and teacher are the learner. This type of learning transformation is in its infancy at Northern Cass. The team at Northern Cass believed that this process of learning will continue to evolve with technology integration at Northern Cass. Many people have stated that Northern Cass is on the cutting edge of technology. However, it has been the administration's, faculties', and students' theme that "Northern Cass is on the cutting edge of learning."

Computers in the hands of 85 students resulted in some technology malfunctions during the one-to-one journey. A student help desk support system under the direction of the technology coordinator, Tim Keckler, was implemented during the initial stage of the project. Weekly training was provided for the student technicians who managed the help desk. A seven-period student technical support system was implemented to keep the computers functioning efficiently. Students who served as help desk support staff gained valuable skills in communication, time management, training, and IT software and hardware repair skills. The help desk established a goal to limit computer repair time to under a five-minute interval.

For the fall of 2007, Northern Cass had a laptop in the hands of students in grades 10 through 12. The laptop program was expanded to include electronic textbooks, reducing the weight of the backpack. Students will continue to expand on the teachable moments and project-based learning opportunities that prevail in a one-to-one initiative. Of course, student organization skills continue to evolve utilizing the organizational tools that complement the laptop. Northern Cass students have

recognized that learning can transpire through efficient and effective use of technology in the quest to develop independent, lifelong learners.

Purpose of the Study

Laptop initiatives have been a relatively new phenomenon in K-12 education in America. The literature review suggests that students participating in one-to-one initiatives will improve their academic performance in writing, attendance, student behavior, project-based learning, and higher-order thinking skills (Lowther & Ross, 2003; Rockman, 2003). The literature also suggests that continued research needs to be conducted to measure student academic achievement in the core content areas of reading, language arts, and mathematics (Great Maine Schools Project, 2004; Rockman, 2003).

The purpose of this study was to examine how a laptop initiative in the 11th and 12th grade effected student achievement and student academic performance over an academic calendar year at a selected small, rural North Dakota high school. The two variables in this study were the perceived student performance skills based on pre-existing survey results from student, teacher, and parent participants and the pre-existing Northwest Evaluation Association Measure of Academic Progress (NWEA MAP) test results from laptop students at Northern Cass School District.

Research Questions

The following research questions were used to facilitate this study:

1. What effects does a laptop initiative have on student academic performance based on the perceptions of participating junior and senior students?

2. What effects does a laptop initiative have on student academic performance based on the perceptions of participating teachers?
3. What effects does a laptop initiative have on student academic performance based on the perceptions of parents?
4. What impact does a one-to-one laptop initiative have on the instructional practices of participating teachers after one year of project implementation?
5. How do the perceptions of parents, teachers, and students differ regarding the impact of the one-to-one laptop initiative on student academic performance?
6. What effect will a one-to-one laptop initiative for students in 11th and 12th grade at Northern Cass have on student achievement based on Northwest Evaluation Association Measure of Academic Progress test results in the content areas of reading, language arts, and math in comparison to other 11th and 12th grade North Dakota students?

Selection of the Study Group

The study group consisted of 39 juniors and 40 seniors who participated in the one-to-one laptop initiative at Northern Cass School District.

Table 1 illustrates the number of enrolled Northern Cass juniors and seniors who participated in the laptop initiative at Northern Cass during the 2006-2007 school year. All 79 or 100% of Northern Cass juniors and seniors participated in the laptop initiative.

Table 2 shows the frequencies and percentages of junior and senior students who took the survey administered in April 2007. Thirty-eight juniors or 97.4% and 36 seniors or 92.3% participated in a survey administered by Northern Cass School District

Table 1. Frequencies and Percentages of Students Who Participated in the Laptop Initiative (N=79).

Student Grade	Frequency	Percent
11	39	100.0
12	40	100.0

Table 2. Frequencies and Percentages of Students Who Participated in the Laptop Survey (N=39 Juniors and N=40 Seniors).

Student Grade	Frequency of Students Who Completed the Survey	Percent
11	38	97.4
12	36	92.3

to determine the effects that the laptop initiative has on student performance based on student, teacher, and parent results. Northern Cass School District acquired permission to use the Mitchell Institute survey instrument assessment tool for laptop initiatives from Lisa Plimpton, Director of Research, at Mitchell Institute.

Laptop students participated in the pre and post NWEA testing conducted by Northern Cass in early October 2006 and late April 2007. Rasch Unit (RIT) scores were used to measure student academic growth in reading, language arts, and math during the students' academic year. Test results were also utilized as a baseline reference for Northern Cass laptop students to determine a significant difference in student achievement in comparison to all North Dakota juniors and seniors who took the NWEA

test in the fall of 2006 and spring of 2007. Permission was also granted from the Northern Cass School Board to utilize existing NWEA student data and the survey results from students, parents, and teachers to conduct the study. Table 3 identifies the frequencies and percentages of students who participated in the NWEA testing conducted by Northern Cass School District.

Table 3. Frequencies and Percentages of Students Who Participated in the NWEA Test (Fall of 2006 and Spring of 2007).

Northern Cass Students	NWEA Fall 2006 N	%	NWEA Spring 2007 N	%
Grade 11	39	100.0	39	100.0
Grade 12	40	100.0	39	97.5

All 39 or 100% of the juniors took the NWEA test both the fall of 2006 and spring of 2007. There were 40 or 100% of the seniors who took the test in the fall of 2006. One senior student was unable to participate in the spring NWEA test, resulting in 39 seniors or 97.5% who completed the test in the spring of 2007.

Sixteen laptop teachers or 100% completed the survey administered by Northern Cass School District. The faculty survey was administered on-line. Table 4 shows the frequency and percentage of Northern Cass teachers who took the laptop survey assessment.

Table 4. Frequency and Percentage of Teachers Who Completed the Survey (N=16).

Frequency of Teachers Who Completed the Survey	Percent
16	100.0

One survey with a self-addressed, stamped envelope was mailed to every junior and senior parent. No follow-up surveys were sent. Table 5 illustrates the frequencies and percentages of parents who completed the survey.

Table 5. Frequencies and Percentages of Teachers Who Completed the Survey (N=39 Junior Parents and N=40 Senior Parents).

Parents Who Completed the Survey	Frequency	Percent
Junior Parents	21	53.8
Senior Parents	17	42.5

There were 21 junior laptop parents or 53.8% and 17 senior laptop parents or 42.5% who completed the survey administered by Northern Cass School.

Data Collection

Northern Cass School District provided the researcher with existing student test scores in reading, language arts, and math tests (NWEA MAP) from Northwest Evaluation Association (2004-2006). Northern Cass School District tested students in both the fall of 2006 and spring of 2007 with NWEA MAP assessment to provide the data needed to make educational leadership decisions for overall student achievement.

Tests were administered in early October and late April. Test scores provided existing data for the study and were compared to North Dakota juniors and seniors who took the NWEA MAP test in both the fall of 2006 and spring of 2007. Permission to use the pre-existing data was granted by the Northern Cass School Board (Appendix A).

The Northern Cass School District conducted student, teacher, and parent surveys in April 2007 that measured the perceived student academic performance in relation to the laptop initiative implemented in the 2006-2007 school year (Appendix B). The survey was part of the assessment tool that measured the overall perceived impacts of the laptop project. Northern Cass School District acquired permission to use the Mitchell Institute survey instrument assessment tool for laptop initiatives from Lisa Plimpton, Director of Research, at Mitchell Institute (Appendix C).

Data Analysis

The two variables in this study were the perceived student academic performance skills based on survey results from student, teacher, and parent participants and student achievement based on the Northwest Evaluation Association Measure of Academic Progress (NWEA MAP) test results from laptop students at Northern Cass School District. Descriptive analysis was interpreted to determine student, teacher, and parent perceptions of student academic performance based on the implementation of a one-to-one laptop initiative at Northern Cass School District. A descriptive analysis was conducted to determine whether the laptop initiative improved student academic performance and how it impacted instructional practices of participating teachers.

The data collected from the NWEA MAP assessments and surveys were analyzed through descriptive analysis and by using the Statistical Package for the Social Sciences (SPSS). A chi square test of independence was used to identify significant differences that existed in the survey results between students, teachers, and parents. A one sample t-test was used to determine significant RIT mean differences that existed on the Northwest Evaluation Association Measure of Academic Progress (NWEA MAP) test results for Northern Cass and North Dakota junior and senior students. The data analysis was presented in tabular and narrative format.

CHAPTER IV

RESULTS AND ANALYSIS

The purpose of this study was to examine how a laptop initiative in the 11th and 12th grade effected student achievement and student academic performance over an academic calendar year at a selected small, rural North Dakota high school. The two variables in this study were the perceived student performance skills based on pre-existing survey results from student, teacher, and parent participants and the pre-existing Northwest Evaluation Association Measure of Academic Progress (NWEA MAP) test results from laptop students at Northern Cass School District. Descriptive analysis was interpreted to determine student, teacher, and parent perceptions of student academic performance based on the implementation of a one-to-one laptop initiative at Northern Cass School District. Statistical tests were performed to determine student performance growth in comparison to other North Dakota 11th and 12th grade students on NWEA MAP test results in reading, language arts, and math. For results and analysis, this chapter is divided into three sections: selection of the study group, analysis of data, and statistical analysis.

Analysis of Data

An analysis of the pre-existing data supplied by the Northern Cass Public School District was conducted to determine whether the laptop initiative improved student academic performance and how it impacted instructional practices of Northern Cass

teachers. A statistical analysis was also performed to determine whether significant relationships existed between students, teachers, and parents on their perceptions of how the laptop initiative impacted student learning and performance. A second statistical analysis was performed to determine whether the laptop initiative impacted student achievement of participating students in the content areas of reading, language arts, and math; however, student academic achievement was not a major focus of this study.

The Northern Cass School District wanted to measure how the laptop initiative impacted home computer and Internet access and usage. Table 6 illustrates the frequencies and percentages of students who had a home computer and Internet access prior to the laptop initiative. The table also shows the type of Internet access and when they acquired their Internet access.

Table 6. Frequencies and Percentages of Students' Home Computer and Internet Access (N=74).

	N	%
Students who had a computer at home prior to the laptop initiative	71	96.0
Students who have Internet access	71	96.0
Student who acquired Internet access after the laptop initiative	5	6.8
Students who have broad band Internet access	42	58.3
Students who have dial-up Internet access	30	41.7

Of the 74 student respondents, 71 or 96% indicated that they had a home computer prior to the laptop initiative at Northern Cass. All 71 or 96% of the students

indicated they had Internet access at home prior to the laptop initiative. Five or 6.8% of the students acquired Internet access at home after they received their laptop from school. There were 42 or 58.3% of the students who stated they had broad band Internet access and 30 or 41.7% of the students had dial-up Internet access. Two did not respond to this question.

Northern Cass established communication and collaboration as one of the project goals upon implementation. Thus, school officials wanted to measure frequencies and percentages of student to student and student to teacher assistance as a result of the laptop initiative. Table 7 indicates frequencies and percentages on the collaborative assistance that transpired throughout the initiative.

Table 7. Frequencies and Percentages of Student Perceptions Regarding the Technology Assistance Between Students and Teachers (N=74).

Question	Daily		Weekly		Monthly		Less Than Monthly		Never	
	N	%	N	%	N	%	N	%	N	%
How often do you typically help another student use a computer?	5	6.8	26	35.1	13	17.6	19	25.7	11	14.9
How often does another student help you use your laptop?	3	4.1	14	18.9	18	24.3	30	40.5	9	12.2
How often do you typically help a teacher use a computer?	1	1.4	5	6.8	10	13.5	20	27.0	38	51.4

Of the student responses, 26 or 35.1% indicated that they assist another student weekly with technology assistance since implementation of the laptop initiative. Thirty students or 40.5% responded that other students help them use their laptop less than monthly. Only one student or 1.4% helps teachers use the computer on a daily basis.

Five students or 6.8% help teachers on a weekly basis with technology issues related to their computers.

Another desired goal established by Northern Cass School District in relation to the laptop initiative was to provide students the technology literacy skills for successful college and career opportunities. Table 8 categorizes how the students rated their technology literacy skills after one year of project participation.

Table 8. Students' Self-Rated Technology Literacy Skills (N=74).

User Level	Frequency	Percent
Novice – I can turn the computer on, but I don't really know how to use many programs.	2	2.7
Beginner – I am able to use some basic functions such as word processing and the Internet.	2	2.7
Intermediate – I am able to use many of the programs, but I don't have a lot of experience with them.	33	44.6
Advanced – I am able to use many of the programs and have had a great deal of experience with them.	29	39.2
Expert – I am able to teach others how to use some programs and I am able to fix minor problems with my computer when they happen.	8	10.8

Of the student responses, 33 or 44.6% identified their skills as intermediate and 29 or 39.2% rated their technology literacy skills as advanced.

Sixteen teachers participated in the laptop initiative at Northern Cass and 100% of the participating teachers completed the survey. Of the teachers who completed the survey, there was one teacher who taught both math and foreign language. This resulted

in the frequency being 17. Teachers who instructed in various discipline areas were involved in the laptop initiative. Table 9 lists the frequencies and percentages of subject areas taught by participating teachers.

Table 9. Frequencies and Percentages of Subject Areas Taught by Participating Teachers (N=17).

Subject Area	Frequency	Percent
Art	1	6.3
Language Arts/English	3	18.8
Science	1	6.3
Technology Education	2	12.5
Foreign Language	2	12.5
Math	4	25.0
Social Studies/History	3	18.8
Family and Consumer Science	1	6.3

Of the teacher responses, 3 teachers or 18.8% taught in the disciplines areas of language arts/English and social studies/history and 4 teachers or 25% instructed math courses. There were 2 teachers or 12.5% who taught in the discipline areas of technology education and foreign language. Only one teacher or 6.3% taught in the subject areas of art, science, and family and consumer science.

The teacher survey measured the amount of years that they have been teaching. Six of the teachers who were involved in year one of the laptop initiative had 20 or more

years of teaching experience. Four of the participating teachers had 13 to 19 years of experience. The years of experience ranged from 7 to 9 to 3 or fewer for the remaining teachers. Table 10 illustrates the frequencies and numbers of years participating laptop teachers have been teaching.

Table 10. Frequencies and Number of Years Teaching of Participating Laptop Teachers (N=16).

Number of Years Teaching	Frequency
3 or Fewer	2
4-6	2
7-9	2
13-19	4
20 or More	6

The survey also measured the technology literacy skills of the teachers. Of the teacher responses, 11 teachers or 68.8% reported their technology skill level as intermediate (e.g., assign projects, organize information, create your own class materials). There were 4 teachers or 25% who reported their skill level as advanced (e.g., regularly integrate technology into curriculum, provide staff development opportunities for others). Only 1 teacher or 6.3% rated their technology skill level as novice (still learning to use the machine). Table 11 illustrates the teacher perceptions regarding their technology literacy skills.

Table 11. Teacher Perceptions in Regards to Their Technology Literacy Skills (N=16).

Teacher Technology Literacy Skills	Frequency	Percent
Novice – (still learning to use the machine)	1	6.3
Beginner – (e.g., e-mail, word processing, JMC)	0	0.0
Intermediate – (e.g., assign projects, organize information, create your own class materials)	11	68.8
Advanced – (e.g., regularly integrate technology into curriculum, provide staff development opportunities for others)	4	25.0
Expert – (e.g., use technology for student assessment, develop learner-centered strategies)	0	0.0

The parent survey measured the highest level of education of any adult member in the household. A total of 38 parents responded to the survey. Of the responses, 15 or 39.5% reported a bachelor's degree and only 2 or 5.3% reported a high school degree or GED. Table 12 identifies the highest level of education completed by any adult in the household.

Of the 38 parents who responded to the survey, all 38 or 100% indicated having both a computer and Internet access at home. Of the 38 parents who had Internet access, 22 or 59.5% had broad band access and 15 or 40.5% had dial-up access. Table 13 lists the home computer with Internet access and identifies the Internet band-width of the home computer.

Table 12. Highest Level of Education by Adult Member in the Household (N=38).

Level of Education	Frequency	Percent
Less Than High School	0	0.0
High School/GED	2	5.3
Some College	8	21.1
Associate Degree	11	29.0
Bachelor's Degree	15	39.5
Advanced Degree (Master's, PhD)	3	7.9

Table 13. Home Computer Internet Access and Band-Width of Internet Access (N=38).

	Frequency	Percent
Home Computer With Internet Access	38	100.0
Broad Band-High Speed Internet Access	22	59.5
Dial-up Internet Access	15	40.5

The survey asked parents to rate their computer literacy skills. A majority (21 or 55.3%) of the parents rated their computer skills as intermediate while 10 or 26.3% reported their skills as advanced. Seven or 18.4% of the parents reported their skills as beginner. Table 14 lists the parents' perceptions relative to computer literacy skills.

Table 14. Frequencies and Percentages of Parents' Perceptions on Computer Literacy Skills (N=38).

Parent Computer Literacy Skills	Frequency	Percent
I do not use a computer	0	0.0
Beginner – (I am just learning)	7	18.4
Intermediate – (I am comfortable using a computer)	21	55.3
Advanced – (I can help teach others)	10	26.3

Statistical Analysis

Research Question #1

What effects does a laptop initiative have on student academic performance based on the perceptions of participating junior and senior students?

A Likert-type scale was used to measure the student perceptions of their academic performance in regard to a laptop initiative after one year of implementation. Research question one was formulated to determine what effects a laptop initiative has on students' academic performance based on participating student perceptions. The researcher utilized 12 survey questions to measure the effect that the laptop initiative had on student performance. Students were asked to select their response on a Likert-type scale that ranged from 5=strongly agree to 1=strongly disagree. For reporting purposes, strongly agree and agree selections were combined as were disagree and strongly disagree selections. Table 15 presents the student perceptions in regards to the effect that the laptop initiative had on their academic performance.

Table 15. Frequencies and Percentages of Student Perceptions on How the Laptop Initiative Effected Student Academic Performance.

Statement	SA and A		Neutral		D and SD	
	N	%	N	%	N	%
1. Laptops make schoolwork more interesting.	59	79.8	11	14.9	4	5.4
2. Laptops make schoolwork easier to do.	57	77.0	12	16.2	5	6.8
3. Laptops have improved the quality of my schoolwork.	54	73.0	14	18.9	6	8.1
4. Having a laptop has improved my grades.	32	43.2	30	40.5	12	16.2
5. I do more homework outside of school since I received my laptop.	33	44.6	23	31.1	18	24.3
6. I am more motivated to do schoolwork when I use my laptop.	42	56.8	19	25.7	13	17.6
7. Having a laptop helps me to be better organized.	59	79.8	12	16.2	3	4.1
8. I enjoy going to school more since I received my laptop.	32	43.2	28	37.8	14	18.9
9. I am more likely to revise/edit my schoolwork when it is done on the laptop.	54	73.0	16	21.6	4	5.4
10. The availability of the Internet simplifies research of information for classroom assignments.	66	89.2	7	9.5	1	1.4
11. I am more interested in school when we use the laptops.	41	55.4	24	32.4	9	12.2
12. I prefer to handwrite my assignments rather than using my laptop.	13	17.6	13	17.6	48	64.9

Of the 74 student responses, 66 or 89.2% agreed or strongly agreed with the statement that the availability of the Internet simplified research for assignments. A majority of students, 59 or 79.8%, stated that laptops improved their organization. Another 59 or 79.8% of the students indicated that laptops make schoolwork more interesting. There were 57 or 77% of the students who responded favorably with the statement that laptops make schoolwork easier to do. Students indicated that the

availability of the Internet, interest, organization, and ease to complete schoolwork had the greatest impact on their classroom performance. Students also responded favorably when utilizing the computers for revision, editing, and typing assignments. Of the 74 respondents, 54 or 73% suggested they were more likely to revise or edit schoolwork when using their laptop. There were 48 or 64.9% of the students who disagreed or strongly disagreed with the statement to handwrite assignments rather than using their laptop for typing assignments.

A lower number of students, 32 or 43.2%, indicated that the laptops have improved their grades. Another 32 or 43.2% of the student respondents stated that they enjoy going to school more since they received their laptops. Of the 74 student responses, 33 or 44.6% stated that they do more homework outside of school since they received their laptop.

The survey administered by Northern Cass School District measured frequencies in academic areas that students used their laptop computers for homework. Table 16 lists the student perceptions in frequencies and percentages of academic areas that students use their laptop computer for homework.

Of the 57 students who were enrolled in a language arts class, 54 or 94.7% indicated that they used their laptops for homework. There were 71 students enrolled in social studies/history during the 2006-2007 school year. Of these 71 students, 67 or 94.4% stated that they used their laptops for homework in social studies or history.

Table 16. Frequencies and Percentages of Student Perceptions Measuring the Academic Subject Areas That Students Use Laptop for Homework (N=Number of Student Respondents Who Took the Class).

Academic Area	Yes		No	
	N	%	N	%
Language Arts (reading/writing) (N=57)	54	94.7	3	5.3
Foreign Language (N=17)	10	58.8	6	35.3
Social Studies/History (N=71)	67	94.4	4	5.6
Mathematics (N=73)	36	49.3	26	35.6
Science (N=46)	35	76.1	11	23.9
Technology/Computer Ed. (N=24)	18	75.0	6	25.0
FACS (N=21)	17	81.0	4	19.0
Industrial Technology (N=6)	3	50.0	3	50.0
Business Education (N=8)	7	87.5	1	12.5

Students were also surveyed on the amount of time they use their laptop for each academic class enrolled. Table 17 reports the frequencies and percentages of student perceptions relative to the hour blocks of student laptop usage during class.

The largest number of students, 19 or 29.7%, reported utilizing their laptops seven or more hours per week during mathematics. Students in social studies and language arts reported the highest frequencies in using their laptop in the one to three hours per week time block. These numbers were 54 or 79.4% and 43 or 76.8%, respectively. The largest frequency and percentage of math students (19 or 29.7%) reported using their laptops seven or more hours per week. Math students were also the

Table 17. Frequencies and Percentages of Student Perceptions Relating to the Amount of Time Laptops Were Used in the Classroom (N=Number of Student Respondents Who Took the Class).

Academic Class	0 hours per week		1-3 hours per week		7 or more hours per week	
	N	%	N	%	N	%
Language Arts (N=56)	2	3.6	43	76.8	11	19.6
Foreign Language (N=14)	2	14.3	10	71.4	2	14.3
Social Studies (N=68)	1	1.5	54	79.4	13	19.1
Mathematics (N=64)	21	32.8	24	37.5	19	29.7
Science (N=42)	6	14.3	31	73.8	5	11.9
Computer Education (N=20)	3	15.0	6	30.0	11	55.0
FACS (N=20)	3	7.5	15	75.0	2	10.0
Industrial Tech. (N=5)	2	40.0	3	60.0	0	0.0
Business Education (N=8)	1	12.5	6	75.0	1	12.5

largest frequency and percentage of students (21 or 32.8%) who reported zero hours per week in laptop usage during class.

Research Question #2

What effects does a laptop initiative have on student academic performance based on the perceptions of participating teachers?

A Likert-type scale was used to measure the teacher perceptions of student academic performance in regards to a laptop initiative after one year of implementation. Research question two was formulated to determine what effects a laptop initiative has on student academic performance based on the participating teacher perceptions. The researcher utilized 11 survey questions to measure the effect that the laptop initiative had

on student performance. Teachers were asked to select their response on a scale that ranged from 5=strongly agree to 1=strongly disagree. For reporting purposes, strongly agree and agree selections were combined as were disagree and strongly disagree selections. Table 18 illustrates teacher perceptions in regards to the effect that the laptop initiative had on student academic performance.

Table 18. Frequencies and Percentages of Teacher Perceptions on How the Laptop Initiative Effected Student Academic Performance.

Statement	SA & A		Neutral		D & SD	
	N	%	N	%	N	%
1. Laptops make schoolwork more interesting for students.	15	93.8	1	6.3	0	0.0
2. Laptops make schoolwork easier to do for students.	9	56.3	6	37.5	1	6.3
3. Student achievement in my classes with laptops has improved.	6	37.5	9	56.3	1	6.2
4. Laptops have improved student grades.	4	25.0	9	56.3	3	18.8
5. Students do more homework outside of school as a result of laptops.	4	25.0	8	50.0	4	25.0
6. Students are more motivated to do schoolwork when the usage of a laptop is required.	9	56.3	7	43.8	0	0.0
7. Laptops have improved student organization.	8	50.0	8	50.0	0	0.0
8. Students are more likely to revise/edit work when it is done on the laptop.	11	68.8	4	25.0	1	6.3
9. The availability of the Internet simplifies research of information for student classroom assignments.	16	100.0	0	0.0	0	0.0
10. Students are more interested in school when we use the laptops.	14	87.5	2	12.5	0	0.0
11. Students prefer to handwrite assignments rather than using their laptop.	1	6.3	3	18.8	12	75.0

Of the 16 teacher responses, all 16 or 100% of the teachers stated that the availability of the Internet simplified research for students in the classroom. Another 15 or 93.8% of the teacher responses suggested that laptops make schoolwork more interesting for students. There were 14 or 87.5% of the teacher respondents who agreed or strongly agreed with the statement that students are more interested in school when they use their laptop. Twelve or 75% of the teachers disagreed or strongly disagreed with the statement that students would prefer to handwrite their assignments rather than using their laptop. Another 11 or 68.8% of the teachers indicated that students were more likely to revise and edit their schoolwork when it is done on their laptop.

Only 4 or 25% of the teachers agreed or strongly agreed with two statements that laptops improved student grades and influenced students to do more homework outside of school. Six or 37.5% of the teachers felt that student achievement improved as a result of the implementation of laptops.

Northern Cass teachers were asked how the laptop initiative affected students at various academic abilities. The survey asked teachers to identify their beliefs regarding how laptops effected students' academic performance for three groups of students that included "traditional," "at-risk or low-achieving," and "high-achieving." These terms were not further defined in the survey, leaving each respondent to interpret them. Table 19 reports teacher perceptions on how the laptop initiative impacted learning for the traditional student.

Among the traditional students, teachers indicated that the greatest impact made on the learner involved classroom engagement, teacher interaction, and student

Table 19. Teacher Perceptions on How the Laptop Initiative Impacted Learning for Traditional Students (N=16).

	Traditional					
	Declined		No Effect		Improved	
	N	%	N	%	N	%
Interaction with teachers	0	0.0	3	18.8	13	81.3
Interaction with other students	2	12.5	1	6.3	13	81.3
Engagement / Interest level	0	0.0	3	18.8	13	81.3
Motivation	0	0.0	4	25.0	12	75.0
Ability to work in groups	0	0.0	9	56.3	7	43.8
Ability to work independently	0	0.0	5	31.3	11	68.8
Quality of work	0	0.0	4	25.0	12	75.0
Participation in class	0	0.0	4	25.0	12	75.0
Preparation for class	0	0.0	8	50.0	8	50.0
Ability to retain content material	0	0.0	7	43.8	9	56.3
Behavior	1	6.3	9	56.3	6	37.5
Attendance	0	0.0	11	73.3	4	26.7

interaction. The three questions had 13 teachers or 81.3% suggesting improvement. Of the 16 teachers who completed the survey, 2 or 12.5% reported a decline in student interaction for traditional students.

Table 20 lists the teachers' perceptions on how the laptop initiative impacted learning for at-risk or low-achieving students.

Quality of work, 14 or 87.5%, followed by teacher interaction, 13 or 81.3%, had the greatest impact on at-risk or low-achieving students as reported by the 16 teachers who completed the survey. There were 4 teachers or 25% who selected participation in

Table 20. Teacher Perceptions on How the Laptop Initiative Impacted Learning for At-Risk or Low-Achieving Students (N=16).

	At-Risk or Low-Achieving					
	Declined		No Effect		Improved	
	N	%	N	%	N	%
Interaction with teachers	0	0.0	3	18.8	13	81.3
Interaction with other students	2	12.5	4	25.0	10	62.5
Engagement / Interest level	0	0.0	5	31.3	11	68.8
Motivation	0	0.0	7	43.8	9	56.3
Ability to work in groups	0	0.0	10	62.5	6	37.5
Ability to work independently	1	6.3	5	31.3	10	62.5
Quality of work	0	0.0	2	12.5	14	87.5
Participation in class	4	25.0	2	12.5	10	62.5
Preparation for class	0	0.0	10	62.5	6	37.5
Ability to retain content material	0	0.0	7	43.8	9	56.3
Behavior	3	18.8	7	43.8	6	37.5
Attendance	0	0.0	11	73.3	4	26.7

class as the greatest decline resulting from the implementation of the laptop initiative. A majority of the teachers (11 or 73.3%) suggested that the laptop initiative had no effect on student attendance.

Table 21 presents the teachers' perceptions on how the laptop initiative impacted learning for high-achieving students.

For the high-achieving students, teachers reported that quality of work, 15 or 93.8%, and student engagement, 16 or 100%, had the greatest impact on student performance as a result of the laptop initiative. A majority of the teachers, 12 or 75%,

Table 21. Teacher Perceptions on How the Laptop Initiative Impacted Learning for High-Achieving Students (N=16).

	High-Achieving					
	Declined		No Effect		Improved	
	N	%	N	%	N	%
Interaction with teachers	0	0.0	5	31.3	11	68.8
Interaction with other students	3	18.8	2	12.5	11	68.8
Engagement / Interest level	0	0.0	0	0.0	16	100.0
Motivation	0	0.0	2	12.5	14	87.5
Ability to work in groups	0	0.0	8	50.0	8	50.0
Ability to work independently	0	0.0	4	25.0	12	75.0
Quality of work	0	0.0	1	6.3	15	93.8
Participation in class	0	0.0	4	25.0	12	75.0
Preparation for class	0	0.0	6	37.5	10	62.5
Ability to retain content material	0	0.0	9	56.3	7	43.8
Behavior	0	0.0	12	75.0	4	25.0
Attendance	0	0.0	12	80.0	3	20.0

indicated that the laptop initiative had no effect on student behavior. Another 12 or 80% reported that the initiative had no effect on student attendance for high-achieving students. Three teachers or 18.8% of the teachers reported a decline in student interaction for high-achieving students.

Research Question #3

What effects does a laptop initiative have on student academic performance based on the perceptions of parents?

A Likert-type scale was used to measure the parent perceptions of student academic performance in regards to a laptop initiative after one year of implementation. Research question three was formulated to determine what effects a laptop initiative has on their child's academic performance based on the perceptions of parents. The researcher utilized the parent responses of eight survey questions to measure the effect that the laptop initiative had on student academic performance. Parents were asked to select their response on a scale that ranged from 5=strongly agree to 1=strongly disagree. For reporting purposes, strongly agree and agree selections were combined as were disagree and strongly disagree selections. Table 22 illustrates the parent responses in regards to the effect that the laptop initiative had on student academic performance.

The greatest frequency or percentage of parents indicated that laptops make schoolwork easier to do for their child. Of the parent responses, 33 or 86.8% agreed or strongly agreed with this statement. There were 32 or 84.2% of the parents who agreed or strongly agreed with the statement that laptops make schoolwork more interesting for their child. Parents also reported favorably with the statement that laptops improved the quality of their child's schoolwork. Thirty or 79% of the parents supported this statement.

Parents reported the smallest influence that laptops had on their child's academic performance was in homework outside of school. Of the 38 parent responses, 17 or 44.7% reported that their child does more homework outside of school since they received their laptop. The next statement with the lowest frequency or percentage of favorable response from parents was whether their child enjoys school more since

Table 22. Frequencies and Percentages of Parent Perceptions on How the Laptop Initiative Effected Student Academic Performance (N=74).

Statement	SA & A		Neutral		D & SD	
	N	%	N	%	N	%
1. Laptops make schoolwork more interesting for my child.	32	84.2	4	10.5	2	5.3
2. Laptops make schoolwork easier to do for my child.	33	86.8	3	7.9	2	5.3
3. Laptops have improved the quality of my child's schoolwork.	30	79.0	7	18.4	1	2.6
4. Having a laptop has improved my child's grades.	20	52.6	14	36.8	4	10.5
5. My child does more homework outside of school since they received their laptop.	17	44.7	15	39.5	6	15.8
6. My child is more motivated to do schoolwork when using their laptop.	23	60.5	13	34.2	2	5.3
7. The laptop initiative has improved my child's organizational skills.	27	71.1	7	18.4	4	10.5
8. My child enjoys going to school more since they received their laptop.	19	50.0	14	36.8	5	13.2

receiving their laptop. Of the 38 parent responses, 19 or 50% stated that their child enjoys school more as a result of the laptop initiative.

Research Question #4

What impact does a one-to-one laptop initiative have on the instructional practices of participating teachers after one year of project implementation?

Research question four was formulated to determine if and how teachers changed their instructional practices as a result of the laptop initiative. The survey studied various areas regarding the perceptions of teachers in relation to the impact of their

instructional practices after one year of project implementation. Table 23 illustrates the teachers' perceptions on how the laptop initiative impacted teacher instructional preparation since implementation.

Table 23. Frequencies and Percentages of Teacher Perceptions Relating to Instructional Preparation Since Laptop Implementation (N=16).

Statement: Since the laptop program began, would you say that you:	Frequency	Percent
Spend **more** time planning now than before	9	56.3
Spend about the same amount of time planning lessons	6	37.5
Spend **less** time planning lessons now	1	6.3

There were 9 or 56.3% of the participating teachers who reported that they spend more time planning lessons since inception of the initiative. Six or 37.5% spend about the same amount of time and 1 teacher or 6.3% spends less time.

Teachers were asked if the laptop program made them a more efficient teacher. Table 24 lists the teachers' perceptions relative to teaching efficiency. Of the 16 teacher responses, 11 or 68.8% stated that the program made them more efficient while 5 or 31.3% reported no change.

Table 24. Frequencies and Percentages of Teacher Perceptions Relating to Instructional Efficiency in Regards to the Laptop Initiative (N=16).

Statement: Overall, would you say that the laptop program has made you:	Frequency	Percent
Less efficient	0	0.0
Neither less nor more efficient	5	31.3
More efficient	11	68.8

The survey measured many variables involving classroom instructional practices and student behaviors in the classroom. The greatest change reported by teachers occurred in student engagement in multiple activities and students working on different assignments during class. Table 25 provides a summary of the teachers' surveyed perceptional responses relative to changes in instructional practices and student classroom behaviors.

Table 25. Teachers' Perceptions on How the Laptop Initiative Impacted Instructional Practices and Student Classroom Behaviors (N=16).

Instructional Practices and Student Behaviors Since the Laptop Program Began	More Often		About as Often		Less Often	
	N	%	N	%	N	%
Students teach other students	10	62.5	6	37.5	0	0.0
Students teach the teacher	5	31.3	11	68.8	0	0.0
Students select their own research areas	7	43.8	7	43.8	2	12.5
Students explore a topic on their own	11	68.8	3	18.8	2	12.5
Students work in groups	4	25.0	10	62.5	2	12.5
Students review their own work	6	37.5	9	56.3	1	6.3
Students engage in multiple activities during class	13	81.3	3	18.8	0	0.0
Students do different assignments in one class	13	81.3	3	18.8	0	0.0
Students write more than one page	5	31.3	10	62.5	1	6.3
A textbook is the primary guide	0	0.0	9	56.3	7	43.8
Student interests influence lessons	10	62.5	5	31.3	1	6.3
Students answer textbook questions	0	0.0	8	53.3	7	46.7
Direct instruction	3	18.8	11	68.8	2	12.5
Quizzes and tests	2	12.5	10	62.5	4	25.0
Teacher evaluates student work	3	18.8	12	75.0	1	6.3
Curriculum regularly connects to other disciplines	7	43.8	9	56.3	0	0.0

There were 13 or 81.3% of the teachers who reported change more often in these two student learning practices in the classroom. Other major changes as indicated by teachers occurred in (a) students exploring their own topic (11 or 68.8%), (b) students teach other students (10 or 62.5%), and (c) student interests influence lessons (10 or 62.5%). Other instructional practices that changed involved textbook usage. Seven or 43.8% of the teachers indicated that they use the textbook less often as a primary guide since the laptop program began. Another 7 or 46.7% of the teachers indicated that students answer textbook questions less often.

Research Question #5

How do the perceptions of parents, teachers, and students differ regarding the impact of the one-to-one laptop initiative on student academic performance?

Research question five was formulated to determine if significant differences existed between students, teachers, and parents on their perceptions of how the laptop initiative effected student learning and academic performance. The chi square test of independence was used to measure the difference in perceptions of the three participating groups in relation to student academic performance after one year of the laptop initiative. Table 26 lists the percentages, chi square, and states whether there is a significant or non-significant difference in the agreed (A) or strongly agreed (SA) statements for students, teachers, and parents.

The chi square test for independence statistical analysis revealed a significant difference in percentages of agreement with students, parents, and teachers on statement 3, laptops have improved the quality of schoolwork, and with statement 7, laptops have

Table 26. Difference in Student, Teacher, and Parent Responses on How the Laptop Initiative Effected Student Academic Performance (N=74).

Statement	% of Student Responses	% of Teacher Responses	% of Parent Responses	Chi Square
1. Laptops make schoolwork more interesting.	79.8	93.8	84.2	1.21
2. Laptops make schoolwork easier to do.	77.0	56.3	86.8	7.47
3. Laptops have improved the quality of schoolwork.	73.0	37.5	79.0	12.53*
4. Laptops have improved student grades.	43.2	25.0	52.6	3.77
5. Students do more homework outside of school since they received their laptop.	44.6	25.0	44.7	3.70
6. Students are more motivated to do schoolwork when using their laptop.	56.8	56.3	60.5	5.25
7. Laptops have helped student organization.	79.7	50.0	71.1	10.19*
8. Students enjoy going to school more since they received their laptop.	43.2	Not Surveyed	50.0	4.98
9. Students are more interested in school when using the laptops.	55.4	87.5	Not Surveyed	14.85*
10. Students are more likely to revise/edit schoolwork when it is done on the laptop.	73.0	68.8	Not Surveyed	.12
12. Students prefer to handwrite assignments rather than using their laptops.	17.6	6.3	Not Surveyed	1.30

* Significant at .05 level.

helped student organization. The significant level of difference between the three surveyed groups for statement 3 and 7 is reported at the .05 level of significance. Statement 9 suggested that students are more interested in school when using their laptops. The statement appeared on the student and teacher surveys. Thus, the parents

were unable to provide feedback on this statement. Teachers responded to this statement with a majority (87.5%) who agreed or strongly agreed with this statement. There were 55.4% of the students who agreed or strongly agreed with this statement. The chi square test of independence found a significant difference in the student and teacher responses at the .05 level of significance.

Research Question #6

What effect will a one-to-one laptop initiative for students in 11th and 12th grade at Northern Cass have on student achievement based on Northwest Evaluation Association Measure of Academic Progress test results in the content areas of reading, language arts, and math in comparison to other 11th and 12th grade North Dakota students?

Research question six was formulated to determine if Northern Cass laptop students performed at a greater rate in academic achievement in comparison to other North Dakota juniors and seniors based on the Measure of Academic Progress RIT scores. Rasch Unit (RIT) is a curriculum scale developed by NWEA that uses the individual item difficulty values to estimate student achievement. The RIT scale relates numbers on a scale directly to the difficulty of items on the tests and it is equal interval. There were approximately 1,000 North Dakota juniors and seniors from other school districts who took both the fall and spring MAP test. These students represented the norm sample group. It was assumed by the researcher that these students were not participates in a 24/7 one-to-one laptop initiative since Northern Cass is the only known laptop school in North Dakota that administers the NWEA MAP assessment. Both the

norm and sampled groups were tested in the fall and spring of the 2006-2007 school year in the content areas of language arts, reading, and math. A one sample t-test was used to determine if a significant difference occurred between the mean RIT scores in language arts, reading, and math for Northern Cass and North Dakota students who participated in the 2006 and 2007 fall and spring NWEA MAP test.

Table 27 presents the fall of 2006 and spring 2007 mean RIT differences in language arts for junior and senior students from North Dakota and Northern Cass School District on a one sample t-test.

Table 27. NWEA Mean RIT Differences in Language Arts for North Dakota and Northern Cass Junior and Senior Students for the Fall of 2006 and the Spring of 2007.

Grade and Testing Period	Northern Cass Mean RIT	North Dakota Mean RIT	Mean Difference
11 Fall 2006	224.57	226.38	-1.81
11 Spring 2007	226.82	225.99	0.83
12 Fall 2006	228.82	220.29	8.53**
12 Spring 2007	224.77	230.45	-5.68**

* Significant at the .05 level
**Significant at the .01 level

Both the junior North Dakota controlled group and the junior Northern Cass sampled group showed no significant mean RIT difference in language arts test scores at the .05 or the .01 level. Northern Cass seniors' mean RIT test scores demonstrated a significant favorable difference in comparison to the North Dakota norm sampled group for the fall of 2006 at the .01 level. However, the Northern Cass seniors' mean RIT test

scores were considerably lower than the norm state average in the spring of 2007. The mean RIT language arts test score differences were significant at the .01 level.

Table 28 presents the fall of 2006 and spring of 2007 mean RIT differences in reading for junior and senior students from North Dakota and Northern Cass School District on a one sample t-test.

Table 28. NWEA Mean RIT Differences in Reading for North Dakota and Northern Cass Junior and Senior Students for the Fall of 2006 and the Spring of 2007.

Grade and Testing Period	Northern Cass Mean RIT	North Dakota Mean RIT	Mean Difference
11 Fall 2006	221.39	226.38	-4.99*
11 Spring 2007	221.72	229.26	-7.54**
12 Fall 2006	231.25	231.5	-0.25
12 Spring 2007	230.08	214.03	16.05**

* Significant at the .05 level
**Significant at the .01 level

Juniors at Northern Cass scored a lower mean RIT score in reading for both the fall of 2006 and spring of 2007 testing periods in comparison to the North Dakota mean RIT scores. The mean difference in the fall was -4.99, which was significantly different at the .05 level. Northern Cass juniors experienced a mean RIT difference of -7.54 in comparison to the state mean RIT averages for the spring of 2007. Differences in state and Northern Cass spring of 2007 reading RIT averages for juniors were significant at the .01 level.

Northern Cass seniors scored slightly lower with a mean RIT score of 230.08 in the spring of 2007 than their fall of 2006 score of 231.25. However, their mean reading RIT score of 230.08 was significantly higher than the state average of 214.03 for the spring of 2007. The spring of 2007 mean reading RIT difference between both the Northern Cass and North Dakota seniors was significant at the .01 level.

Math was the final comparison made regarding measuring the significant differences in mean student RIT scores for Northern Cass laptop students and the North Dakota norm sampled group of junior and senior students. Table 29 presents the fall of 2006 and spring of 2007 mean RIT differences in math for junior and senior students from North Dakota and Northern Cass School District on a one sample t-test.

Table 29. NWEA Mean RIT Differences in Math for North Dakota and Northern Cass Junior and Senior Students for the Fall of 2006 and the Spring of 2007.

Grade and Testing Period	Northern Cass Mean RIT	North Dakota Mean RIT	Mean Difference
11 Fall 2006	245.52	241.69	3.83
11 Spring 2007	246.15	242.01	4.14*
12 Fall 2006	241.85	238.25	3.6
12 Spring 2007	246.72	234.81	11.91**

* Significant at the .05 level
**Significant at the .01 level

Junior comparisons identify that Northern Cass juniors had a significant difference in mean RIT test scores for the spring of 2007 at a .05 level in comparison to the norm sample group of North Dakota students. Both groups of seniors showed no

significant difference in mean RIT scores for math in the fall of 2006. However, the spring of 2007 senior math mean RIT score difference of 11.91 was significant at the .01 level.

The summary, conclusions, and recommendations for further study are presented in the next chapter.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Chapter V contains the summary of the study, summary of findings and conclusions, recommendations for action, and recommendations for further study.

Summary of the Study

Laptop initiatives have been a relatively new phenomenon in K-12 education in America. Researchers suggest that students participating in one-to-one initiatives will improve their academic performance in writing, attendance, student behavior, project-based learning, and higher-order thinking skills (Lowther & Ross, 2003; Rockman, 2003). It also has been suggested by researchers that further studies on laptop initiatives need to be conducted that measure student academic achievement in the core content areas of reading, language arts, and mathematics (Great Maine Schools Project, 2004; Rockman, 2003).

The purpose of this study was to examine how a laptop initiative in the 11th and 12th grade effected student achievement and student academic performance over an academic calendar year at a selected small, rural North Dakota high school. The two variables in this study were the perceived student performance skills based on pre-existing survey results from student, teacher, and parent participants and the

pre-existing Northwest Evaluation Association Measure of Academic Progress (NWEA MAP) test results from laptop students at Northern Cass School District.

There were 39 junior and 40 senior students from Northern Cass School District who participated in the one-to-one laptop initiative during the 2006-2007 academic school year. Sixteen teachers who taught in the discipline areas of language arts, math, science, foreign language, art, physical education, family and consumer science, technology education, and business education were classroom instructors in the one-to-one laptop initiative. These teacher participants received over 40 hours of training prior to the laptop initiative at Northern Cass. The training consisted of the transformation of instructional practices through the use of technology.

The two variables in this study were the perceptions of student academic performances based on survey results from student, teacher, and parent participants and the Northwest Evaluation Association Measure of Academic Progress (NWEA MAP) test results from laptop students at Northern Cass School District. Descriptive analysis was interpreted to determine student, teacher, and parent perceptions on student academic performance based on the implementation of a one-to-one laptop initiative at Northern Cass School District. A descriptive analysis was conducted to determine whether the laptop initiative improved student academic performance and how it impacted instructional practices of participating teachers. A chi square test of independence was used to identify significant differences that existed in the survey results between students, teachers, and parents. A one sample t-test was used to determine significant RIT mean differences that existed on the NWEA MAP test results

for Northern Cass and North Dakota junior and senior students. Approximately 1,000 North Dakota junior and senior students took the NWEA MAP assessment in reading, language arts, and math in the fall of 2006 and spring of 2007. These 1,000 student test results were used as the norm sample group to determine the RIT test score differences in this study. The following questions were addressed in this study:

1. What effects does a laptop initiative have on student academic performance based on the perceptions of participating junior and senior students?
2. What effects does a laptop initiative have on student academic performance based on the perceptions of participating teachers?
3. What effects does a laptop initiative have on student academic performance based on the perceptions of parents?
4. What impact does a one-to-one laptop initiative have on the instructional practices of participating teachers after one year of project implementation?
5. How do the perceptions of parents, teachers, and students differ regarding the impact of the one-to-one laptop initiative on student academic performance?
6. What effect will a one-to-one laptop initiative for students in 11^{th} and 12^{th} grade at Northern Cass have on student achievement based on Northwest Evaluation Association Measure of Academic Progress test results in the content areas of reading, language arts, and math in comparison to other 11^{th} and 12^{th} grade North Dakota students?

Summary of Findings and Conclusions

This section attempts to provide a summarization of the descriptive and statistical analysis of the data in Chapter IV. Findings and conclusions will be reported in sequential order as presented by the six research questions in the study.

Question 1 Findings and Conclusions

Question 1. What effects does a laptop initiative have on student academic performance based on the perceptions of participating junior and senior students?

Survey data that consisted of 12 statements pertaining to student perceptions relative to academic laptop usage in and out of the classroom was the basis for the descriptive data used to determine the effectiveness of the laptop initiative for student academic performance. Statements in the survey measured students' motivation, time spent on homework, organization, grades, quality of schoolwork, and writing and editing with the use of a laptop computer.

Surveyed students indicated that the availability of the Internet, interest in school, organization, and ease to complete schoolwork had the greatest impact on their academic performance as a result of the laptop initiative. The largest percentage of students (89.2%) indicated that the instant availability of the Internet simplified research for assignments. Research seems to support the theory that laptop initiatives will enhance student writing skills. Immediate access to a word processor, the ability for students to quickly edit and revise, along with the instant access to the Internet, may be some factors for improving student writing skills. However, educators must be cautious regarding the information available to students on the Internet. A majority of students have mastered

the skill of Web searching. As a result of the literature review and personal experience of the researcher, it may be imperative for schools to focus instruction on filtering, processing, and organizing information to provide a meaningful purpose and understanding to the student. Students who master these skills will be able to produce a valid published product. The validity and accuracy of content is important for students to make critical decisions that will impact their education and future careers.

Many variables impact student organization in the classroom. Northern Cass School District utilized a classroom server that enabled teachers to post notes, study guides, and other classroom resources online. This classroom server has replaced student file folders that store notes, homework, or study guides. Students and teachers at Northern Cass have experienced fewer misplaced assignments or notes since these classroom documents are readily available online for downloading through PDF or word document formats. Students' ability to download these resources on a 24/7 basis may have impacted their response to the statement relating to organization. Northern Cass School District provided a one-day training session on utilization of the SharePoint classroom server to enhance both student and teacher organizational skills. Continuous training and support on server utilization was provided by the district technology coordinator.

There were 79.8% of the students who suggested laptops improved their organization and made schoolwork more interesting. It is interesting to note that 50% of the teachers perceived that laptops improved student organization. The remaining 50% of surveyed teachers perceived no change in student organizational skills. It is the

opinion of the researcher that the teachers who perceived no change in student organizational skills failed to utilize the strategies provided in the professional development on the SharePoint classroom server.

Research continues to emphasize that our current students are digital natives. Digital natives are those who grew up with digital technology from birth. It seems that the digital society is here forever and will continue to impact our global world. It may be no surprise that students are interested in learning when using a technology tool since technology has influenced their lives since birth. Technology may be deeper than a simple tool; it seems to be a culture that influences the daily lives of digital immigrants.

While past research on laptop initiatives has suggested an increase in student motivation and grades, this study showed the lowest percentage of student responses supporting this notion. The smallest percentage of students (43.2%) suggested that they enjoy going to school more since they received their laptops. This same percentage of students stated that laptops have improved their grades. Most school officials would be delighted to find a program that would increase student motivation and grades by 43.2%. Yet, for reporting purposes, these two survey statements had the lowest percentages with favorable responses. There were 16.2% of the students who reported receiving lower grades since the laptop implementation and 12.2% who disagreed with the statement that laptops made school more interesting. Both responses had a low percentage of disagreement with the two statements. Thus, it may be conclusive that the greatest majority of students were neutral or agreed with the statements.

Many student responsibilities result when a student receives a computer on a 24/7 basis. These responsibilities include proper care for an expensive computer, ethical Internet usage, and avoidance of playing games or chatting when schoolwork must be completed. It is essential that schools implementing laptop initiatives have a detailed user policy to control the many distractions that can correlate with technology. A well designed and fully implemented student user policy is essential for one-to-one laptop initiatives to achieve the desired outcomes of enhanced student learning. Continued and ongoing education for students and parents on proper usage in and out of the classroom can also decrease the negative outcomes experienced upon implementation of a laptop initiative. The ongoing education must focus on the dangers available on the Internet such as pornography, sexual predators, and falsified content. Educators model to students how to utilize the technology as a learning tool and eliminate wasteful time spent on online chatting or playing games. Emphasis on enhanced student learning must be the focus throughout implementation.

Students were asked to list academic areas in which they utilized their laptop most for homework outside of the classroom. A majority of students perceived language arts (94.7%) and social studies (94.4%) as the two academic areas in which laptops were used for homework. Mathematics demonstrated the smallest percentage at 35.6%. Both language arts and social studies are discipline areas that seem to require frequent writing and research. It appears that the common software application used would be a word processor and a web browser. The survey failed to question teachers on their specific technological skills and the specific types of training they received prior to and during

the initiative. One may question if teachers in the discipline areas of math or science have the necessary training to implement lessons that utilize instructional software such as spreadsheets to enhance student learning with the use of technology.

Question 2 Findings and Conclusions

Question 2. What effects does a laptop initiative have on student academic performance based on the perceptions of participating teachers?

The largest percentage of teacher responses (100%) indicated that the one-to-one laptop initiative simplified research for students in the classroom. Both students (89.2%) and teachers (100%) strongly supported the statement that laptops simplified research. It is evident that the immediate availability of laptops and wireless Internet access enhance students' ability to conduct research.

Teachers also expressed agreement with the statements that laptops make schoolwork more interesting (93.8%) and that students are more interested in school when using laptops (87.5%). Students seemed to agree with teachers that laptops make schoolwork more interesting with 79.8% who agreed or strongly agreed with this statement. However, a smaller percentage of students (55.4%) agreed or strongly agreed that laptops make school more interesting. The statement that had the largest percentage of disagreement by the teachers involved homework outside of school. There were 25% of the teachers who disagreed with the thought that students do more homework outside of school and 50% of the teachers selected neutral on this statement. The survey failed to measure required laptop usage in the classroom or for student homework. Required

usage of laptops during school or for homework usage may have impacted both student and teacher responses relating to these statements.

An overall common thread was reported by students and teachers involving laptops for the purpose of research, writing, and editing. Both groups suggested benefits with the immediate access of technology to complete writing and research assignments. The research conducted at Northern Cass supports the research conducted on other one-to-one laptop studies. Research also supports that students are more motivated to do schoolwork and attend school when involved in a laptop initiative. Similar results were found in the Northern Cass study. However, a smaller percentage (55.4%) of students reported that they enjoy going to school more since the laptop initiative began. Yet, it seems a larger percentage of students (79.8%) indicated that they enjoy doing schoolwork more when they use their laptops. Educators may wonder if the amount of time requiring student laptop usage impacts student motivation. A measurement on time and usage of laptops by students and their motivated perceptions on school may provide some clarity on this issue.

In summary, research question two measured teacher perceptions regarding the laptop initiative and what effects it had on student academic performance. Teachers recognized benefits of the laptop program when it involved research and writing. Teachers also supported or were neutral with statements that involved student motivation, grades, organization, and homework outside of school. There were no responses by teachers that signified strong disapproval of the laptop initiative. Thus, it is the researcher's conclusion that teachers have recognized improvement in student

academic performance as a result of the implementation of the laptop initiative at Northern Cass School District. The improvement in student academic performance was identified in research and writing, quality of schoolwork, classroom engagement, and student interest level when utilizing laptops to complete assignments.

The study also measured teacher perceptions on how the laptop initiative impacted student learning for the "traditional, at-risk or low achieving, and high-achieving" students. Once again, teachers reported improved or no effect on all three groups of students in the areas of interaction, engagement, motivation, collaboration, participation, preparation, retention, behavior, and attendance. Quality of work had the highest support from teachers for all three groups. This second component of the teacher survey seems to solidify a positive response by teachers on the impacts of the laptop initiative.

Before schools implement a one-to-one laptop initiative, they must recognize that students will be deterred from learning as a result of the laptop. It was stated earlier in this chapter that these outside deterrents may include chatting, games, music, or videos irrelevant to the lesson being taught. Teacher frustrations may grow with students off task by browsing the Internet, playing games, or listening to music during classroom lessons. Teachers may identify these distractions as student engagement or behavior issues. An example of this analogy would be by the four teachers (25%) who reported a decline in participation in class for "at-risk or low-achieving and high-achieving" students and the three teachers (18.8%) who reported a decline in behavior for these same groups of students. Once again, an acceptable user policy that outlines proper

usage is important for effective implementation of a one-to-one laptop project. Building level support from principals providing an ongoing monitoring system may also be critical for project success.

Question 3 Findings and Conclusions

Question 3. What effects does a laptop initiative have on student academic performance based on the perceptions of parents?

Parents indicated the largest percentage of agreement with three statements: (a) Laptops make schoolwork more interesting for my child (84.2%), (b) laptops make schoolwork easier to do for my child (86.8%), and (c) laptops have improved the quality of my child's schoolwork (79%). The largest percentage of disagreement was with the statement "My child does more homework outside of school since they received their laptop" (15.8%).

All three groups (students, teachers, and parents) reported favorable agreement with the statement that laptops make schoolwork more interesting. Both students and parents felt that the laptop initiative improved the quality of schoolwork. Parents' responses were similar to students and teachers in recognizing that the laptop initiative had impacted student motivation and quality of work. Once again, all three groups had the largest percentage of disagreement with the statement that laptops have influenced students to do more homework outside of school. There were 24.3% students, 25% teachers, and 15.8% parents who disagreed with this statement. Although these percentages were low for all three groups, it is important to recognize a common theme that transpired. This theme seems to imply that students in the study were not spending

more time on homework as a result of the laptop initiative. The study failed to measure the amount of homework required by the use of the laptop.

From the survey results, one may conclude that students enjoy using their laptop to do schoolwork. All three groups in the survey felt that the quality of work improved when using a laptop. Yet, the largest percentage of disagreement resulted in homework usage. To draw a valid conclusion, it may be important to measure how much homework teachers assign to students that requires the usage of their laptop. If homework assignments require the same requirement for completion before laptop implementation, one may conclude that no change would occur in the amount of time students spend doing homework.

Research questions one, two, and three continue to support that a one-to-one laptop initiative does impact student academic performance in regards to motivation, quality of work, interest, organization, and research and writing in a positive manner. To what degree is unknown and difficult to measure. In order for educators to have a significant understanding on the impacts that a laptop initiative has on student academic performance, it would be advantageous to identify and categorize the different components that impact student academic performance. Once these components are identified and categorized, it would then be helpful to study how each individual component impacts the academic performance of students as a result of a laptop initiative.

Question 4 Findings and Conclusions

Question 4. What impact does a one-to-one laptop initiative have on the instructional practices of participating teachers after one year of project implementation?

A majority of participating teachers (56.3%) indicated that they spend more time planning for classroom instruction as a result of the laptop initiative while 37.5% of the surveyed teachers reported that they spend about the same amount of time. Research has indicated that implementation of a laptop initiative requires a transformation of instructional practices in the classroom. Traditional instructional practices model the teachers as the deliverer of course content through lecture. Assessment of knowledge and comprehension is often conducted through tests or quizzes. Implementation of a laptop initiative under the traditional method of instruction will often result in failure. For successful implementation, teachers have to transform their instructional practices in the classroom towards facilitation. Under this constructivist model, students learn from each other while teachers guide the learning process. A focus must be placed on problem solving and critical thinking skills. In order for teachers to change their instructional practices, a tremendous amount of professional development must be provided. However, professional development alone will not accomplish the desired outcome. Teachers will have to spend a considerable amount of training outside of the classroom in order to prepare students for the 21st century. It appears evident that it may not be the laptop that changes how students learn, but the framework of classroom instruction involving the laptop that will provide the desired change. Thus, one may conclude that in order to determine the effectiveness of a laptop initiative, educators

must first identify effective measures of classroom instruction throughout implementation. A majority of Northern Cass teachers suggested an increase in time spent on planning preparation. The findings seem to support that, for effective laptop implementation, teachers will need to spend additional time revamping traditional lessons.

Surprisingly, 68.8% of the teachers indicated that the laptop program made them a more efficient teacher. No teachers reported the program made them less efficient in relation to instructional efficiency. You often hear the argument from teachers that technology integration impedes the content covered in the curriculum. An association may be made that if more time is spent in preparation by the teacher, the rigor of the curriculum can continue. Northern Cass teachers indicated they spend more time in instructional preparation. They also reported that the laptop program enhanced their instructional efficiency.

Research question four measured the impact that the laptop initiative had on their instructional practices over the course of an academic school year. The survey asked teachers various questions that included collaborative learning, independent learning, engagement, writing, use of textbooks, instruction, and student assessment.

Teachers reported that the laptop program resulted in students teaching other students more often than before the implementation of the laptop program. There were 62.5% of the teachers who reported an increase. A majority of teachers also stated that student interaction with other students increased since project implementation for the "traditional, at-risk or low achieving, and high-achieving" students. One may conclude

that the laptop initiative has increased student collaboration, but it is important to understand why increased interaction and collaboration among students occurred. Teachers can influence student interaction and collaboration in the classroom by the method of delivery. Student interaction and collaboration is filtered or encouraged by the classroom teachers. Thus, the laptop initiative may not be responsible for increased student interaction or collaboration, but the responsibilities for increased student interaction and collaboration rest upon the instructional methods used by the teacher in the classroom.

There were 43.8% of the teachers who reported that students select their own research areas more often and 68.8% of the students explore their own topic as a result of the laptop initiative. Northern Cass teachers reported that 37.5% of the students review their own work more often while 56.3% of the teachers were neutral on this statement. It is evident from the reported data that the enthusiasm of students to learn on their own increased resulting from the initiative. Another reported finding from the teacher survey supported the theory that the laptop initiative transformed students to become independent learners. There were 62.5% of the teachers who stated that since the implementation of the laptop initiative student interests influenced the classroom lessons more often. A common thread seemed to transpire demonstrating students' enthusiasm towards independent learning by (a) students selecting their own research, (b) students exploring their own topics of research, (c) students reviewing their own work, and (d) student interests influencing the lesson. In order for these classroom characteristics to occur, the classroom teachers must have altered their instructional

practices. One instructional change that occurred as a result of the laptop initiative was a change creating a classroom environment of learning independence. Teachers witnessed students becoming independent in exploring and selecting research topics. Classroom teachers also experienced an increase in students reviewing their work and allowed student interests to influence the lesson in the classroom.

Northern Cass teachers consistently reported that student engagement increased as a result of the project's implementation. Over 81% of the teachers stated that students are engaged in multiple activities since students received their laptops. A large percentage of teachers also reported that student engagement and interest level increased as a result of the laptop initiative. Since teachers were not asked why student engagement increased, it is difficult to determine reported findings. Several assumptions why engagement increased may include the novelty of a laptop, the reality that today's students are digital natives, or that the learning activities involving technology excite and challenge the learner.

The laptop initiative created a shift in textbook usage as the primary guide by teachers. Over 43% of the teachers reported using the textbook as the primary guide less often. A large percentage of teachers (46.7%) reported that students answer textbook questions less often since the project was implemented. A vast array of online educational resources that are available for various curriculums may have influenced classroom teachers to reduce textbook usage. Locating these resources can be time intensive. Teachers must spend considerable preparation time outside of the classroom to implement outside resources. Northern Cass laptop teachers indicated that they have

spent more time preparing for lessons as a result of the laptop initiative. The decrease in textbook usage may have a direct correlation with the increased time spent on class preparation by teachers. A decrease in textbook usage is another indicator of how the laptop initiative impacted the instructional practices of classroom teachers.

Direct instruction seemed to be the primary method of classroom instruction by the teachers. Over 68% of the teachers reported that they use direct instruction about as often since project implementation. Assessment practices by classroom teachers also remained similar. A majority of teachers indicated that they continue to use quizzes and tests as primary means of assessment. Participating teachers also reported that they are the primary assessor.

Direct instruction, along with quizzes and tests as the primary form of assessment, align with traditional instructional teaching practices. The laptop initiative changed some of the instructional practices by teachers. Change resulted in student collaboration, independent learning, engagement, writing, and textbook usage. However, teachers continued to use direct instruction and traditional assessment practices. There are many influences and expectations for classroom teachers. Students are still held accountable by state standardized tests and college entrance exams. School curriculums are driven by state standards and college entrance exams. While many educational theorists recognize that student learning can occur through various methods other than direct instruction, it is difficult for classroom teachers to eliminate this practice. The same holds true for assessment practices. There are many forms of assessment to measure student learning, but testing seems to be the preferred method by

legislation and colleges to determine student achievement. Thus, teachers experience tremendous pressure to utilize tests and grade reporting as the primary means for assessment.

Question 5 Findings and Conclusions

Question 5. How do the perceptions of parents, teachers, and students differ regarding the impact of the one-to-one laptop initiative on student academic performance?

The research study measured how the laptop initiative effected student academic performance as a result of a one year laptop implementation for junior and senior students at Northern Cass School District. A survey was the instrument that measured student, teacher, and parent perceptions in regards to the laptop initiative. The survey measured student motivation, organization, grades, quality of schoolwork, writing, and editing with the usage of a laptop computer. Response similarities and differences occurred by the three groups who participated in the survey. A chi square test for independence was utilized to determine when significant differences occurred.

The survey had 12 statements which measured student, teacher, and parent perceptions of the effects that the laptop initiative had on student academic performance. Three of these statements showed a significant difference in levels of agreement at the .05 level. Laptops improved the quality of schoolwork was the first statement that demonstrated a significant difference from the three responding groups. Survey results showed that 73% of the students and 79% of the parents either agreed or strongly agreed with the notion that laptops improve the quality of schoolwork. Teachers reported a

significantly lower level of agreement. Less than 38% of the teachers supported this statement. It is interesting that a majority of both parents and students suggested the quality of schoolwork improved in comparison to the majority of teachers who were neutral on this statement. In order to draw a conclusion on the impact laptops made on the quality of work, it may be important to recognize the number of teachers who disagreed or strongly disagreed with the statement. The data in Table 18 present one teacher or 6.2% who disagreed or strongly disagreed and nine or 56.3% of the teachers who were neutral. It seems that the reported frequency and percentage of teachers who disagreed with the impact on quality of work would suggest that laptops did not hinder the quality of student work. While the statistical analysis identifies significant differences in the level of agreement between the three surveyed groups, data also support that the laptop initiative did not decrease the quality of student work. The majority of frequencies and percentages of all three groups fall within the level of neutral or agreed.

The second statement with significant differences involved student organizational skills. Statistical data resulted in a chi square difference of 10.19, which is a significant difference at the .05 level. A large majority of students (79.7%) and parents (71.1%) suggested that the laptop initiative did improve student organization. There were eight or 50% of the teachers who also agreed with the statement. Once again, in order to understand why a significant difference occurred, it is critical to identify the frequencies and percentages of teachers who disagreed or who reported a neutral perception on this statement. The remaining eight or 50% of the teachers were

neutral on the effects laptops have on student organization. No teachers suggested that the laptop initiative decreased student organization. Statistical data demonstrate significant differences in the responses of the surveyed groups, but the descriptive data support enhanced student organization as a result of the initiative. The study fails to identify the variables that impacted student organization. This knowledge would be critical for educators to understand before further one-to-one laptop initiatives are implemented in schools.

Students reported a different perception than teachers when identifying their interest level in school when using laptops. The chi square difference of 14.85 was significant at the .05 level. A large percentage of teachers (87.5%) felt that students are more interested in school when using laptops. A significantly smaller percentage of students (55.4%) agreed or strongly agreed with this statement. The data in Table 15 show that 12.2% of the students are less interested in school since receiving their laptops and 32.4% of the students reported neutral on this statement. When you combine the agreed and neutral responses of students, it is evident that a large majority of students feel that the laptop initiative enticed their interest in school. Yet, it is alarming why nine or 12.2% of the students were less interested in school since laptop implementation. Teaching practices changed as a result of the laptop initiative. Students experienced teaching strategies that required critical thinking and independent learning. Some students may have found difficulty in adjusting to the new instructional practices in the classroom.

The research proved three statements as having significant differences in the participant responses. This suggests that the remaining nine had some significant similarities. It may be relative to recognize these similarities and identify how these similarities can impact the future existence of one-to-one projects.

Three statements had lower percentages in level of agreement from the three surveyed groups. The data in Table 26 illustrate statement 4, laptops have improved student grades, statement 5, students do more homework outside of school since they received their laptop, and statement 8, students enjoy going to school more since they received their laptop, as lower percentages in the level of agreement in comparison to other statements on the survey. The percentages are not alarmingly low, but a conclusion can be drawn that students, teachers, and parents have not recognized a great increase in grades or homework completion since implementation. Also, a lower percentage of students and parents expressed that the laptop initiative did not result in students enjoying school more since they received their laptops. The remaining statements are listed as follows:

1. Laptops make schoolwork more interesting.
2. Laptops make schoolwork easier to do.
6. Students are more motivated to do schoolwork when using their laptop.
10. Students are more likely to revise/edit schoolwork when it is done on the laptop.
12. Students prefer to handwrite assignments rather than using their laptops.

All of these statements had a high percentage in the level of agreement in the participant responses. This significance in agreement by students, teachers, and parents seems to indicate that the laptop initiative impacted student interest, schoolwork, motivation, writing, and editing skills in a positive manner.

In conclusion to research question five, it is evident that all three groups felt that the laptop initiative made schoolwork more interesting for students and easier to do, but did not necessarily suggest that students enjoy school more. The three studied groups were not in agreement with laptops improving the quality of schoolwork. A smaller percentage of teachers agreed with this statement. The laptop initiative seemed to have a smaller impact on student grades and homework completion. All three groups recognized the benefits that laptops can provide in the form of writing and editing. There were some perceptions in regards to the laptop initiative that had lower levels of agreement from students, parents, and teachers. However, no findings resulted in strong disagreement of the participants in negative outcomes to student academic performance as a result of the laptop initiative.

Question 6 Findings and Conclusions

Question 6. What effect will a one-to-one laptop initiative for students in 11^{th} and 12^{th} grade at Northern Cass have on student achievement based on Northwest Evaluation Association Measure of Academic Progress test results in the content areas of reading, language arts, and math in comparison to other 11^{th} and 12^{th} grade North Dakota students?

For reporting purposes, three separate tables were used to show differences in NWEA MAP mean RIT scores that occurred between Northern Cass and North Dakota juniors and seniors. The three tables presented the statistical data for language arts, reading, and math.

The data in Table 27 showed no significant differences that occurred between Northern Cass and North Dakota juniors for the fall of 2006 and spring of 2007 testing periods. Thus, it is assumed that the laptop initiative had no significant impact on student achievement for juniors in the content area of language arts. It is noted that Northern Cass juniors did increase their mean RIT score from fall to spring while the North Dakota norm group decreased their mean RIT score. Northern Cass juniors experienced an increase of 2.25 RIT points from fall of 2006 to spring of 2007.

Northern Cass seniors experienced a significant decrease in the mean RIT score for language arts. The fall of 2006 data showed that Northern Cass seniors had an 8.53 RIT difference in comparison to the North Dakota norm sample group. This difference was significant at the .01 level. Results from the spring of 2007 showed North Dakota students scoring higher than Northern Cass students. The mean RIT difference of -5.68 suggested that the laptop initiative had a negative impact on academic achievement in the content area of language arts for Northern Cass senior students. This difference was significant at the .01 level. It was alarming to the researcher that the Northern Cass mean RIT scores declined from fall to spring. Northern Cass seniors experienced a decline of 4.05 mean RIT points in language arts.

Student reading scores for juniors presented a significant difference in the fall and spring testing periods. Northern Cass students scored significantly lower in the fall of 2006 testing period with a mean RIT difference of -4.99, which was significant at the .05 level. This difference grew to -7.54 for the spring of 2007 testing period, which was significant at the .01 level. The statistical test results imply that the laptop initiative had a negative impact on student academic achievement in reading for Northern Cass junior students. This difference occurred as a result of the North Dakota juniors increasing their mean RIT scores to 229.26 while Northern Cass mean RIT scores in reading remained parallel at 221.72.

Both Northern Cass and North Dakota seniors had no significant differences in the fall of 2006 mean RIT scores in reading, but a significant difference was reported in favor of the Northern Cass seniors in the spring of 2007 reading RIT scores. The mean RIT difference of 16.05 was significant at the .01 level. These results seem to indicate that the laptop initiative did impact the academic achievement for Northern Cass seniors in reading. But, it is important to look at the North Dakota fall of 2006 reading RIT score of 231.5 and the spring of 2007 reading RIT score of 214.03. This sharp decline resulted in Northern Cass students experiencing a significant difference in spring RIT scores. Another important component in this part of the study shows the reading RIT scores for Northern Cass students actually declined by 1.17 RIT points.

The final comparison in RIT differences was conducted in the core content area of math. Northern Cass juniors experienced no mean RIT difference in the fall of 2006, but there was a positive mean difference for Northern Cass juniors in the spring of 2007

testing period. This positive difference in math was 4.14, which was significant at the .05 level. It also was recognized that the 2007 spring mean RIT average of 246.15 increased in comparison to the 2006 fall average of 245.52 for Northern Cass juniors. The statistical analysis would suggest that the laptop initiative may have positively impacted student achievement for Northern Cass juniors in the content area of math. Northern Cass seniors also experienced a growth in fall to spring RIT scores in math. Their mean RIT average increased by 4.87 RIT points from the 2006 fall testing period to the 2007 spring testing period. A positive significant difference also resulted in the spring of 2007 mean RIT scores for Northern Cass seniors in comparison to the North Dakota norm group of seniors. This difference was 11.91 RIT points, which was significant at the .01 level. The statistical data indicate that the laptop initiative positively impacted the academic achievement for Northern Cass seniors in the content area of math.

Research question six attempted to determine how the implementation of a laptop initiative would impact student academic achievement in language arts, reading, and math. The data in Table 30 provide a summary of the statistical data and the impacts that the laptop initiative seemed to have on student achievement for Northern Cass junior and senior students in the content areas of language arts, reading, and math.

Summary of Language Arts

The statistical data suggest that Northern Cass juniors experienced no change in student achievement in language arts as a result of laptop implementation while the seniors dropped in student achievement. Spring RIT scores for juniors increased but the

Table 30. Summary of the Statistical Analysis and the Impact It Had on Student Achievement for Northern Cass Junior and Senior Students in Language Arts, Reading, and Math.

Content Area	Grade	Impact on Achievement
Language Arts	Juniors	No Impact
Language Arts	Seniors	Negative Impact
Reading	Juniors	Negative Impact
Reading	Seniors	Positive Impact
Math	Juniors	Positive Impact
Math	Seniors	Positive Impact

growth was not substantial to support a significant difference from the North Dakota norm group. Northern Cass seniors experienced a drop in spring RIT scores and the difference when compared to the North Dakota norm was substantial and proved a significant difference.

Summary of Reading

Northern Cass juniors experienced a negative impact on test scores in comparison to the North Dakota norm group. Their fall to spring RIT scores remained parallel, but the North Dakota norm group had a substantial increase in their spring RIT scores. This increase by the North Dakota norm group resulted in a significant difference from the Northern Cass juniors. The difference suggested a negative impact on student achievement in the content area of reading for Northern Cass juniors.

Northern Cass seniors dropped slightly in spring RIT scores in comparison to their fall RIT average. North Dakota seniors experienced a substantial decline in their reading RIT average. This significant difference suggested a positive impact on student achievement in the content area of reading for Northern Cass seniors.

Math Summary

Both Northern Cass juniors and seniors achieved substantial RIT score increases from fall to spring. These increases were also significantly different in comparison to the North Dakota norm group. The statistical analysis suggests that both junior and senior students experienced positive impacts on student achievement in the content area of math over the course of one academic year. Test score increases and significant differences when compared to state averages may have been impacted by the laptop initiative.

Conclusions on Student Achievement

In order to understand why the difference occurred in test scores, it may be important to clarify the content curriculum taught in language arts, reading, and math. The NWEA MAP test is aligned with North Dakota state standards. If schools fail to have an aligned curriculum, the results of the student test scores may be impeded. Another variable that affects test results may include the instructional practices within the classroom. It is concluded that curriculum is a primary indicator, along with instructional practices, that affects student achievement. A laptop initiative may serve as a tool to enhance the instructional practices that affect student achievement.

The data in Table 30 illustrated the overall impact the laptop initiative had on student achievement for Northern Cass students. Math was the only subject area where both junior and senior test scores increased substantially at the end of the academic year while state RIT score averages declined sharply. Northern Cass test scores proved significantly different when compared to state averages. Over 35% of Northern Cass students reported not using their laptop computer for math homework. However, there were 26% of the students who reported using their laptop seven or more hours for math per week and 32.9% of the students who reported using their laptop at least one hour per week for math. One can cautiously credit some of the achievement gains to the laptop initiative. Yet, it is undetermined the exposure of curriculum students received in the state of North Dakota. It is noted that 84.9% of Northern Cass junior and senior students were enrolled in a high level math course during the 2006-2007 school year. This high percentage of Northern Cass students enrolled in a math course may have impacted the increase in student RIT scores for the academic school year.

In order to provide transparency on the impact that laptop initiatives have on student achievement, additional research is needed. This research needs to measure curriculum, instructional practices, and methods regarding laptop implementation. Tests such as the NWEA MAP assessments weigh heavily on curriculum alignment. The outcome of student test scores will be impacted by curriculum content and instructional practices. One-to-one laptop initiatives should be recognized as a component of instructional practices that may influence the outcome of student test scores.

Recommendations for Action

The review of the literature suggests that educators, corporate America, and our global society recognize the need to prepare students for the 21st century. Global society has identified the need for students to possess Information Communication Technology (ICT) Literacy skills that will enable them to think critically, analyze information, communicate, collaborate, problem solve, and make decisions. The perceptions of students, teachers, and parents in the study indicated enhancement in the essential ICT literacy skills; therefore, schools and universities should prepare educators and provide technology-integrated curriculum that will prepare students as a 21st century learner.

In order to accomplish this task, the following actions should be considered:

1. American schools must implement a viable curriculum that provides the content for students to be prepared for the 21st global workforce. This curriculum must contain the technological opportunities that enhance learning opportunities for students. These learning opportunities must afford students an opportunity to be problem solvers, critical thinkers, and communicate in a digital society.
2. In order to employ a viable curriculum that prepares students for the 21st century workforce, teachers must change instructional practices from a teacher-centered traditional instruction to a student-centered constructivist instruction. To accomplish this task, schools must work closely with teacher preparatory universities in providing a professional development model that transforms the instructional practices of teachers. This model must include

methods of effective technology integration that will enhance the outcome of student learning.

3. Education leaders and institutions must research current methods of technology integration in the classrooms. The focus of research must be placed on the traditional computer lab method of integration versus a classroom model that may include a one-to-one laptop environment. School leaders need to eliminate costly ineffective practices of technology integration and begin an evolution of successful technology integration.
4. State legislation needs to place immediate emphasis on funding schools and universities with technology integration at a level that provides optimal learning opportunities for students. Funding needs to focus on both professional development and equipment infrastructure. A framework of accountability must be implemented to assure that schools and universities meet the desired standards of technology integration.

Recommendations for Further Study

Laptop initiatives in schools are relatively a new phenomenon in K-12 education. Some research suggests that one-to-one laptop initiatives impact student performance and student learning. However, implementation of a one-to-one laptop initiative is a larger process than placing computers in the hands of students with the expectation of increased student academic performance and achievement. Based on this study, the recommendations that follow are suggested for further study regarding the

implementation of a one-to-one laptop initiative for the purpose of improving student academic performance and achievement.

1. The perceptions of students, teachers, and parents indicated that the laptop initiative increased student engagement, writing and research skills, interest level on assignments involving laptops, quality of schoolwork, and organization. The participant perceptions also indicated that student grades, student increased interest in attending school, and amount of time spent on homework experienced minimal impact as a result of the laptop initiative. What the data failed to indicate was why and how the changes occurred in student performance throughout the implementation of the one-to-one laptop initiative. Research of why and how student academic performances are impacted as a result of a laptop initiative would be prudent information for future schools that intend to implement a laptop program.
2. A transformation of instructional practices may have a grave impact on the effected outcome of a laptop initiative. Instructional practices are influenced by professional development and building level leadership. Further study that measures prior professional development and change in the instructional practices of classroom teachers may provide educators a conceptual understanding of how technology integration impacts student learning.
3. The current study measured the level of student academic performance as perceived by participating students, teachers, and parents. The study also analyzed pre-existing test data provided by Northern Cass School District in

the content areas of language arts, reading, and math. It is noted by the researcher that many variables impact student achievement. These variables include curriculum and instructional practices of the classroom teacher. Technology integration is simply a component of instructional practices. Further research under an environment of controlled curriculum and similar instructional practices with the only difference presumed to be the laptop initiative would provide valuable data measuring student academic achievement. The acquired knowledge for such a study would enable school districts the opportunity to make critical decisions on funding and implementing technology.

4. The long-term effects that a laptop initiative has on students may impact their readiness for post secondary education and the global workforce. Information regarding these outcomes would provide K-12 institutions viable information before implementing a laptop initiative. It is recommended by the researcher that a further longitudinal study over a six to seven year period be conducted on the impact that a laptop initiative had on students after their K-12 education.

APPENDICES

Appendix A
Letter of Permission from the Northern Cass School Board

Northern Cass School District No. 97
Home of the Jaguars

21 18th St. SE
Hunter, ND 58048
Phone: (701) 874-2322 Fax: (701) 874-2422
Web Site: www.northerncass.k12.nd.us

Allen Burgad, Superintendent
Terry Baesler, High School Principal
Shelly Swanson, Elementary Principal
Julie Keckler, Business Manager

December 27, 2006

University of North Dakota
Grand Forks, ND

ATTN: Dr. Larry Klundt and the Institutional Review Board

Dear Dr. Klundt:

Northern Cass School District grants permission to Allen Burgad, Superintendent of Northern Cass to utilize NWEA MAP testing data and student, parent, and faculty surveys for the purpose of conducting a study for his dissertation. Both the NWEA MAP test results and surveys are pre-existing data that is needed for our school district to make educational decisions for the patrons of our local education agency.

Thank you.

If you have concerns or questions you may contact me at:

Doug Rensvold
Northern Cass School District Board President
17135 14th St. SE
Gardner, ND 58036-9718
Ph. 701-860-6526

Sincerely,

Doug Rensvold

The Northern Cass School District does not discriminate on the basis of race, color, natural origin, gender, or disability.

Appendix B

Student, Teacher, and Parent Surveys

STUDENT SURVEY – NORTHERN CASS LAPTOP INITIATIVE

This survey is being conducted by Northern Cass School District. The laptop program is being studied to find out how laptops are utilized in the classrooms. Your participation in the survey is voluntary, and your identity and responses will be kept confidential. The survey asks you to answer some questions about your experience with the laptop program at Northern Cass. Your views about the laptop program are important, and we hope you will take a few minutes to answer the survey questions honestly.

Please answer all of the following questions, as we are attempting to track changes over time.

Thank you for your participation.

1. Grade Level: ☐ 11 ☐ 12

2. Gender: ☐ Female ☐ Male

3. Did you have a computer at home before you got your laptop at school? ☐ Yes ☐ No

4. Do you have access to the Internet at home? ☐ Yes ☐ No

   IF YES, What type of Internet Access? ☐ Broad Band ☐ Dial-up

5. Did you have Internet access before you received your laptop? ☐ Yes ☐ No

6. What grades do you usually receive in school?
   ☐ Mostly As ☐ Mostly As and Bs ☐ Mostly Bs ☐ Mostly Bs and Cs
   ☐ Mostly Cs ☐ Mostly Cs and Ds ☐ Mostly Ds ☐ Other: _____

7. In which classes is using the computer most beneficial to your learning? (Check all that apply.)
   ☐ None ☐ Art, Music
   ☐ Foreign Language ☐ Language Arts/English
   ☐ Math ☐ Science
   ☐ Social Studies, History ☐ Other: _____

8. Please circle the best answer that applies to you.

	5 Daily	4 Weekly	3 Monthly	2 Less than monthly	1 Never
How often do you typically help another student use a computer?	5	4	3	2	1
How often does another student help you use your laptop?	5	4	3	2	1
How often do you typically help a teacher use a computer?	5	4	3	2	1

9. Please circle your level of agreement with each of the following statements:

	5 Strongly Agree	4 Agree	3 Neutral	2 Disagree	1 Strongly Disagree
Laptops make schoolwork more interesting.	5	4	3	2	1
Laptops make schoolwork easier to do.	5	4	3	2	1
Laptops have improved the quality of my schoolwork.	5	4	3	2	1
Having a laptop has improved my grades.	5	4	3	2	1
I do more homework outside of school since I received my laptop.	5	4	3	2	1
I am more motivated to do schoolwork when I use my laptop.	5	4	3	2	1
Having a laptop helps me to be better organized.	5	4	3	2	1
I enjoy going to school more since I received my laptop.	5	4	3	2	1
I am more likely to revise/edit my work when it is done on the laptop.	5	4	3	2	1
The availability of the Internet simplifies research of information for classroom assignments.	5	4	3	2	1
I am more interested in school when we use the laptops.	5	4	3	2	1
I prefer to handwrite my assignments rather than using my laptop.	5	4	3	2	1
What I learn in school is helping me to prepare for the future.	5	4	3	2	1
What I learn in school is relevant to my life now.	5	4	3	2	1

10. Have you ever used your laptop to communicate or work with students or teachers at another school?
☐ Yes ☐ No

If **YES**, Have you worked with others at a school: (Check all that apply.)
☐ in ND ☐ in another state ☐ in another country

11. How would you rate your overall skill in using computers? *Please check only one.*

☐ Novice	I can turn the computer on, but I don't really know how to use many programs
☐ Beginner	I am able to use some basic functions such as word processing and the Internet
☐ Intermediate	I am able to use many of the programs, but I don't have a lot of experience with them
☐ Advanced	I am able to use many of the programs and have had a great deal of experience with them
☐ Expert	I am able to teach others how to use some programs and I am able to fix minor problems with my computer when they happen

12. Indicate how often **YOU USE YOUR LAPTOP IN SCHOOL** for each class listed. Then indicate if you **USE YOUR LAPTOP FOR HOMEWORK FOR THIS CLASS.**

	I do not take this class	0 hours per week	1-3 hours per week	7 or more hours per week	Do you use your laptop for homework for this class? Yes	No
Language Arts (reading/writing)	☐	☐	☐	☐	☐	☐
Foreign Language (Spanish/German)	☐	☐	☐	☐	☐	☐
Social Studies/History	☐	☐	☐	☐	☐	☐
Mathematics	☐	☐	☐	☐	☐	☐
Science	☐	☐	☐	☐	☐	☐
Technology/Computer Ed.	☐	☐	☐	☐	☐	☐
FASC	☐	☐	☐	☐	☐	☐
Industrial Technology	☐	☐	☐	☐	☐	☐
Physical Education	☐	☐	☐	☐	☐	☐
Business Education	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐

TEACHER SURVEY NORTHERN CASS LAPTOP INITIATIVE

This survey is being conducted by Northern Cass School District. The laptop program is being studied to find out how laptops are utilized in the classrooms. Your participation in the survey is voluntary, and your identity and responses will be kept confidential. The survey asks you to answer some questions about your experience with the laptop program at Northern Cass. Your views about the laptop program are important, and we hope you will take a few minutes to answer the survey questions honestly. ***Please answer all of the following questions, as we are attempting to track changes over time.***

1. What grade level(s) do you teach: ☐ 11 ☐ 12

2. Which subject(s) do you teach? (Check all that apply.)
   - ☐ Art
   - ☐ Language Arts/English
   - ☐ Science
   - ☐ Technology Education
   - ☐ Foreign Language
   - ☐ Math
   - ☐ Social Studies, History
   - ☐ Family and Consumer Science

3. For how many years have you been teaching?
   ☐ 3 or fewer ☐ 4 - 6 ☐ 7 - 9 ☐ 10 - 12 ☐ 13 - 19 ☐ 20 or more

4. Do you have access to the Internet at home? ☐ Yes ☐ No

5. How would you rate your overall skill level in the use of the laptop for instruction?
   - ☐ Novice (still learning to use the machine)
   - ☐ Beginner (e.g., e-mail, word processing, JMC)
   - ☐ Intermediate (e.g., assign projects, organize information, create your own class materials)
   - ☐ Advanced (e.g., regularly integrate technology into curriculum, provide staff development opportunities for others)
   - ☐ Expert (e.g., use technology for student assessment, develop learner-centered strategies)

6. How often do you use a computer to do the following: (1=Never, 2=Less than monthly, 3=Monthly, 4=Weekly, and 5=Daily). **Circle your selected answer.**

	5 Daily	4 Weekly	3 Monthly	2 Less than monthly	1 Never
Conduct research for lesson plans or curriculum design	5	4	3	2	1
Develop instructional materials or presentations	5	4	3	2	1
Produce homework assignments	5	4	3	2	1
Assess student work	5	4	3	2	1
Manage student information	5	4	3	2	1
Communicate with students and parents	5	4	3	2	1
Communicate with colleagues	5	4	3	2	1

7. Since the laptop program began, would you say that you: (Circle one.)
   1. Spend **more** time planning lessons now than before
   2. Spend about the same amount of time planning lessons
   3. Spend **less** time planning lessons now

8. Overall, would you say that the laptop program has made you: (Circle one.)
   1. Less efficient 2. Neither less nor more efficient 3. More efficient

9. Would you say that the following practices occur in your classroom less often, about as often, or more often now than they did before the laptop program began? **Circle the answer that best applies to your classroom.**

	3 More often	2 About as often	1 Less often
Students teach other students	3	2	1
Students teach the teacher	3	2	1
Students select their own research areas	3	2	1
Students explore a topic on their own	3	2	1
Students work in groups	3	2	1
Students review their own work	3	2	1
Students engage in multiple activities during class	3	2	1
Students do different assignments in one class	3	2	1
Students write more than one page	3	2	1
A textbook is the primary guide	3	2	1
Student interests influence lessons	3	2	1
Students answer textbook questions	3	2	1
Direct instruction	3	2	1
Quizzes and tests	3	2	1
Teacher evaluates student work	3	2	1
Curriculum regularly connects to other disciplines	3	2	1

10. In which of the following areas do you think the laptop program has had a positive impact? (Check any that apply.)
    - ☐ Students' computer literacy
    - ☐ Quantity and quality of what students learn in school
    - ☐ Roles of students and teachers in the classroom
    - ☐ Personalized learning opportunities for each student
    - ☐ Rigor of the curriculum
    - ☐ Reliable assessment of student progress, work, and effort
    - ☐ Your access to educational resources

    Please describe any others:

11. Please indicate below the effect you think laptops have had on different groups of students in the following areas:

	Traditional Students			At-Risk or Low-Achieving Students			High-Achieving Students		
	Improved	No Effect	Declined	Improved	No Effect	Declined	Improved	No Effect	Declined
Participation in class	☐	☐	☐	☐	☐	☐	☐	☐	☐
Preparation for class	☐	☐	☐	☐	☐	☐	☐	☐	☐
Attendance	☐	☐	☐	☐	☐	☐	☐	☐	☐
Behavior	☐	☐	☐	☐	☐	☐	☐	☐	☐
Motivation	☐	☐	☐	☐	☐	☐	☐	☐	☐
Engagement / Interest level	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ability to work independently	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ability to work in groups	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ability to retain content material	☐	☐	☐	☐	☐	☐	☐	☐	☐
Quality of work	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interaction with teachers	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interaction with other students	☐	☐	☐	☐	☐	☐	☐	☐	☐

12. Please circle your level of agreement with each of the following statements:

Since the laptop program began:	5 Strongly Agree	4 Agree	3 Neutral	2 Disagree	1 Strongly Disagree
My goals for students have changed.	5	4	3	2	1
My role in the classroom has changed.	5	4	3	2	1
The school climate has changed.	5	4	3	2	1
Student achievement in my classes with laptops has improved.	5	4	3	2	1
My computer skills have improved.	5	4	3	2	1
My understanding of how people learn has changed.	5	4	3	2	1
My beliefs about teaching and learning have changed.	5	4	3	2	1
The curriculum in my classes has changed.	5	4	3	2	1
I have had adequate professional development opportunities.	5	4	3	2	1
The school has developed effective policies and procedures for the laptop program.	5	4	3	2	1
Laptops make schoolwork more interesting for students.	5	4	3	2	1
Laptops make schoolwork easier to do for students.	5	4	3	2	1
Laptops have improved student grades.	5	4	3	2	1

Question 12 Continued

Since the laptop program began:	5 Strongly Agree	4 Agree	3 Neutral	2 Disagree	1 Strongly Disagree
Students do more homework outside of school as a result of laptops.	5	4	3	2	1
Students are more motivated to do schoolwork when the usage of a laptop is required.	5	4	3	2	1
Laptops have improved student organization.	5	4	3	2	1
Students are more likely to revise/edit work when it is done on the laptop.	5	4	3	2	1
The availability of the Internet simplifies research of information for student classroom assignments.	5	4	3	2	1
Students are more interested in school when we use the laptops.	5	4	3	2	1
Students prefer to handwrite assignments rather than using their laptop.	5	4	3	2	1
The laptop initiative has better prepared students for the future.	5	4	3	2	1

13. Do you think the laptop program has had any negative impacts? ☐ Yes ☐ No

    If **YES**, Please describe:

    Please briefly describe the most useful training you've participated in and how it was delivered:

14. Please briefly describe how you see yourself using technology in the classroom in three to five years:

15. What training or assistance do you need to further integrate technology into the curriculum?

16. Which of the following formats for professional development activities do you prefer? (Check all that apply.)
    - ☐ Two-day training at the beginning of summer
    - ☐ Two-day training at the end of summer
    - ☐ A series of shorter after-school training sessions during the school year
    - ☐ Training during early-release time throughout the school year
    - ☐ Teaming with another teacher or student to learn more
    - ☐ Other (please describe):

PARENT SURVEY – NORTHERN CASS LAPTOP INITIATIVE

This survey is being conducted by Northern Cass School District. The laptop program is being studied to find out how laptops are utilized in the classrooms. Your participation in the survey is voluntary, and your identity and responses will be kept confidential. The survey asks you to answer some questions about your experience with the laptop program at Northern Cass. Your views about the laptop program are important, and we hope you will take a few minutes to answer the survey questions honestly.

Please answer all of the following questions, as we are attempting to track changes over time.

1. In what grade(s) do you have children? ☐ 11 ☐ 12

2. What is the highest level of education completed by any of the adults in your household?
   - ☐ Less than high school diploma
   - ☐ High school diploma/GED
   - ☐ Some college
   - ☐ Associate degree (two-year college)
   - ☐ Bachelor's degree (four-year college)
   - ☐ Advanced degree (Master's, PhD…)

3. Do you have a computer at home? ☐ Yes ☐ No

4. Do you have access to the Internet at home? ☐ Yes ☐ No
   If yes ☐ Dial-up ☐ Broad Band – High Speed

5. How would you rate your computer skills overall? (Check one.)
   - ☐ I do not use a computer
   - ☐ Beginner (I am just learning)
   - ☐ Intermediate (I am comfortable using a computer)
   - ☐ Advanced (I can help teach others)

6. Have you used JMC to check your child's grades, etc.? ☐ Yes ☐ No

   If **YES**, How often do you typically use JMC?
   ☐ Less than monthly ☐ Monthly ☐ Weekly ☐ Daily

7. Has the laptop program made any difference in **your** computer skills?
   ☐ Yes ☐ No

   If **YES**, Please briefly describe:

8. How much time does this child spend using his or her laptop **at home** during a typical week?
   - ☐ None ☐ 1 – 4 hours per week ☐ 5 – 10 hours per week
   - ☐ More than 10 hours per week

9. Which of the following activities does this child do at home using his or her laptop? (Check any that apply.)

☐ Search for information
☐ Organize information
☐ Complete homework
☐ Work on websites or digital films
☐ Communicate using e-mail or instant messaging
☐ Work on class presentations or projects
☐ Work on assignments with other students
☐ I don't know

10. Please circle your level of agreement with each of the following statements:

	5 Strongly Agree	4 Agree	3 Neutral	2 Disagree	1 Strongly Disagree
Laptops make schoolwork more interesting for my child.	5	4	3	2	1
Laptops make schoolwork easier to do for my child.	5	4	3	2	1
Laptops have improved the quality of my child's schoolwork.	5	4	3	2	1
Having a laptop has improved my child's grades.	5	4	3	2	1
My child does more homework outside of school since they received their laptop.	5	4	3	2	1
My child is more motivated to do schoolwork when using their laptop.	5	4	3	2	1
The laptop initiative has improved my child's organizational skills.	5	4	3	2	1
My child enjoys going to school more since they received their laptop.	5	4	3	2	1

11. Do you think that the laptop program has had a positive impact in any of the following areas? (Check any that apply.)

☐ Your child's computer literacy
☐ Quantity and quality of what students learn in school
☐ Roles of students and teachers in the classroom
☐ Personalized learning opportunities for each student
☐ Rigor of the curriculum at school
☐ Your child's access to educational resources

12. Do you have any suggestions for new ways laptops could be used to improve your child's learning experience at school? ☐ Yes ☐ No

If **YES**, Please briefly describe:

Appendix C
Permission Letter to Use Survey Instrument

Mitchell Institute
SENATOR GEORGE J. MITCHELL SCHOLARSHIP RESEARCH INSTITUTE

December 21, 2006

University of North Dakota
Grand Forks, ND
ATTN: Dr. Larry Klundt
Institutional Review Board

Dear Dr. Klundt:

I am writing to notify you that I have granted permission to Mr. Allen Burgad to use the Mitchell Institute's survey instruments for his assessment of the laptop initiative in the Northern Cass School District. I understand that Mr. Burgad will use the survey instruments we used in our study of one-to-one laptops at Piscataquis Community High School for the Great Maine Schools Project in 2003 and 2004. He may use the student, faculty, and parent survey instruments we used, and may alter the survey instruments as needed for the purposes of his evaluation.

Our study included 190 student surveys (67% of the high school student body at the time). Twenty-two of 26 faculty members at the school completed the survey. 130 parents completed surveys, for a response rate of 45%. The student and faculty surveys were conducted online, and the parent survey was mailed.

If you need more information, please contact me at (207)773-7700 or lplimpton@mitchellinstitute.org.

Sincerely,

Lisa Plimpton
Director of Research

22 Monument Square, Suite 200, Portland, Maine 04101 · 207-773-7700 · 1-888-220-7209 · Fax 207-773-1133 · www.mitchellinstitut

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