

ANYTIME, ANYWHERE LEARNING  
FINAL EVALUATION REPORT OF THE  
LAPTOP PROGRAM

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## EXECUTIVE SUMMARY

This report summarizes the results of an evaluation study of Anytime, Anywhere Learning (Laptop Program). The overall purpose of this evaluation was to determine the effectiveness of providing 5th and 6th grade students with access to laptop computers with regard to classroom learning activities, technology usage, and writing achievement.

The Laptop Program is based on the Anytime Anywhere Learning (AAL) program (AAL, 2000), which has been in schools since 1996 and has impacted more than 100,000 students and teachers. The goal of the AAL program is to provide students the knowledge, skills and tools to learn anytime and anywhere.

The WLSC Laptop Program arranged to have laptop computers available for a monthly lease fee of fifty dollars. The Laptop classrooms were equipped with wireless access to the Internet and printers. The program also provided students and parents the opportunity to receive training on basic computer skills. The Laptop teachers received ten full days of professional development prior to the 1999-2000 academic year and six one-half day sessions during the year. The training was based on the NTeQ model, which provides teachers a framework to develop problem-based lessons that utilize real-world resources, student collaboration, and the use of computer tools to reach solutions. The lessons are typically structured around projects, which engage the students in critically examining community and global issues, while strengthening student research and writing skills.

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## RESEARCH QUESTIONS

The evaluation of the Laptop Program was structured around three primary research questions that focused on classroom practices, student behavior and writing ability. The detailed questions are listed below:

- Is teaching different in a Laptop classroom? To answer this question, observers examined classroom practices to determine if instructional practices in Laptop classrooms were different from those in non-Laptop classes. For example, were classrooms lecture-based and/or project-based, were the classrooms academically focused and were students engaged, did teacher questions call for students to construct responses or simply recall factual information.
- Do students behave differently in a Laptop classroom? By observing and talking to students, observers gauged the level of interest in learning, student attitude toward one another (do they get along and are they helpful), and the degree to which students take initiative for their learning as opposed to being dependent on the teacher for constant direction.
- Do students achieve differently in a Laptop classroom? Observers assessed writing samples from Laptop and non-Laptop classrooms looking for both content and quality, observed whether writing in the classroom was sustained or short-term question and answer, and whether technology was used as a tool to increase the quality of work or simply for computer assisted instruction.

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## DESIGN

The evaluation period extended from September 1, 1999 through May 30, 2000. The evaluation design was based on both quantitative and qualitative data collected from students, teachers, and parents involved with the Laptop Program and students and teachers in non-Laptop classrooms in seven schools (four elementary and three middle) within WLCS. Comparative

analyses were completed for teaching activities and learning outcomes and descriptive analyses were completed for student, teacher, and parent reactions to the Laptop Program.

The data set for the evaluation included classroom observations, student writing test scores, student surveys and focus groups, teacher surveys and interviews, and parent surveys and interviews. Two separate observation measures were used to collect observation data: The *School Observation Measure (SOM<sup>®</sup>)*, and the *Survey of Computer Use (SCU)*. *SOM<sup>®</sup>* was based on 60 continuous minutes of observation, divided into about 4, 15-minute segments. These 4 observation periods were then summarized on one *SOM<sup>®</sup>* Data Summary form. *SCU* was completed as part of the 60-minute observation sessions, only if students used technology during that time. A total of 50 classroom observations were conducted, with 32 in Laptop classrooms and 18 in non-Laptop classrooms.

The WLCS's *Writing Scoring Guide* was used to assess prompted writing samples from Laptop and non-Laptop students. A sample of 32 Laptop and 32 non-Laptop students were randomly selected to complete the writing test. Experienced reviewers used the district's four-point rubric (ranging from 1 to 4, with 4 being the highest rating possible) to conduct a blind assessment of the writing samples for Ideas and Content, Organization and Form, Style, and Conventions, yielding four scores per student.

The student, teacher, and parent surveys, interviews, and focus groups primarily focused on three areas: have the laptop computers had a personal impact (increased skills – research, computer, learning), have the laptops impacted what happens in the classroom, and what are the benefits, difficulties, and ways to improve the program. The final data set includes: 397 student surveys, 58 student participants in focus groups, 13 teacher surveys, 7 teacher interviews, 187 parent surveys, and 40 parent interviews.

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## RESULTS

### CLASSROOM OBSERVATIONS

SOM<sup>®</sup> In an initial analysis of the SOM<sup>®</sup> data, rubric categories 2-4 were collapsed into one category to yield a two-category scheme reflecting the percentage of visits in which a strategy was either observed or not observed. The analysis revealed significant differences, which favored Laptop over the Control teachers on project-based learning (65% observed vs. 22%), independent inquiry/research (58% vs. 24%) computer for instructional delivery (22% vs. 0%), and computer as a learning tool (88% vs. 17%). In general, strategies promoting learner activity, such as cooperative learning, inquiry, sustained writing, and computer uses were more likely to be observed in Laptop classrooms.

There were seven comparisons that yielded statistically significant differences from *t*-tests comparing the means for Laptop and Control classes on each SOM<sup>®</sup> item, all of which had associated effects sizes of .59 or higher in absolute value. All of the significant differences favored the Laptop classes: computer as a learning tool ( $ES = +2.29$ ), project-based learning ( $ES = +0.95$ ), independent inquiry ( $ES = +0.89$ ), higher-level instructional feedback ( $ES = +0.61$ ), teacher as facilitator ( $ES = +0.64$ ), cooperative learning ( $ES = +0.59$ ), and computer for instructional delivery ( $ES = +0.59$ ).

SCU Laptop classes, as would be expected, contained more computers ( $p < .001$ ) than did Control classes. Additional areas where significant differences occurred were that Laptop classes had more: (a) PC's, (b) up-to-date computers, (c) Internet access, (d) printer access, (e) color printer access, (f) computers clustered together, and (g) computers that were distributed. Further, Laptop classes always had at least one student at one computer and rarely had more. By

comparison, about half of the Control classes averaged one student per computer, while half had more than five students per computer. All three comparisons involving the availability of computers to students significantly favored the Laptop classes. With regard to student technology skills, Laptop students were rated significantly higher than were Control students on computer skills ( $p < .001$ ), keyboarding skills ( $p < .001$ ), and mouse skills ( $p < .01$ ).

Comparisons of observation means using  $t$ -tests revealed statistically significant differences, most of which are noted above, and collectively show that Laptop classes provided greater access to computers and associated peripheral equipment to develop higher skill levels by students, to engage students and teachers more extensively in computer applications, to use computers more for research and for production in writing and design, and to make greater use of word-processing and Internet software. Importantly, on the final rubric, Laptop classes were rated as making much more meaningful use of computers compared to Control classes ( $M$ 's = 3.18 vs. 1.00,  $ES = +2.72$ ).

## WRITING PERFORMANCE

Writing Scores Students in Laptop ( $n = 32$ ) and Control ( $n = 32$ ) classes were asked to write a prompted essay. The essays were then scored in the blind on a rubric encompassing the four dimensions of Organization, Idea, Style, and Conventions. For each dimension, the essay was scored from 1 to 4, with 4 being the highest rating possible.

Mean performance scores for Laptop and Control students were analyzed via a one-way multivariate analysis of variance (MANOVA) with the four dimension scores serving as the dependent variables. The MANOVA yielded a significant program effect ( $p = .048$ ), therefore, univariate analysis of variance (ANOVA) was performed separately on each dimension. All four tests were highly significant and indicative of higher performance by Laptop than Control

students. Effect sizes ranged from +0.61 to +0.78, suggesting moderately strong and educationally important effects.

## STUDENT REACTIONS

Student Survey The Laptop student survey responses ( $n = 397$ ), indicated that students felt their computer skills had increased, and they were better able to do Internet research. They were less certain that using computers at school increased their interest in learning, made them want to get better grades, improved their writing, or made it easier for them to work with other students. Over half of the students reported fairly regular use of the laptop and the Internet for completing homework, while even more reported uses for “other things.” The two most frequently cited “other things” were email/chat and games.

When students were asked to describe the best thing about having a laptop, students included that it helped them learn computer skills, helped with school assignments, provided access to the InternetInternet, and it helped the students become more organized. When students were asked about the hardest part of having the laptop, there was general consensus that it was difficult to keep track of and carry back and forth to school. Other concerns included reoccurring technical problems (e.g., freezes, charging, slow), using Microsoft Access, and students lacking sufficient computer skills. Overall, the survey results show that Laptop students were highly appreciative of having laptop computers and were taking advantage of its resources for performing a variety of learning activities both at school and at home. Students were more likely to experience benefits of the laptop activities for the development of specific technology skills than for increasing their basic interest in school and grades.

Student Focus Group The researchers conducted six student focus groups that involved a total of 58 students. Results from the focus groups closely align with findings from the student

survey. When looking at learning and performance, the students indicated that they were more involved in writing, researching, and in collaborative project work. Many students reported an improvement in grades, although some students indicated there was no change in grades, and a few said some grades had dropped. Students felt they had a closer relationship with their teachers, more self-confidence, and improved attitudes towards school.

The majority of the students indicated that their parents liked the Laptop program. Others felt the Laptop program had improved relationships between students and their parents, that parents provided more help with homework, and that parents were amazed/happy at how quickly students had gained computer skills. All of the final comments were positive and indicated that the students liked having the laptop and looked forward to using it again next year.

## TEACHER REACTIONS

Teacher Survey Thirteen Laptop teachers responded to the Teacher Survey. Results indicated that teachers were extremely positive regarding the benefits of the Laptop Program for them and their students. All agreed that the program experience: (a) increased their basic skills in computer applications, (b) increased the emphasis on higher-order learning in their classroom, (c) increased project-based learning, and (d) was beneficial to them as teachers. There was also strong agreement that they: were better prepared to create lessons integrating computers, frequently integrated technology, school-related interactions with students and parents increased, and would like to participate in the project again next year.

The teachers indicated that the greatest benefit of the Laptop program was for students to have access to technology and InternetInternet resources. The teachers also felt that use of the laptop had resulted in students having greater research skills, improved writing skills, interest in school, and greater self-confidence. The difficulties cited were all related to the technology

itself, e.g., power, weight, drives, server, and printers. They were also concerned with students tampering with software and the laptop settings. As could be expected, teachers indicated that the program could be improved by providing more technical support, more basic training, providing a solution to the power problems and providing more projectors.

Teacher Interviews There were seven randomly selected Laptop teachers who were interviewed. Teachers indicated that classroom practices had changed due to the laptops in that they used more cooperative learning, completed more projects, and acted as facilitators of learning more frequently. Teachers reported that the projects involved more integration of subjects, research, higher-levels of learning, writing, and the use of spreadsheets, word processing, and the Internet than non-laptop projects. The teachers reported that they use authentic assessment and involve students in self-assessment and the development of rubrics now more frequently. As a result, teachers indicated that students produce higher quality work and had more self-confidence, greater enthusiasm, increased depth of knowledge, and were more engaged with other learners. Teachers indicated that there were fewer missed assignments and an overall improvement in grades.

## PARENT REACTIONS

Parent Survey Encouragingly, parents ( $n = 187$ ) generally viewed the Laptop Program as helpful to their children's education. More than half felt that the program *increased* their child's interest in school, involvement in project-type school work, and research skills. Between one-third to one-half believed that increases occurred in school achievement, writing skills, and ability to work with other students.

Results from the open-ended items show that over one-half of the parents stated that the most beneficial part of the Laptop program was that their child had improved his/her knowledge

in different subject areas and also improved in computer literacy. The parents expressed concerns that it was difficult for their child to keep track of, be responsible for, and carry the laptop to and from school. Other concerns were related to monitoring student use of the Internet and overuse of computer games. The parents felt that more training is needed for teachers, parents and students (keyboarding). Another suggestion was to offer the program to all students in the district.

Parent Interview The parent interviews were conducted with a random selection of 40 parents (20 5<sup>th</sup> grade, 20 6<sup>th</sup> grade) whose children were participating in the Laptop study. Overall, the parents were supportive of the Laptop Program and felt that it has had a positive impact on the child's learning and participation in school. There was a general consensus that the Laptop Program was providing their child with important computer, organizational, and research skills that are of benefit now and will enhance their future work opportunities. Most of the parents indicated that the laptop had little influence on the family, however, a few noted positive impacts on younger siblings. The majority of the parents also reported that the laptop had not changed interactions with the child or teacher primarily because they were already actively involved.

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## DISCUSSION

Results of this study suggest varied impacts of the Laptop Program on students, teachers, and family members. These findings are discussed below in reference to the three primary research questions.

### IS TEACHING DIFFERENT IN A LAPTOP CLASSROOM?

According to both teacher reports and classroom observations, Laptop classes are being taught differently than regular (Control) classes. Not only did the former classes incorporate

technology to a much greater degree, they tended to employ more student-centered strategies such as project-based learning, independent inquiry/research, teacher as coach/facilitator, and cooperative learning. Most revealing in the study were the ways in which technology was accessed and employed in the Laptop classrooms. Compared to their Control counterparts, the Laptop students demonstrated more technical skill with computers and used computers more extensively for a variety of production and research functions. Not surprisingly, observers rated Laptop classes as making much more *meaningful* usage of computers as educational tools.

Nearly all teachers believed that they were teaching differently than before by integrating technology into both newly developed lessons and existing lessons that had previously been taught without computers. Further, nearly all felt that they had increased the frequency of project-based learning, higher-order learning activity, and school-related interactions with parents and students. Laptop parents reported that their child was taking advantage of the laptop computer for school and other activities, especially in developing research skills.

The implication from these multiple data sources is that teaching and learning were being impacted, in ways that promoted active learning and technology applications, as a consequence of all students having continual access to individual computers. Not surprisingly, although cooperative learning was observed relatively frequently in Laptop classes, students typically worked individually while using computers. Thus, they benefited from having their own computer to complete their work, while still being able to collaborate easily with others on information and strategies.

## DO STUDENTS BEHAVE DIFFERENTLY IN A LAPTOP CLASSROOM?

As described above, Laptop students were more active, autonomous, and collaborative in their classroom behaviors. For example, cooperative learning was observed “frequently” or

“extensively” in 35% of the Laptop classes, but only 11% of the Control classes. Students frequently or extensively engaged in projects in 55% of the Laptop classes compared to only 17% of the Control classes. Laptop teachers confirmed these impressions by describing their students as more independent, active, and engaged. The teachers were highly impressed with students’ abilities and interests in using computers to enhance learning.

In their survey and interview responses, students indicated they had increased their computer skills substantially and were much more prepared to do Internet research. About two-thirds of the students generally worked with the laptop alone in the classroom, but they still collaborated frequently with others in sharing information, asking questions, and providing assistance. As a group, the students were less committal about the effects of the laptop in increasing the interest in learning, writing skills, and facilitating collaboration, although about one-third (still a substantial number) felt that they did realize these types of benefits.

## DO STUDENTS ACHIEVE DIFFERENTLY IN A LAPTOP CLASSROOM?

In this study, we assessed student achievement in terms of writing performance on a prompted essay. Grading, using a four-point rubric, was “blind” to students’ enrollment in Laptop vs. Control classes. Results significantly favored the Laptop group on all evaluation dimensions -- Organization, Ideas, Style, and Conventions. Aside from being statistically significant, the differences across all dimensions reflected relatively strong advantages for the Laptop group, with effect sizes ranging from +0.61 to +0.78.

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## CONCLUSIONS

In this evaluation of the first year of the Laptop Program, the results are consistently supportive of beneficial impacts on students, teachers, and parents. Specifically, all three groups

believed that the program was positively changing teaching and learning both at school and at home. These impressions were directly confirmed in visits to Laptop versus Control classrooms. While more research is needed on how the Laptop Program impacts student achievement, the positive results from the writing assessment are highly suggestive. Laptop students were doing more sustained writing in class and were demonstrating more skill in writing, making a causal connection highly likely. Control classes could also increase their emphasis on writing, but it is obvious that continual and immediate access to computers provided the Laptop students and their teachers with a very strong advantage. In future research, we hope to examine whether Laptop students demonstrate comparable advantages in problem solving. We anticipate that they will, given the extensive project and inquiry activities in which they engage. At this point, given the present data, we are most certain of one program result -- Laptop students are much more fluent than other students with using the technology of the 21<sup>st</sup> Century for learning, research, and production. For them, computers are fully integrated with and a natural part of their educational experiences both at school and at home.

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FINAL EVALUATION REPORT OF THE  
LAPTOP PROGRAM

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This report summarizes the results of an evaluation study of Anytime, Anywhere Learning (Laptop Program) implemented in Walled Lake Consolidated Schools (WLCS). The overall purpose of this evaluation was to determine the educational impact of providing 5th and 6th grade students with access to laptop computers with regard to classroom learning activities, technology usage, and writing achievement.

The Laptop Program is based on the Anytime Anywhere Learning (AAL) program (AAL, 2000), which has been in schools since 1996 and has impacted more than 100,000 students and teachers. The goal of the AAL program is to provide students the knowledge, skills and tools to learn anytime and anywhere.

The WLSC Laptop Program arranged to have laptop computers available for a monthly lease fee of fifty dollars. The Laptop classrooms were equipped with wireless access to the Internet and printers. The program also provided students and parents the opportunity to receive training on basic computer skills. The Laptop teachers received ten full days of professional development prior to the 1999-2000 academic year and six one-half day sessions during the year. The training was based on the NTeQ model which provides teachers a framework to develop problem-based lessons that utilize real-world resources, student collaboration, and the use of

computer tools to reach solutions. The lessons are typically structured around projects which engage the students in critically examining community and global issues, while strengthening student research and writing skills.

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## RESEARCH QUESTIONS

The evaluation of the Laptop Program was structured around three primary research questions that focused on classroom practices, student behaviors, and student achievement. Also of interest was the reaction and support of teachers and parents involved with the Laptop Program. The detailed research questions are listed below:

- Is teaching different in a Laptop classroom? To answer this question, observers examined classroom practices to determine if instructional practices in Laptop classrooms were different from those in non-Laptop classes. For example, were classrooms lecture-based and/or project-based, were the classrooms academically focused and were students engaged, did teacher questions call for students to construct responses or simply recall factual information.
- Do students behave differently in a Laptop classroom? By observing and talking to students, observers gauged the level of interest in learning, student attitude toward one another (do they get along and are they helpful), and the degree to which students take initiative for their learning as opposed to being dependent on the teacher for constant direction.
- Do students achieve differently in a Laptop classroom? Observers assessed writing samples from Laptop and non-Laptop classrooms looking for both content and quality, observed whether writing in the classroom was sustained or short-term question and answer, and whether technology was used as a tool to increase the quality of work or simply for computer assisted instruction.

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## EVALUATION DESIGN AND MEASURES

The evaluation period extended from September 1, 1999 through May 30, 2000. The evaluation design was based on both quantitative and qualitative data collected from students, teachers, and parents involved with the Laptop Program and students and teachers in non-Laptop classrooms in seven schools (four elementary and three middle) within WLCS. Comparative analyses were completed for teaching activities and learning outcomes and descriptive analyses were completed for student, teacher, and parent reactions to the Laptop Program.

### PARTICIPANTS

The participant pool from which data for the Laptop evaluation were collected included all teachers, students, and parents involved with the Laptop Program and randomly selected non-Laptop teachers and their students from schools with Laptop Programs. The non-Laptop teachers and their students were used for the comparative component of the study, which involved classroom observations and writing tests. The numbers of participants by evaluation measure can be seen in Table 1.

Table 1

## Evaluation Measure by Number of Participants

Evaluation Measure	Total Number	Number by Participant Group
School Observation Measure	50	32 Laptop Classrooms 18 Non-Laptop Classrooms
Survey of Computer Use	33	30 Laptop Classrooms 3 Non-Laptop Classrooms
Writing Test	64	32 Laptop Students 32 Non-Laptop Students
Student Survey	397	Laptop Students
Student Focus Group	58	Laptop Students
Teacher Survey	13	Laptop teachers
Teacher Interview	7	Laptop teachers
Parent Survey	187	Laptop Parents
Parent Interview	40	Laptop Parents

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**MEASURES**

The data set for the evaluation included classroom observations, student writing test scores, student surveys and focus groups, teacher surveys and focus groups, and parent surveys and interviews. Descriptions of each measure and its administration procedure is given below.

**CLASSROOM OBSERVATIONS**

Classroom visits were conducted by trained and unbiased observers to collect frequency data regarding observed instructional practices. Two separate observations measures were used to collect data: The *School Observation Measure (SOM<sup>®</sup>)* and the *Survey of Computer Use*

(*SCU*). The *SCU* was used as an extension to the *SOM*<sup>®</sup> to provide more detailed observation data regarding student use of technology.

*SOM*<sup>®</sup> Structured observations have been conducted by researchers across the United States for several years using the *Classroom Observation Measure (COM)*<sup>®</sup>, developed and validated by researchers at the Center for Research in Educational Policy (Ross et al., 1991). Overall observation items from *COM*<sup>®</sup> were modified to create the *SOM*<sup>®</sup> (Appendix A) which was purposely designed to provide a more practical instrument for formative evaluation in that it allows for a greater number of classrooms to be visited and requires less extensive training of observers than the *COM*<sup>®</sup>.

To ensure the reliability of data, observers receive a manual providing definitions of terms, examples and explanations of target strategies, and a description of procedures for completing the instrument. After receiving instruction in a group session, each observer participates in sufficient practice exercises to ensure that his/her data are comparable with those of experienced observers. In a reliability study (Lewis, Ross, & Alberg, 1999), pairs of trained observers selected the identical overall response on the five-category rubric on 67% of the items and were within one category on 95% of the items. Further results establishing the reliability and validity of *SOM*<sup>®</sup> are provided in the report.

The standard *SOM*<sup>®</sup> procedure involves observers' visiting 10-12 randomly selected classrooms, for 15 minutes each, during a three-hour visitation period. The observer examines classroom events and activities descriptively, not judgmentally. Notes are taken relative to the use or nonuse of 24 instructional strategies, such as cooperative learning, direct instruction, and technology. At the conclusion of the three-hour visit, the observer summarizes the frequency with which each of the strategies was observed across all classes in general on the *SOM*<sup>®</sup> Data

Summary form. The frequency is recorded via a 5-point rubric that ranges from (0) Not Observed to (4) Extensively.

For the Laptop program evaluation, the focus was the program within the school (Laptop vs. Control) rather than the whole school. Accordingly, Laptop and Control teachers were the basic observation samples. Because individual teachers are likely to be more consistent in their teaching orientations than are multiple teachers in a school, one *SOM*<sup>®</sup> was based on 60 continuous minutes of observation, divided into about 4 (rather than 10-12) 15-minute segments. These 4 observation periods were then summarized on one *SOM*<sup>®</sup> Data Summary form. Specifically, a total of 50 *SOM*<sup>®</sup> observation periods were conducted in seven schools during the Spring 2000 academic year. Of the 50 observation periods, approximately two-thirds (32) were conducted in Laptop classrooms and approximately one-third (18) in non-Laptop classrooms to provide control data.

*SCU* The second evaluation instrument used in this study was the *Survey of Computer Use (SCU)* (Lowther et al., 1999). The *SCU* was completed as part of the 60-minute observation sessions, only if students used technology during that time. As with the procedure used with *SOM*<sup>®</sup> observations, data for the *SCU* were recorded in 15-minute intervals then summarized on the *SCU Data Summary Form*.

The *SCU* is designed to exclusively capture *student* access to and use of computers rather than teacher use of technology. Therefore, two primary types data are recorded on the *SCU*: technical issues related to the computers and student activities while using computers. The *SCU* begins with data regarding the type of technology available to students in the classroom (e.g., PC/Mac, age, Internet access, printer access). With this information, the scope of possible computer activities can be defined. In other words, if a classroom is only equipped with one, out-

dated computer that lacks Internet access, then multimedia presentations with hyperlinks to related web sites cannot be developed. However, word-processed reports that are enhanced with student drawings would be a possibility.

Other data collected in the descriptive section include number of students per computer, level of engagement, and technical difficulties while working at the computers. The final area in this section addresses three types of computer skills: general computer, keyboarding, and mouse. The general computer skills include student ability to locate and open applications, menu use, save and print documents, etc. Keyboarding skills regard student ability to enter information via the keyboard. Mouse skills include maneuverability and ability to point, click and drag. A five-level scale that ranges from (1) very low to (5) high is used to record level of computer skills observed.

The next section of the *SCU* focuses on student use of computers. It examines the types of activities, subject areas of activities, and software being used. Computer activities are divided into three categories based on the type of software used: production tools, Internet, and educational software. Within each category, activities associated with each type of software are identified. For example, under Production Tools, sample activities include word process (creative writing), design layout, generate results, and create presentation. For the Internet, activities include locate resources and interact with others, and for Educational Software, two activities are listed: learn or review content or solve problems with computer games. With this type of documentation, several activities could be noted during an observation of one student working on a computer. As an example, if a student was observed developing a multimedia presentation with hyperlinks – it would be possible to observe and record four activities: word process (creative writing); design layout, create interactive product, and locate Internet resources.

The computer activities, subject areas, and software being used are summarized and recorded on the *SCU Data Summary Form* via a five-point rubric that ranges from (0) Not Observed to (4) Extensively observed.

The final section of the *SCU* is an Overall Rubric. The purpose of the rubric is to assess the meaningfulness of the computer activities with regard to students' use of the *computer as a tool* to enhance his/her learning. The rubric has four levels, three of which are used to rate the meaningfulness of computer activities where the computer was used as a tool (4 - Very meaningful, 3 – Meaningful, 2 – Somewhat meaningful). Level 1 of the rubric indicates the computer was *not* used a tool. Of the 50 *SOM*<sup>®</sup> observation periods, computers were being used by students in 30 of the 32 (94%) Laptop classrooms observed and in 3 of the 18 (16%) non-Laptop classrooms observed. Thus, SCU data were collected for 30 Laptop and 3 non-Laptop classrooms.

## STUDENT ACHIEVEMENT

Writing Test As a means of determining the impact of the Laptop Program on student performance, the WLCS's *Writing Scoring Guide* was used to assess prompted writing samples from Laptop and non-Laptop students. The District's assessment examines four dimensions of writing: Ideas and Content, Organization, Style, and Conventions. A sample of 32 Laptop and 32 non-Laptop students were randomly selected to complete the writing test. Experienced reviewers used the district's four-point rubric (ranging from 1 to 4, with 4 being the highest rating possible) to conduct a blind assessment of the writing samples for each of the four dimensions, yielding four scores per student (Appendix B).

## STUDENT REACTIONS

To increase understanding of the implementation processes and outcomes of the Laptop Program, a survey was administered and focus groups were conducted with students participating in the Laptop Program and a survey was given to a randomly selected group of students in non-Laptop classrooms. Details of the survey and focus group are below.

Student Survey The 35-item Student Survey included multiple choice, Likert-type items and open-ended questions (Appendix C). The survey begins by asking students how having the laptop has impacted them personally. These items addressed the student's writing ability, interest and improvement in school, and if the laptop made schoolwork easier. The next section explored if students worked with other students while using the laptop and asked students to identify the subject areas covered in laptop lessons. The students then were asked to describe how often they used the laptop at home, what laptop activities they did at home, and if other family members used the computer. The last questions in this section inquired about Internet access in the home. If Internet access was available, students were asked to identify if and how it was used. In Section 4, students were asked to rate how well they used 11 different types of computer software. The rating scale ranged from "Not at all" to "Very Well." The last section provided students space to write responses to four items: the best thing about having the laptop, the most difficult part about having the laptop, what they would change about having a laptop and using it in school, and if they had any additional comments. The Laptop student survey was administered during class time to over 400 laptop students.

Student Focus Group The Student Focus Group questions were targeted toward four major areas: Overall Impressions of the Laptop Program, Classroom Level Changes, Student Results, and Parent Support (Appendix D). Questions from the first section asked students to

briefly describe what it was like to have the laptop. This was followed by asking them about the best and most difficult parts of having the laptop. The questions then changed focus to address how the laptops had changed what happened in the classroom. These items asked students if they had more projects this year, if the assignments were more involved and if their school work required more research and writing. This section was followed by asking students if they thought they were better students and if their relationships with other students or the teacher had changed as a result of having the laptop. Lastly, students were asked about parental support for the program, involvement with school activities, and whether or not the laptop had an impact on other family members. Ten groups of four to five students were randomly selected from the pool of 5<sup>th</sup> grade and 6<sup>th</sup> grade laptop students. The focus groups were conducted by researchers from Wayne State University.

## TEACHER REACTIONS

All teachers participating in the Laptop Study were asked to complete a survey and a random sample was selected to participate in Teacher Interviews. Instruments for the survey and interview are described below.

Teacher Survey The teacher survey was comprised of 36 items (Appendix E). Thirty-three of the items used a Likert-type response method while three were open-ended. The survey provided space for Additional Comments. The items were divided into four categories: Personal Impact, Student Impact, Student Use, and Your Reflections. The Personal Impact items asked if the Laptop Program had increased their computer skills, their ability to design integration and project-based lessons, and/or communications with students and parents. The Student Impact items asked teachers their impressions about the Laptop Program's impact on students' interest in learning, grades, writing skills, research skills, or ability to work with others. The section on

Student Use focused on student grouping during computer use and subject areas and the types of software used in laptop lessons. The Reflection items asked teachers to describe the greatest benefit and most difficult aspects of the Laptop Program. It also asked teachers for suggestions on how the Laptop Program could be improved.

Teacher Interview The Teacher Interview questions were grouped into five areas (Appendix F). Four of the areas were identical to Student Focus Group items: Overall Impressions of the Laptop Program, Classroom Level Changes, Student Results, and Parent Support. The fifth item was Impact on Teachers.

Overall impressions covered implementation this year, benefits, and difficulties of the program. For Classroom Level Changes, teachers were asked about project-based and cooperative learning, the research and writing skills of students, and the use of authentic assessment. Student Results not only focused on achievement, but also student relationships with other students and the teacher, and student motivation/enthusiasm. The teachers were asked how the program had impacted them personally and their relationship with other teachers. The final section covered the impact of the Laptop Program on parent-teacher/school relationships and parental support.

The teacher interview participants were randomly selected from the pool of 5<sup>th</sup> and 6<sup>th</sup> grade Laptop teachers. The interviews were conducted by researchers from Wayne State University.

## PARENT REACTIONS

The Laptop Program requires strong parental support in that they must agree to pay monthly lease fees for the laptop, attend training sessions, and assume responsibility, with their

child, for the laptop. Therefore, input from parents whose children are participating in the Laptop Program is critical to understanding the impact of implementation.

Parent Survey The purpose of the parent survey was to find out how having the laptop computer had impacted the student involved in the program and other members of the family (Appendix G). The parents were asked whether or not the family owned other computers and if Internet access was available. For the families that had InternetInternet access, four items inquired about how the online resources were used. The next section asked for parent perceptions on how much the laptop had changed their son or daughter's interest, achievement, writing and research skills, involvement in projects, and ability to work with other students. Parents were then asked to reply to questions about whether or not the laptop had changed the father's, mother's, or other family members' involvement with the child in the Laptop Program, each other, or the teacher. The survey ends with six open-ended items for parents to write responses about the benefits and difficulties of having the laptop.

Parent Interview Phone interviews were conducted with 40 parents whose child was involved with the Laptop Program (Appendix H). The interviews were structured to not only obtain specific information, for example "To what degree do you feel the laptop has had on your child's interest in school?", but to also find out supporting reasons for parent responses. The interview focused on the student's use of the computer at home and school, impact of the laptop on the family, and finally, the Laptop Program in general. The interviews were conducted by an experienced telephone interviewer and each interview lasted from 20 to 30 minutes in length. Parent responses were recorded as hand-written notes taken during the interview.

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## RESULTS

### *SCHOOL OBSERVATION MEASURE<sup>®</sup> (SOM<sup>®</sup>)*

As indicated in the description of SOM<sup>®</sup>, the observation procedure focused on 24 instructional strategies using a five-point rubric (0 = not observed, 1 = rarely, 2 = occasionally, 3 = frequently, and 4 = extensively). Two additional items use a three-point scale (1 = low, 2 = moderate, 3 = high) to rate the degree to which academically-focused class time and student attention/interest/engagement are evidenced. Each observation lasted one hour. At the end of each session, the observer completed the final rubrics and ratings. The total observations completed were 32 for the Laptop teachers and 18 for the Control teachers.

In an initial analysis, we collapsed the rubric categories 2-4 into one category to yield a two-category scheme reflecting the percentage of visits in which a strategy was either observed or not observed. A summary of the findings for the overall sample of Laptop and Control schools, listed by percentage of times observed, is presented in Table 2. Asterisks that appear on the table adjacent to the strategy label indicate a statistically significant effect derived from a two-way chi-square analysis in which the factors were Observed (Yes or No) and Treatment (Laptop vs. Control).

As can be seen in the table, significant differences favored Laptop over the Control teachers on project-based learning (65% observed vs. 22%), independent inquiry/research (58% vs. 24%) computer for instructional delivery (22% vs. 0%), and computer as a learning tool (88% vs. 17%). In general, strategies promoting learner activity, such as cooperative learning, inquiry, sustained writing, and computer uses were more likely to be observed in Laptop classrooms.

Table 2

Proportion of times an event was observed (1-4) versus not observed (0)

Strategies	Laptop		Control	
	Observed	Not observed	Observed	Not observed
Direct instruction	68.8	31.3	77.8	22.2
Team teaching	15.6	84.4	11.1	88.9
Cooperative learning	65.6	34.4	38.9	61.1
Individual tutoring	13.3	86.7	11.1	88.9
Ability groups	0.0	100.0	0.0	100.0
Multi-age grouping	0.0	100.0	0.0	100.0
Work centers	3.1	96.9	11.1	88.9
Higher level instructional feedback	61.3	38.7	38.9	61.1
Integration of subject areas	21.9	78.1	5.6	94.4
Project-based learning**	64.5	35.5	22.2	77.8
Use of higher-level questioning	56.3	43.8	50.0	50.0
Teacher as facilitator	71.9	28.1	61.1	38.9
Parent/community involvement	0.0	100.0	5.6	94.4
Independent seatwork	71.9	28.1	55.6	44.4
Hands-on learning	19.4	80.6	16.7	83.3
Systematic individual instruction	0.0	100.0	5.9	94.1
Sustained writing/composition	53.1	46.9	38.9	61.1
Sustained reading	28.1	71.9	38.9	61.1
Independent inquiry/research*	58.1	41.9	23.5	76.5
Student discussion	50.0	50.0	44.4	55.6
Computer for instructional delivery*	21.9	78.1	0.0	100.0
Computer as a tool**	87.5	12.5	16.7	83.3
Performance assessment	37.5	62.5	22.2	77.8
Student self-assessment	18.8	81.3	16.7	83.3

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

Tables 3 and 4 extend the results to all five rubric categories and the two summary items for the Laptop and Control classrooms, respectively. For Laptop, strategies viewed occasionally or more (frequently or extensively) in at least 30% of the classrooms include direct instruction (53% total), cooperative learning (56%), higher-level instructional feedback (52%), project-based learning (61%), higher-level questioning (50%), teacher acting as coach or facilitator (69%), independent seatwork (59%), sustained writing (47%), independent inquiry (52%), student discussion (34%), technology as learning tool (81%), and performance assessment (38%). For Control classrooms, the strategies viewed occasionally or more included direct instruction (72%), cooperative learning (39%), higher-level questioning (33%), teacher acting as coach or facilitator (45%), independent seatwork (50%), and student discussion (45%). At the other extreme are

strategies never or rarely observed. Those in Laptop classes reaching 95% or higher for these two lowest categories combined were ability groups, multi-age groups, work centers, parent/community involvement, and systematic individual instruction. Those never or rarely observed in Control classes were ability groups, multi-age groups, parent/community involvement, computer for instructional delivery, and technology as a learning tool. On the two final summary items, it should also be noted that in Laptop classes (Table 3), academically-focused class time was rated as high in 68% of the visits, while level of student interest/engagement was rated as high in 81%. In Control classes (Table 4), by comparison, these ratings were only 50% and 61%, respectively.

Table 3

## School Observation Measure Data Summary for Laptop classrooms

The extent to which each of the following was used or present in the classroom...	Percent None	Percent Rarely	Percent Occasionally	Percent Frequently	Percent Extensively
<b>Instructional Orientation</b>					
Direct instruction (lecture)	31.3%	15.6%	9.4%	18.8%	25.0%
Team teaching	84.4%	0.0%	12.5%	0.0%	3.1%
Cooperative/collaborative learning	34.4%	9.4%	21.9%	18.8%	15.6%
Individual tutoring (teacher, peer, aide, adult volunteer)	86.7%	6.7%	0.0%	6.7%	0.0%
<b>Classroom Organization</b>					
Ability groups	100.0%	0.0%	0.0%	0.0%	0.0%
Multi-age grouping	100.0%	0.0%	0.0%	0.0%	0.0%
Work centers (for individuals or groups)	96.9%	3.1%	0.0%	0.0%	0.0%
<b>Instructional Strategies</b>					
Higher level instructional feedback (written or verbal) to enhance student learning	38.7%	9.7%	12.9%	25.8%	12.9%
Integration of subject areas (interdisciplinary/thematic units)	78.1%	3.1%	12.5%	6.3%	0.0%
Project-based learning*	35.5%	3.2%	6.5%	9.7%	45.2%
Use of higher-level questioning strategies	43.8%	6.3%	12.5%	21.9%	15.6%
Teacher acting as a coach/facilitator	28.1%	3.1%	9.4%	18.8%	40.6%
Parent/community involvement in learning activities	100.0%	0.0%	0.0%	0.0%	0.0%
<b>Student Activities</b>					
Independent seatwork (self-paced worksheets, individual assignments)	28.1%	12.5%	12.5%	28.1%	18.8%
Experiential, hands-on learning	80.6%	3.2%	3.2%	3.2%	9.7%
Systematic individual instruction (differential assignments geared to individual needs)	100.0%	0.0%	0.0%	0.0%	0.0%
Sustained writing/composition (self-selected or teacher-generated topics)	46.9%	6.3%	9.4%	12.5%	25.0%
Sustained reading	71.9%	3.1%	6.3%	9.4%	9.4%
Independent inquiry/research on the part of students*	41.9%	6.5%	3.2%	16.1%	32.3%
Student discussion	50.0%	15.6%	3.1%	15.6%	15.6%
<b>Technology Use</b>					
Computer for instructional delivery (e.g. CAI, drill & practice)	78.1%	3.1%	3.1%	6.3%	9.4%
Technology as a learning tool or resource (e.g. Internet research, spreadsheet or database creation, multi-media, CD ROM, Laser disk)***	12.5%	6.3%	15.6%	15.6%	50.0%
<b>Assessment</b>					
Performance assessment strategies	62.5%	0.0%	9.4%	6.3%	21.9%
Student self-assessment (portfolios, individual record books)	81.3%	0.0%	6.3%	12.5%	0.0%
<b>Summary Items</b>					
			Low	Moderate	High
Academically focused class time			3.2%	29.0%	67.7%
Level of student attention/interest/engagement			6.5%	12.9%	80.6%

\* $p < .05$ , \*\* $p < .001$ , \*\*\* $p < .001$

Table 4

## School Observation Measure Data Summary for Control Classrooms

The extent to which each of the following was used or present in the classroom...	Percent None	Percent Rarely	Percent Occasionally	Percent Frequently	Percent Extensively
<b><i>Instructional Orientation</i></b>					
Direct instruction (lecture)	22.2%	5.6%	22.2%	22.2%	27.8%
Team teaching	88.9%	0.0%	0.0%	11.1%	0.0%
Cooperative/collaborative learning	61.1%	0.0%	27.8%	11.1%	0.0%
Individual tutoring (teacher, peer, aide, adult volunteer)	88.9%	0.0%	5.6%	5.6%	0.0%
<b><i>Classroom Organization</i></b>					
Ability groups	100.0%	0.0%	0.0%	0.0%	0.0%
Multi-age grouping	100.0%	0.0%	0.0%	0.0%	0.0%
Work centers (for individuals or groups)	88.9%	5.6%	0.0%	5.6%	0.0%
<b><i>Instructional Strategies</i></b>					
Higher level instructional feedback (written or verbal) to enhance student learning	61.1%	16.7%	5.6%	16.7%	0.0%
Integration of subject areas (interdisciplinary/thematic units)	94.4%	0.0%	0.0%	0.0%	5.6%
Project-based learning*	77.8%	0.0%	5.6%	11.1%	5.6%
Use of higher-level questioning strategies	50.0%	16.7%	11.1%	16.7%	5.6%
Teacher acting as a coach/facilitator	38.9%	16.7%	16.7%	22.2%	5.6%
Parent/community involvement in learning activities	94.4%	5.6%	0.0%	0.0%	0.0%
<b><i>Student Activities</i></b>					
Independent seatwork (self-paced worksheets, individual assignments)	44.4%	5.6%	16.7%	22.2%	11.1%
Experiential, hands-on learning	83.3%	0.0%	11.1%	0.0%	5.6%
Systematic individual instruction (differential assignments geared to individual needs)	94.1%	0.0%	0.0%	5.9%	0.0%
Sustained writing/composition (self-selected or teacher-generated topics)	61.1%	11.1%	0.0%	11.1%	16.7%
Sustained reading	61.1%	16.7%	0.0%	11.1%	11.1%
Independent inquiry/research on the part of students*	76.5%	5.9%	11.8%	0.0%	5.9%
Student discussion	55.6%	0.0%	16.7%	22.2%	5.6%
<b><i>Technology Use</i></b>					
Computer for instructional delivery (e.g. CAI, drill & practice)	100.0%	0.0%	0.0%	0.0%	0.0%
Technology as a learning tool or resource (e.g. Internet research, spreadsheet or database creation, multi-media, CD ROM, Laser disk)***	83.3%	16.7%	0.0%	0.0%	0.0%
<b><i>Assessment</i></b>					
Performance assessment strategies	77.8%	5.6%	0.0%	5.6%	11.1%
Student self-assessment (portfolios, individual record books)	83.3%	0.0%	11.1%	5.6%	0.0%
<b><i>Summary Items</i></b>					
			Low	Moderate	High
Academically focused class time			5.6%	44.4%	50.0%
Level of student attention/interest/engagement			5.6%	33.3%	61.1%

\* $p < .05$ , \*\* $p < .001$ , \*\*\* $p < .001$

Table 5 lists significant results from *t*-tests comparing the means for Laptop and Control classes on each SOM<sup>®</sup> item. The table also shows the standard deviations, significance (probability) levels for the *t*-tests, and effect sizes. The latter statistic is commonly used in inferential statistical analyses in conjunction with significance tests to determine the educational importance of an effect. While an effect is considered statistically significant (meaning “reliable” or unlikely to be due to chance) if the probability level is less than or equal to  $p = .05$ , a “significant” effect may still be quite small in magnitude and of little practical meaning. For example, if 1000 high school students used Textbook A to prepare for a science test and 1000 used Textbook B, the first group may average one-half point higher (e.g., 88% vs. 87.5%) on the final exam, a difference found to be statistically significant with that large a sample. But such a small difference would probably not merit making a textbook adoption change.

Effect sizes compliment significance tests by indicating the number of standard deviations by which the “experimental” or “program” group mean exceeds the control group mean. In the present analyses we computed effect sizes via Cohen’s *d* formula (Cohen, 1988), using the pooled standard deviation for the SFT and Control groups in the denominator. Effect sizes in absolute value ranging from +.40 to +.60 are considered moderate in size and of educational importance; those exceeding +1.00 are considered to be strong in magnitude and of high importance. Note, however, that to be viewed seriously (i.e., as reliable), even a large effect size should be associated with a statistically significant difference. For example, a sample of 5 students may average 90% with Textbook A, whereas a comparison sample of 5 may average only 75%. With such a small sample, this apparently large effect may still not be considered reliable by the statistical test.

Table 5

A Summary of Items Showing Significant Differences Between Laptop and Control Group Comparisons on the SOM<sup>©\*</sup>

Items Using Rating Scale A**	Laptop		Control		<i>t</i>	<i>p</i>	<i>ES</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Computer used as a tool	2.84	1.43	.16	.38	7.71	.000	2.29
Project-based learning	2.25	1.84	.66	1.32	3.21	.002	0.95
Independent Inquiry	1.90	1.81	.52	1.12	2.83	.007	0.89
Higher-level instructional feedback	1.64	1.53	.77	1.16	2.07	.044	0.61
Teacher as facilitator	2.40	1.70	1.38	1.37	2.17	.035	0.64
Cooperative learning	1.71	1.50	.88	1.18	2.01	.050	0.59
Computer for instructional delivery	.65	1.35	.00	.00	2.04	.047	0.59

\*Sorted by Effect Size

\*\*Rating Scale A

0 = Not Observed

1 = Rarely Observed

2 = Occasionally

Observed

3 = Frequently Observed

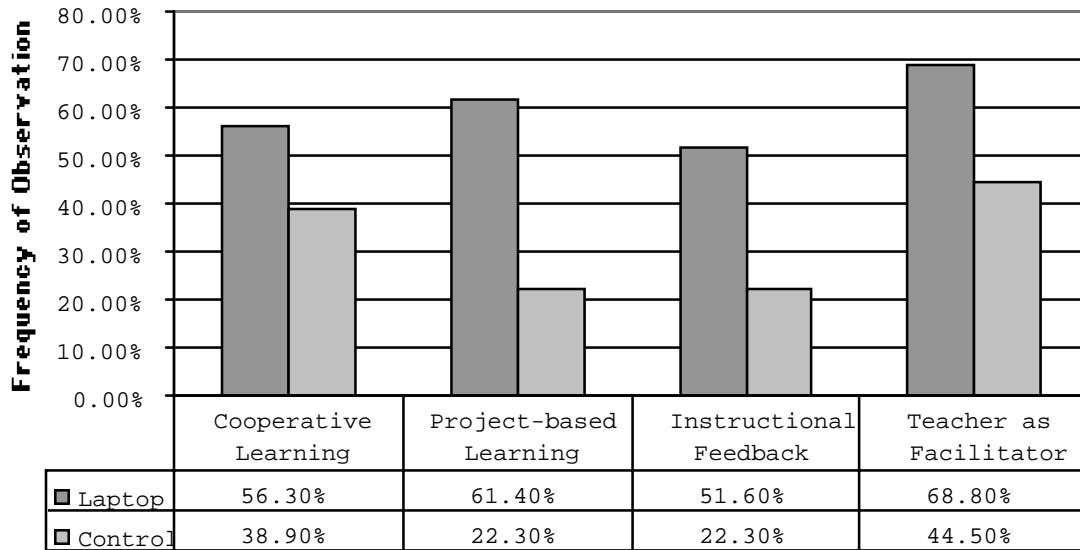
4 = Extensively Observed

As shown in Table 5, there were seven comparisons that yielded statistically significant differences, all of which had associated effects sizes of .59 or higher in absolute value. Figure 1 depicts these seven comparisons with regard to the percentage of observations in Laptop and Control schools rated occasionally or higher. All of the significant differences favored the Laptop classes: computer as a learning tool ( $ES = +2.29$ ), project-based learning ( $ES = +0.95$ ), independent inquiry ( $ES = +0.89$ ), higher-level instructional feedback ( $ES = +0.61$ ), teacher as facilitator ( $ES = +0.64$ ), cooperative learning ( $ES = +0.59$ ), and computer for instructional delivery ( $ES = +0.59$ ).

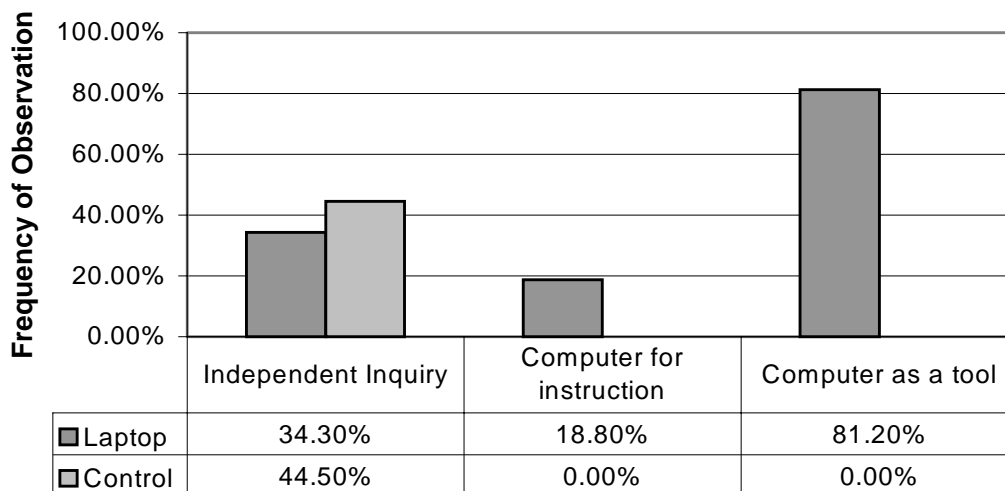
Figure 1

Percentage of Observations in Laptop and Control Classrooms Rated Occasionally or Higher

**Significant Differences in Classroom Practices  
Chart 1**



**Significant Difference in Classroom Practices  
Chart 2**



## SURVEY OF COMPUTER USE (SCU)

Findings on the SCU are summarized in Tables 6 to 14. As shown in Table 6, Laptop classes, as would be expected, contained more computers ( $p < .001$ ) than did Control classes. For example, there were 9 or more computers in about 78% of the Laptop classes but in none (0%) of the Control classes. Additional areas where significant differences occurred (see Table 7) were that Laptop classes had more: (a) PC's, (b) up-to-date computers, (c) Internet access, (d) printer access, (e) color printer access, (f) computers clustered together, and (g) computers that were distributed. Further, Laptop classes always had at least one student at one computer and rarely had more. By comparison, about half of the Control classes averaged one student per computer, while half had more than five students per computer. All three comparisons involving the availability of computers to students significantly favored the Laptop classes.

Table 6  
Computer Setup of Laptop and Control Classrooms

Number of Computers***						
Group	1 Computer	2-3 Computers	4-5 Computers	6-8 Computers	9+ Computers	
Laptop	14.8%	7.4%	0.0%	0.0%	77.8%	
Control	50.0%	33.3%	16.7%	0.0%	0.0%	

\* $p < .05$ , \*\* $p < .001$ , \*\*\* $p < .001$

Type and Configuration of Computers						
Group	How many computers:	Not Observed	Rarely	Occasionally	Frequently	Extensively
Laptop	Were Macintoshes	100.0%	0.0%	0.0%	0.0%	0.0%
	Were PC's**	0.0%	0.0%	0.0%	0.0%	100.0%
	Were up-to-date***	0.0%	0.0%	0.0%	3.6%	96.4%
	Had Internet access**	0.0%	0.0%	0.0%	0.0%	100.0%
	Had printer access**	0.0%	0.0%	0.0%	0.0%	100.0%
	Had color printer access**	0.0%	0.0%	0.0%	0.0%	100.0%
	Were clustered together**	92.9%	3.6%	3.6%	0.0%	0.0%
Were distributed **	25.0%	0.0%	0.0%	0.0%	75.0%	
Control	Were Macintoshes	100.0%	0.0%	0.0%	0.0%	0.0%
	Were PC's	33.3%	8.3%	0.0%	0.0%	58.3%
	Were up-to-date	33.3%	16.7%	8.3%	16.7%	25.0%
	Had Internet access	33.3%	8.3%	8.3%	0.0%	50.0%
	Had printer access	33.3%	8.3%	0.0%	0.0%	58.3%
	Had color printer access	33.3%	8.3%	8.3%	0.0%	50.0%
	Were clustered together	50.0%	16.7%	0.0%	0.0%	33.3%
Were distributed	75.0%	0.0%	0.0%	0.0%	25.0%	

\* $p < .05$ , \*\* $p < .001$ , \*\*\* $p < .001$

Table 7

## Students per Computer

Group	Students per computer	1	2	3	4	5+
Laptop	Least students at one computer***	100.0%	0.0%	0.0%	0.0%	0.0%
	Most students at one computer***	76.0%	16.0%	4.0%	0.0%	4.0%
	Average students at one computer**	100.0%	0.0%	0.0%	0.0%	0.0%
Control	Least students at one computer***	40.0%	0.0%	0.0%	20.0%	40.0%
	Most students at one computer***	0.0%	20.0%	0.0%	0.0%	80.0%
	Average students at one computer**	50.0%	0.0%	0.0%	0.0%	50.0%

\* $p < .05$ , \*\* $p < .001$ , \*\*\* $p < .001$

With regard to student technology skills (see Table 8), Laptop students were rated significantly higher than were Control students on computer skills ( $p < .001$ ), keyboarding skills ( $p < .001$ ), and mouse skills ( $p < .01$ ). For example, students were rated as “very high” on computer skills in 80% of the Laptop observations but in only 8% of the Control observations. Conversely, students were given the very lowest keyboarding skill rating in only 4% of the Laptop observations but in 75% of the Control observations. Finally, Laptop classes were rated as significantly higher than Control classes in computers working well, students being highly engaged in the learning activities, and the teacher providing technical coaching (see Table 9).

Table 8

## Student Technology skills

Group		Not Observed	Rarely	Occasionally	Frequently	Extensively
Laptop	High level of computer skills***	4.0%	0.0%	0.0%	16.0%	80.0%
	High level of keyboarding skills***	4.0%	0.0%	16.0%	16.0%	64.0%
	High level of mouse skills**	4.0%	0.0%	0.0%	8.0%	88.0%
Control	High level of computer skills	75.0%	0.0%	16.7%	0.0%	8.3%
	High level of keyboarding skills	75.0%	0.0%	16.7%	0.0%	8.3%
	High level of mouse skills	83.3%	0.0%	0.0%	8.3%	8.3%

\* $p < .05$ , \*\* $p < .001$ , \*\*\* $p < .001$

Table 9  
Computer Impact

Group		Not Observed	Rarely	Occasionally	Frequently	Extensively
Laptop	Computer (s) worked well***	4.0%	0.0%	0.0%	8.0%	88.0%
	Students were very engaged in computer activities***	8.3%	8.3%	0.0%	20.8%	62.5%
	Teacher provided technical coaching**	18.2%	13.6%	4.5%	13.6%	50.0%
Control	Computer (s) worked well***	83.3%	0.0%	0.0%	8.3%	8.3%
	Students were very engaged in computer activities***	83.3%	0.0%	0.0%	16.7%	0.0%
	Teacher provided technical coaching**	81.8%	0.0%	0.0%	18.2%	0.0%

\* $p < .05$ , \*\* $p < .001$ , \*\*\* $p < .001$

The following results reflect types of computer activities that were observed at least *occasionally* in 20% or more classrooms that had students using computers. In the Laptop classrooms (Table 10), students were using computers for word-processing for non-creative writing (40%), word-processing for creative writing (46%), entering data (21%), drawing or creating design layouts (34%), and creating presentations (26%). Computer activities using Internet/research tools were used to locate resources (50%). In contrast, there was only one area observed at least occasionally in 20% or more Control classes (see Table 11) -- word processing for non-creative writing (27%).

Table 10

## Survey of Computer Use (SCU) Data Summary for Laptop classrooms

The extent to which students used ...	None	Rarely	Occasionally	Frequently	Extensively
<i>Computer activities using Production tools</i>					
Word Process: Non-Creative Writing	44.0%	16.0%	8.0%	4.0%	28.0%
Word Process: Creative Writing*	42.9%	10.7%	7.1%	25.0%	14.3%
Enter Data	71.4%	7.1%	0.0%	7.1%	14.3%
Manipulate Data	92.6%	0.0%	3.7%	3.7%	0.0%
Generate Results	77.8%	3.7%	0.0%	7.4%	11.1%
Draw or Design Layout	59.3%	7.4%	3.7%	11.1%	18.5%
Create Interactive Product	92.6%	0.0%	0.0%	0.0%	7.4%
Create Presentation	66.7%	7.4%	7.4%	7.4%	11.1%
<i>Computer Activities using Internet/Research Tools</i>					
Locate Resources	50.0%	0.0%	7.1%	10.7%	32.1%
Interact with Others	96.0%	4.0%	0.0%	0.0%	0.0%
<i>Computer Activities using Educational Software</i>					
Learn/Review Content/Skills (D&P; Tutorial)	96.3%	0.0%	3.7%	0.0%	0.0%
Solve Problems	96.0%	0.0%	0.0%	0.0%	4.0%
Other	85.0%	5.0%	5.0%	5.0%	5.0%

\* $p < .05$ , \*\* $p < .001$ , \*\*\* $p < .001$

Table 11

## Survey of Computer Use (SCU) Data Summary for Control Classrooms

The extent to which students used ...	None	Rarely	Occasionally	Frequently	Extensively
<i>Computer activities using Production tools</i>					
Word Process: Non-Creative Writing	72.7%	0.0%	9.1%	9.1%	9.1%
Word Process: Creative Writing*	100.0%	0.0%	0.0%	0.0%	0.0%
Enter Data	90.9%	9.1%	0.0%	0.0%	0.0%
Manipulate Data	100.0%	0.0%	0.0%	0.0%	0.0%
Generate Results	90.9%	9.1%	0.0%	0.0%	0.0%
Draw or Design Layout	100.0%	0.0%	0.0%	0.0%	0.0%
Create Interactive Product	100.0%	0.0%	0.0%	0.0%	0.0%
Create Presentation	90.9%	0.0%	0.0%	9.1%	0.0%
<i>Computer Activities using Internet/Research Tools</i>					
Locate Resources	90.9%	0.0%	0.0%	9.1%	0.0%
Interact with Others	100.0%	0.0%	0.0%	0.0%	0.0%
<i>Computer Activities using Educational Software</i>					
Learn/Review Content/Skills (D&P; Tutorial)	100.0%	0.0%	0.0%	0.0%	0.0%
Solve Problems	100.0%	0.0%	0.0%	0.0%	0.0%
Other	100.0%	0.0%	0.0%	0.0%	0.0%

\* $p < .05$ , \*\* $p < .001$ , \*\*\* $p < .001$

Tables 12 and 13 summarize computer activities of Laptop and Control teachers, respectively, in using production tools, Internet/research tools, and educational software in different subjects. Generally, the two groups seem comparable in social studies applications, while Laptop teachers were active in language arts, math, and science applications.

Table 12  
Survey of Computer Use Data Summary for Laptop classrooms

	Language Arts	Math	Science	Social Studies
Computer activities using				
Production tools	45.0%	15.0%	25.0%	47.8%
Internet/Research Tools	31.6%	15.0%	15.8%	34.8%
Educational Software	21.1%	10.5%	14.3%	19.0%

Table 13  
Survey of Computer Use Data Summary for Control Classrooms

	Language Arts	Math	Science	Social Studies
Computer activities using				
Production tools	18.2%	0.0%	0.0%	45.5%
Internet/Research Tools	18.2%	0.0%	0.0%	27.3%
Educational Software	20.0%	0.0%	0.0%	20.0%

Table 14 summarizes statistically significant comparisons of observation means using *t*-tests. Most of these areas of difference have already been noted above, and collectively show that Laptop classes provided greater access to computers and associated peripheral equipment to develop higher skill levels by students (Table 6-11), to engage students and teachers more extensively in computer applications, to use computers more for research and for production in writing and design, and to make greater use of word-processing and Internet software. Importantly, on the final rubric, Laptop classes were rated as making much more meaningful use of computers compared to Control classes ( $M$ 's = 3.18 vs. 1.00,  $ES = +2.72$ ).

Table 14

## A Summary of Items of Showing Significant Differences Between Laptop and Control Group Comparisons on the Survey of Computer Use\*

Item	Scale*	Treatment		Control		<i>t</i>	<i>p</i>	<i>ES</i>
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
<i>Computers:</i>								
were up-to-date	C	3.96	.18	1.83	1.69	6.66	.000	2.31
# of computers	A	4.18	1.57	1.66	.77	5.25	.000	1.82
had Internet access	C	4.00	.00	2.25	1.91	4.84	.000	1.68
had color printer access	C	4.00	.00	2.25	1.91	4.84	.000	1.68
had printer access	C	4.00	.00	2.41	1.97	4.24	.000	1.48
mostly PC's	C	4.00	.00	2.41	1.97	3.99	.000	1.41
computers were clustered	C	.10	.41	1.50	1.88	-3.77	.001	-1.30
computers were distributed	C	3.00	1.76	1.00	1.80	3.26	.002	1.12
<i>Students per Computer</i>								
average students at one computer	A	.95	.21	3.00	2.82	-4.24	.000	-3.15
most students at one computer	A	1.34	.93	4.40	1.34	-6.24	.000	-3.06
least students at one computer	A	.96	.19	3.20	2.04	-5.97	.000	-2.94
<i>Student Computer Skills</i>								
computer skills	C	3.68	.85	.66	1.30	8.45	.000	2.99
mouse skills	C	3.64	.90	.66	1.30	8.08	.000	2.86
keyboarding skills	C	3.36	1.03	.66	1.30	6.81	.000	2.41
<i>Computer Impact</i>								
engaging computer activities	C	3.20	1.31	.50	1.16	6.03	.000	2.62
computers worked well	C	3.76	.83	.58	1.37	8.74	.000	2.50
teacher provided technical coaching	C	2.63	1.64	.54	1.21	3.72	.001	1.37
<i>Computer as Production Tool</i>								
in word processing: creative writing	C	1.57	1.59	.00	.00	3.24	.003	1.15
to draw or design layout	C	1.22	1.67	.00	.00	2.41	.021	.85
<i>Computer as Research Tool</i>								
to locate resources	C	1.75	1.85	.27	.90	2.51	.017	.89
<i>Type of software:</i>								
Word processing	B	.67	.47	.27	.46	2.41	.021	.85
Internet browser	B	.46	.50	.09	.30	2.27	.029	.80
<b>OVERALL</b>								
meaningful use of computers	D	3.18	.98	1.00	.00	5.36	.000	2.72

## \*Rating Scales

**A**

1 = 1 computer  
 2 = 2-3 computers  
 3 = 4-5 computers  
 4 = 6-8 computers  
 5 = 9+ computers

**B**

1 = Yes  
 0 = No

**C**

0 = Not Observed  
 1 = Rarely Observed  
 2 = Occasionally Observed  
 3 = Frequently Observed  
 4 = Extensively Observed

**D**

1=Very low level  
 2=Somewhat  
 3=Meaningful  
 4=Very meaningful

## WRITING PERFORMANCE

Students in Laptop ( $n = 32$ ) and Control ( $n = 32$ ) classes were asked to write a prompted essay. The essays were then scored in the blind (regarding students' enrollment in Laptop vs. Control classes) on a rubric encompassing the four dimensions of Ideas and Content, Organization, Style, and Conventions (see Table 15). For each dimension, the essay was scored from 1 to 4, with 4 being the highest rating possible.

Mean performance scores for Laptop and Control students were analyzed via a one-way multivariate analysis of variance (MANOVA) with the four dimension scores serving as the dependent variables. The MANOVA yielded  $F(4, 59) = 2.556, p = .048$ , indicating a significant program effect. Consequently, univariate analysis of variance (ANOVA) was performed separately on each dimension. As shown in Table 15, all four tests were highly significant and indicative of higher performance by Laptop than Control students. Effect sizes ranged from +0.61 to +0.78, suggesting moderately strong and educationally important effects (see Cohen, 1988).

Table 15

Summary of the MANOVA results and descriptive statistics for Laptop and Control group Writing Scores

	Hotellings T	F	Hypothesis df	Error df	Significance
Overall	.173	2.556	4.00	59.00	.048

	Treatment		Control		F	p	ES
	M	SD	M	SD			
Organization	3.34	.74	2.71	.85	9.763	.003	.78
Idea	3.15	.67	2.65	.65	9.038	.004	.75
Style	3.12	.79	2.53	.76	9.333	.003	.76
Conventions	3.12	.75	2.65	.78	5.936	.018	.61

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

## STUDENT SURVEY

Table 16 summarizes the Laptop student survey responses ( $n = 397$ ), which reflect both direct and indirect outcomes of the Laptop program. With regard to possible program outcomes, the Laptop students were most supportive about their computer skills being increased (“Yes” = 76%), and being better able to do Internet research (80%). Students strongly concurred that they were glad to have a laptop computer (89%) and hoped that they would have a laptop again next year (86%). They were less certain that using computers at school increased their interest in learning (39%), made them want to get better grades (34%), improved their writing (34%), or made it easier for them to work with other students (36%).

Other survey questions dealt with the conditions under which computers were used in school and at home. About two-thirds (66%) of the students generally worked with the laptop alone in the classroom. When they worked with others, it was more frequently with one other student than with groups of three or more students. The most common subjects involved in laptop uses were language arts and social studies. There was moderate use in science and

relatively little use in mathematics. Over half of the students reported fairly regular use of the laptop for completing homework, while even more reported uses for “other things.” Similarly, there was moderate use of the laptop for Internet access to complete homework, but more frequent use of the Internet for “things other than schoolwork.” When students were asked to indicate the “other things” for which the Internet was used, the two most frequently cited responses were: email/chat and games. Students reported family members as using the laptop relatively little if all.

Table 16

## Summary of the descriptive statistics for Laptop Student surveys (N = 397)

	No	Some	Yes
My computer skills are better because I have a laptop.	2.8%	21.4%	75.8%
Using computers at school has made me more interested in learning.	11.1%	50.4%	38.5%
Using computers at school has made me want to get better grades.	22.8%	43.5%	33.7%
My writing has improved because I use computers.	19.7%	46.2%	34.1%
I can now do Internet research to find information.	2.3%	17.4%	80.3%
Using computers at school makes it easier to work with other students.	9.6%	54.1%	36.3%
I am very glad that I have the laptop computer.	.8%	9.8%	89.4%
I would like to have a laptop computer again next year.	3.0%	11.1%	85.8%

	Never	2	3	4	Frequently
How often do you use the laptop in the following ways while in the classroom?					
By yourself	1.5%	5.1%	27.8%	65.6%	0.0%
With one other student	6.6%	45.4%	38.8%	9.2%	0.0%
In groups of three or more students	22.1%	55.9%	15.4%	6.7%	0.0%
How often do you use the laptop for the following subjects?					
Language Arts	3.3%	22.0%	40.8%	33.9%	0.0%
Mathematics	45.4%	36.5%	15.0%	3.0%	0.0%
Science	18.7%	36.4%	24.6%	20.3%	0.0%
Social Studies	3.8%	28.8%	42.5%	24.9%	0.0%
About how often do you use the laptop for homework?	1.5%	27.2%	44.3%	27.0%	0.0%
How often do you use the laptop for things other than homework?	3.6%	18.9%	38.5%	38.8%	.3%
How often do other family members use the laptop?	59.7%	25.9%	9.2%	5.1%	0.0%
If yes, how often do you use the Internet for schoolwork?	16.8%	43.0%	30.9%	9.4%	0.0%
If yes, how often do you use the Internet for things other than schoolwork?	6.1%	20.4%	35.3%	38.3%	0.0%
How well do you use the following software?					
Authoring: HyperStudio, etc.	8.1%	13.2%	33.9%	27.8%	17.0%
Database	1.0%	2.5%	10.4%	20.5%	65.6%
Draw/graphics	7.6%	5.3%	9.1%	16.7%	61.3%
Email	4.6%	4.6%	10.2%	15.3%	65.3%
Games	17.0%	9.5%	21.3%	23.4%	28.8%
Internet	1.0%	2.8%	11.7%	27.2%	57.4%
Power Point presentation	.5%	2.0%	11.0%	25.0%	61.5%
Spreadsheet	1.3%	6.6%	18.5%	32.7%	41.0%
Word Processing	.8%	.3%	2.3%	12.6%	84.1%
Reference: Encyclopedias, etc.	.5%	1.3%	9.4%	17.8%	71.0%
Organization	21.6%	18.0%	19.8%	18.3%	22.3%

A next section of the survey addressed students' skills in various types of software applications. Those rated most highly were word-processing (84%), reference resources (71%), databases (66%), and e-mail (65%). Those rated lowest were authoring/HyperStudio (17%), organization (22%), and games (29%). Intermediate ratings were given to spreadsheet (41%) and Internet (57%).

The final section of the student survey contained three open-ended questions. The first question asked, "What is the best thing about having a laptop?" The most frequent response was that it helped students learn useful computer skills. Other common replies included the laptop helped with school assignments, gave the students access to information on the Internet, and it helped the students become more organized. Several students said the laptop was fun and allowed them to communicate with others via email. When students were asked about the hardest part of having the laptop, there was general consensus that it was heavy and difficult to carry back and forth to school and that it was also hard to keep track of the laptop. Other concerns included reoccurring technical problems (e.g., freezes, charging, slow), using MS Access, and students lacking sufficient computer skills. Students had the following recommendations for improving the program: allow students to customize their laptops (desktops, add games, etc.), to use it in other classes, use it more frequently, and to leave laptops at school. The student survey had space for students to add other comments. Approximately 30 students wrote in comments that were supportive of the program and wanted it to be continued.

Overall, the survey results show that laptop students were highly appreciative of having laptop computers and were taking advantage of its resources for performing a variety of learning activities both at school and at home. Students were more likely to experience benefits of the

laptop activities for specific skill development (e.g. using the Internet) and applications (e.g., word-processing) than for increasing their basic interest in school and grades.

## STUDENT FOCUS GROUPS

The researchers conducted six student focus groups that involved a total of 58 students. The size of the focus groups ranged from 7 to 12 students. Focus group responses closely align with open-ended responses given on the student survey. When asked how it has been to have a laptop this year, students were very positive and indicated that the laptop made it easier to complete homework assignments, that their work was much neater, they enjoyed having access to Internet resources, and that the laptop is fun to use. Students cited the worst part of having the laptop as having to carry it and dealing with technical problems.

The next part of the focus groups emphasized classroom level changes and impact of the laptop on student learning and performance. The students indicated that they write more, research more and use more resources for their schools work now that they have the laptops and access to the Internet. They are more involved in project work and work together more frequently. A less frequently cited impact was the use of rubrics and portfolios. The most common response regarding the impact of having a laptop on student learning was that students' grades had improved, although some students indicated there was no change in grades, and a few said some grades had dropped. Students felt they had a closer relationship with their teachers, more self-confidence, and improved attitudes towards school.

The final portion of the student focus group asked how the laptop had impacted the parents and/or family members. The majority of the students indicated that their parents liked the laptop program. Other responses included that the laptop improved relationships between

students and their parents, that parents provided more help with homework, and that parents were amazed/happy at how quickly students had gained computer skills. A few students said their parents asked them computer-related questions and some parents used the laptop. All of the student final comments were positive, indicating that they liked having the laptop and looked forward to using it again next year.

## TEACHER SURVEY

Thirteen Laptop teachers responded to the Teacher Survey. Results are summarized in Table 17. As can be seen by the results, teacher responses were extremely positive regarding the benefits of the Laptop Program for them and their students. All (100%) agreed that the program experience: (a) increased their basic skills in computer applications, (b) increased the emphasis on higher-order learning in their classroom, (c) increased project-based learning, and (d) was beneficial to them as teachers. There was also strong agreement that they: were better prepared to create lessons integrating computers (89% agreed), frequently integrated technology (89%), school-related interactions with students and parents increased (88%), and would like to participate in the project again next year (89%). With regard to impacts on students, all teachers (100%) believed that the program increased interest in learning and research skills. Over three-fourths indicated that students' performance/grades and ability to work with other students increased. About two-thirds also felt that student writing skills had increased.

Three open-ended questions were included in the final section of the survey. The first asked teachers what they felt was the greatest benefit of the laptop program. The teacher responses fell into two categories, technology and learning. With regard to technology, the teachers felt it was very beneficial for students to have access to technology and the information

made available via the Internet. The teachers also felt that use of the laptop had resulted in students having greater research skills, improved writing skills, interest in school, and greater self-confidence. The difficulties cited were all related to the technology itself. Teachers felt that technical difficulties related to power, weight, drives, server, and printers, negatively impacted the program. They were also concerned with students tampering with software and the laptop settings. As could be expected, teachers indicated that the program could be improved by providing more technical support, more basic training, providing a solution to the power problems and more projectors. Overall, the teachers were generally positive toward the program.

Table 17

## Summary of the descriptive statistics for Teacher surveys (N = 13)

Personal Impact	Strongly Disagree	Disagree	Neutral	Agree	Strongly Disagree
I have increased my personal ability to use basic computer applications, such as databases, spreadsheets, and presentation.	0.0%	0.0%	0.0%	22.2%	77.8%
I am better prepared to create lessons that integrate student use of computers.	0.0%	0.0%	11.1%	44.4%	44.4%
I frequently integrate technology into lessons that I previously taught without the use of computers.	0.0%	0.0%	11.1%	55.6%	33.3%
I have increased the frequency or emphasis of higher-level learning in my classroom instruction.	0.0%	0.0%	0.0%	77.8%	22.2%
I have increased the frequency or emphasis of project-based learning.	0.0%	0.0%	0.0%	55.6%	44.4%
My school-related interactions and communications with students and parents have increased.	0.0%	0.0%	22.2%	33.3%	44.4%
Overall, being a teacher with the laptop project has been beneficial to me.	0.0%	0.0%	0.0%	33.3%	66.7%
I would like to participate in the laptop project again next year.	0.0%	0.0%	11.1%	22.2%	66.7%
Student Impact	Reduced	Same	Increased		
To what degree has having access to laptop computers impacted students?					
Interest in learning	0.0%	0.0%	100.0%		
Performance and/or grades	0.0%	22.2%	77.8%		
Writing skills	0.0%	33.3%	66.7%		
Research skills	0.0%	0.0%	100.0%		
Ability to work with other students	0.0%	11.1%	88.9%		
Student Use	Never	2	3	4	Frequently
How often do your students use the laptop in the following ways?					
Individually	0.0%	22.2%	0.0%	11.1%	66.7%
In pairs	0.0%	22.2%	44.4%	33.3%	0.0%
In groups of three or more students	22.2%	11.1%	44.4%	22.2%	0.0%
How often do your students use the laptop for the following subjects?					
Language Arts	0.0%	0.0%	12.5%	37.5%	50.0%
Mathematics	25.0%	50.0%	25.0%	0.0%	0.0%
Science	0.0%	33.3%	16.7%	50.0%	0.0%
Social Studies	0.0%	0.0%	28.6%	28.6%	42.9%
How often do you use the following software?					
Word Processing	0.0%	0.0%	0.0%	22.2%	77.8%
Drill and Practice	44.4%	44.4%	11.1%	0.0%	0.0%
Tutorials	37.5%	37.5%	25.0%	0.0%	0.0%
Games	33.3%	44.4%	22.2%	0.0%	0.0%
Email	11.1%	44.4%	11.1%	11.1%	22.2%
Internet	0.0%	0.0%	0.0%	55.6%	44.4%
Database	0.0%	33.3%	55.6%	11.1%	0.0%
Spreadsheet	11.1%	11.1%	44.4%	22.2%	11.1%
Desktop Publishing	22.2%	37.5%	12.5%	12.5%	12.5%
Presentation (slide shows)	0.0%	11.1%	11.1%	44.4%	33.3%
Draw/graphics	0.0%	22.2%	22.2%	44.4%	11.1%
Authoring: HyperStudio, etc.	33.3%	33.3%	11.1%	22.2%	0.0%

## TEACHER INTERVIEWS

There were seven randomly selected Laptop teachers who were interviewed. As with the other instruments, the questions addressed the most positive and most difficult aspects of the laptop program, how the program could be improved, how it had impacted classroom practices, student learning, and the teachers. A summary of teacher responses follows.

The interview began with a general question about how the laptop program had gone this year. Teacher responses were very positive with regard to impacts on students, but mentioned technical problems and that the laptop program was viewed as “elitist” by some non-Laptop teachers. They felt the most effective aspects of the laptop program were increased knowledge of technology for both students and teachers, increased research skills, access to resources, and cooperative learning. The most difficult aspects of the program were managing the use of the laptops in a crowded room, managing the use of the Internet, integrating computer use with the curriculum while still meeting performance standards, and technical difficulties.

Teachers indicated that classroom practices had changed due to the laptops in that they used more cooperative learning, did more projects, and acted as facilitators of learning more frequently. They also said that the projects involved more integration of subjects, research, resources and the use of spreadsheets, word processing, and the Internet. These activities involved the students in higher-levels of learning that required analysis, synthesis and evaluation and more writing. The teachers reported that they more frequently used authentic assessment and involved students in the development of rubrics and self-assessment of student products. As a result, teachers indicated that students had more self-esteem and confidence, greater enthusiasm, increased depth of knowledge, and were more engaged with other learners. Student work was

more organized, and often went beyond assignment requirements. Teachers indicated that there were fewer missed assignments and an overall improvement in grades.

Most of the teachers were positive and supportive of the laptop program. Teachers commented that the program had caused them to reflect more on classroom practices, to go beyond what was required, and to work more with individual students. Teachers did indicate that the program did take more preparation time and that they had to generate new classroom rules that now include computer usage. The teachers felt the program had fostered collaborations among other Laptop teachers and some non-Laptop teachers interested in using technology.

Teacher comments regarding parental support were mixed. Some teachers indicated a great deal of parental support, involvement, and communication with regard to student schoolwork. Other teachers indicated that some parents felt the program did not match their perceptions, in that the laptop was used less than expected. It was noted that more parent training would be beneficial. Final comments from teachers included:

- It's a great project, I learned a lot, and look forward to next year.
- Laptop program does not cure prior student behavior problems.
- Program is motivating for teachers
- Creates need for ongoing planning, research, and revision of lesson.

## PARENT SURVEYS

The parent responses ( $n = 187$ ) generally reflect positive views about their children's activities associated with the Laptop Program (see Table 18). Specifically, the majority of parents (58%) reported that their children were using the laptop to complete schoolwork at home 3-4 days a week or every day. Close to half (45%) reported comparable usage of the laptop for activities other than schoolwork. Nearly all (97%) confirmed that their child took the laptop to

school every day. With regard to Internet applications, most parents believed that their child used the Internet for schoolwork and for other activities at least 1-2 days a week. Almost half perceived that family members used the Internet every day for activities other than schoolwork.

Encouragingly, parents generally viewed the Laptop Program as helpful to their children's education. More than half felt that the program *increased* their child's interest in school (63%), involvement in project-type schoolwork (63%), and research skills (37%). From one-third to one-half believed that increases occurred in school achievement (42%), writing skills (48%), and ability to work with other students (37%).

Parent responses also suggested that in about 10-25% of the homes, the Laptop Program increased family members' involvement with their child's education. The majority, however, believed that there were no changes. The areas in which increases were most frequently perceived were fathers' and mothers' involvement with schoolwork and interactions with the child. Increases in interactions with the child's teacher and communications with other parents were seen by about 10-15% of the respondents.

The parent survey ended with six open-ended questions that asked parents to indicate the best and worst aspects of the laptop program, suggested changes for improvement, laptop "rules", and additional comments. Over one-half of the parents stated that the most beneficial part of the laptop program was that their child had improved his/her knowledge in different subject areas and also improved in computer literacy. The parents were concerned that the laptop was difficult for their child to keep track of and be responsible for as well as being too heavy for their child to easily carry. Other concerns were related to monitoring student use of the Internet and overuse of computer games. The parents felt that more training is needed for teachers, parents and students (keyboarding). Another suggestion was to offer the program to all students in the district.

The parents indicated that they had established rules to assist their child in caring for the laptop and in limiting or supervising its use, i.e., the Internet and games. Some of the parents indicated that they only let the laptop students use the computer. In other families, siblings of the laptop child could use the computer if they asked permission prior to use. Overall, the parents were very supportive of the program, but indicated that the laptops could be used more frequently at school. The parents felt the laptop had inspired their child to work more, be more organized, and be more enthusiastic about school and learning in general.

Table 18  
Summary of the descriptive statistics for Laptop Parent Surveys (N = 187)

	Never	Rarely or Occasionally	1-2 days per week	3-4 days per week	Every day
<b>The Laptop</b>					
About how often does your child do school work with the laptop at home?	1.1%	13.1%	27.9%	37.7%	20.2%
How frequently does your child use the laptop for things other than homework?	4.3%	24.5%	26.6%	27.7%	16.8%
How often does your child take the laptop to school?	0.0%	0.0%	.5%	2.2%	97.3%
<b>The Internet</b>					
How often does your child use the Internet for schoolwork?	10.0%	39.2%	35.8%	11.7%	3.3%
How often does he/she use the Internet for things other than schoolwork?	9.3%	25.4%	26.3%	26.3%	12.7%
How frequently do you or other family members use the Internet for things other than your child's schoolwork?	4.0%	8.0%	14.0%	26.7%	47.3%
<b>Does the laptop help?</b>					
		NA	Reduced	Same	Increased
To what degree has the laptop computer changed your child's interest in school?		0.0%	2.7%	33.9%	63.4%
Achievement in school?		.5%	1.6%	56.0%	41.8%
Involvement in project-type school work?		.5%	1.6%	35.2%	62.6%
Writing skills?		0.0%	3.8%	48.6%	47.5%
Research skills?		0.0%	1.1%	14.8%	84.2%
Ability to work with other students?		1.7%	.6%	60.6%	37.2%
<b>The Laptop and your family</b>					
To what degree has the laptop changed the Father's:					
Involvement with your child's schoolwork?		9.7%	2.8%	65.3%	22.2%
Interactions with your child?		8.5%	1.1%	67.2%	23.2%
Interactions with your child's teacher?		12.6%	4.0%	72.6%	10.9%
Communications with other parents?		18.4%	1.7%	74.1%	5.7%
To what degree has the laptop changed the Mother's:					
Involvement with your child's schoolwork?		2.8%	6.1%	66.3%	24.9%
Interactions with your child?		2.2%	1.7%	75.0%	21.1%
Interactions with your child's teacher?		4.4%	2.2%	80.7%	12.7%
Communications with other parents?		8.3%	1.1%	75.0%	15.6%
To what degree has the laptop computer changed other children's:					
Involvement with their brother's or sister's schoolwork?		22.2%	.6%	53.3%	23.9%
Interactions with their brother or sister?		20.7%	0.0%	50.8%	28.5%
Use of the laptop for schoolwork?		38.5%	0.0%	35.2%	26.3%
Positive interactions between each other?		20.2%	.6%	55.1%	24.2%

## PARENT INTERVIEW

The parent interviews were conducted with a random selection of 40 parents whose children were participating in the laptop study. Twenty of the parents had children in the 5<sup>th</sup> grade and 20 had children in the 6<sup>th</sup> grade. Overall, parent responses were positive with regard to the Laptop Program. A summary of the findings are grouped into three areas: impact of laptop on student, impact of laptop on parents/family, and the Laptop Program.

### *IMPACT OF LAPTOP ON STUDENT*

When parents were asked if the laptop had increased their child's learning, 83% of the parents agreed that it had. Slightly more (85%) indicated that the laptop had also increased the child's interest in learning. The following responses were given when parents were asked to explain why the laptop had increased the child's learning and/or interest in school:

- Child has learned important computer skills and has created nicer work.
- Child is able to do work quicker and easier.
- Laptop is interesting, so child does more homework – and is more motivated to learn.
- Child takes more time to do projects and produces better quality work.
- Learning has increased because laptop provides access to more information.
- Paperwork shows an increase in grades.
- The laptop helps with child's ability to research, which increases learning.
- In some areas, such as writing, child has improved tremendously.
- Child is more inclined to search for information and edit work because it's easier.
- Child spends more time on homework and works longer on projects.
- Child is more enthusiastic and able to find information without assistance.
- Learning is more enjoyable because of the laptop - child spends more time on work.

When parents were asked if their child's schoolwork included more project-based learning as a result of the laptops, 70% agreed there had been an increase from the previous year. This question was followed by asking parents to "Describe how the laptop had impacted their child's work with the projects." Below is a sample of parent responses to the question:

- Work looks professional - Better display - Great graphics.
- Child's more likely to start and finish projects without help.
- Child is more willing to work.
- Child spends a lot more time on the projects
- The laptop has improved the quality of work - Better looking than written work.
- Child is better able to display and search for information.
- The laptop is more interesting to use - Child likes typing better than writing.
- Laptop provides a different method to work - while traveling - research anywhere.
- Laptop has allowed the child to do more thinking as opposed to creating.
- Child produces better work with use of charts, graphs and spreadsheets.
- With use of the laptop, child is able to be a self-starter.

Internet access was shown to be available in 87.5% of the homes, with 48.5% of the children using the Internet every day. The parents indicated that their child most frequently used the Internet for research, but also spent time browsing different web sites and using email. Three parents expressed concern about their children having access to "bad aspects" of the Internet.

#### *IMPACT OF LAPTOP ON PARENT/FAMILY*

More than three fourths (82.5%) of the parents had attended the laptop training, however, a few parents noted concerns because their computer skills were still limited. In fact, a few parents indicated that their children were teaching them how to use the laptop. More than half (58%) of the parents indicated that the laptop had not had an impact on the family. However, a few parents noted that the laptop had helped some family members become more computer

literate and that the laptop had created an interest in younger children to learn more about computers.

A majority of the parents (70%) commented that they were involved with their child's school work before getting the laptops, but that their level and type of involvement had increased because of the computers. Other parents indicated that they were less involved because the computers now provided many resources and answers that helped students become independent workers. When parents were asked if the laptop had changed the interactions with their child's teacher, 65% indicated they were involved with their child's teacher prior to the introduction of the laptop and the interactions had remained positive. Some parents commented that they had better communication with teachers due to the use of email. Almost three fourths (72.5%) of the parents commented that the laptops had no or little impact on the amount or type of interactions with other parents.

#### *THE LAPTOP PROGRAM*

The parents were asked to describe the greatest benefit of having a laptop computer available for their child. The most common responses included increased computer ability for the child, increased learning/interest in school, and ability to work anytime, anywhere. A summary of responses is below:

- The laptop educates the entire family about computers.
- Work is easily organized - No books.
- Improved ability to communicate and write.
- Everything is on the computer - Early learning without fear.
- The laptop encourages kids to want to learn more because it's easy and fast.
- Child is able to work on homework anywhere - No books to carry.
- Child is able to work unassisted.
- Exposure to the skills everyone will need in the work force.

- Child has control over when and where to work – can research anywhere.
- Helps children to keep up with technology.
- Learning to use different resources for the future.

When the parents were asked what the most difficult aspect of the Laptop Program was, the most common response (47.5%) was that it was hard for their children to carry the computer to and from school. Less common responses included: keeping the computer maintained, dealing with breakdowns, the cost, teacher requiring both handwritten and word processing of same assignment, parents lacking enough computer knowledge to help child with computer-related tasks.

The final interview question asked parents how the Laptop Program could be improved. Nearly one-third indicated they were pleased with the program and could not offer any suggestions. The remaining responses to this question varied with only 10% of the parents suggesting each of the following: use lighter laptops, let students leave laptops at school, have students save and keep back-up copies of work, increase staff training. Other comments given less frequently included using carrying cases that were larger and not all the same color, provide more typing lessons, reduce the cost, offer more training, provide adapter to use computer with printers and/or other computers, provide power cords, and to add a computer repair facility at school. At the end of the interview, parents were asked if they had any additional comments, and 35% said they thought the program was great and that all students should participate. Here is a list summarizing the less frequently given final thoughts:

- Parent hoped child would use the laptop more
- Laptop is unnecessary, but fun.
- Teachers need more training
- Parent is concerned that the program will not be available in high school.

As can be seen, the parents are supportive of the Laptop Program and feel that it has had a positive impact on the child's learning and participation in school. There was a general consensus that the Laptop Program was providing their child with important computer, organizational, and research skills that are of benefit now and will enhance their future work opportunities. Most of the parents indicated that the laptop had little influence on the family, however a few noted positive impacts younger siblings. The majority of the parents also reported that the laptop had not changed interactions with the child or teacher primarily because they were already actively involved.

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## DISCUSSION

Results of this study suggest varied impacts of the Laptop Program on students, teachers, and family members. These findings are discussed below in reference to the three primary research questions.

### IS TEACHING DIFFERENT IN A LAPTOP CLASSROOM?

According to both teacher reports and classroom observations, Laptop classes are being taught differently than regular (Control) classes. Not only did the former classes incorporate technology to a much greater degree, they tended to employ more student-centered strategies such as project-based learning, independent inquiry/research, teacher as coach/facilitator, and cooperative learning. Overall, the Laptop classes were "busier" and more active learning environments. While the difference was not significant, it is noteworthy that Laptop classes also placed greater emphasis than did Control classes on providing opportunities for sustained writing (see Tables 1-3). Such activities certainly seem likely to contribute to the Laptop students'

superiority over Control students on the writing measure, as will be discussed in more detail below.

Most revealing in the study were the ways in which technology was accessed and employed in the Laptop classrooms. Compared to their Control counterparts, the Laptop students demonstrated more technical skill with computers and used computers more extensively for a variety of production and research functions. Not surprisingly, observers rated Laptop classes as making much more *meaningful* usage of computers as educational tools.

These impressions were corroborated by the Laptop teachers' reactions to their participation. Nearly all believed that they were teaching differently than before by integrating technology into both newly developed lessons and existing lessons that had previously been taught without computers. Further, nearly all felt that they had increased the frequency of project-based learning, higher-order learning activity, and school-related interactions with parents and students. Finally, although Laptop parents were equivocal about the extent of increase in their own and other family members' use of computers as a result of the Laptop project, they were clear that their "Laptop" child was taking advantage of the Laptop computer for school and other activities, especially in developing research skills.

The implication from these multiple data sources is that teaching and learning were being impacted, in ways that promoted active learning and technology applications, as a consequence of all students having continual access to individual computers. Not surprisingly, although cooperative learning was observed relatively frequently in Laptop classes, students typically worked individually while using computers. Thus, they benefited from having their own computer to complete their work (imagine having to share a pencil in writing a story or a

calculator in creating a budget!), but being able to collaborate easily with others on information and strategies.

Reinforcing these formal findings was our own visit (Ross and Lowther) to several Laptop classrooms during the school year. Although we have had extensive experience with researching and observing technology uses in schools, we were truly impressed by the range and depth of the computer integration seen. In several classes, the technology applications were so diverse and frequent that we could barely code the observed events quickly enough, without losing data. Most impressive to us was how naturally and routinely the students and teacher employed the computer in facilitating problem-solving and production. The lesson that stands out most was a sixth-grade project requiring students in a science class to test and evaluate various types of facial tissue and then “advertise” the one that was most “effective.” Students worked actively alone and in pairs entering data into the computers using spreadsheet, data base, word-processing, and graphics software. They were comfortable and skilled in these activities and not a single student was frustrated or unoccupied for the 30 minutes that we were there. The teacher served mainly as a facilitator and coach. Much of her time was spent assisting students who were having equipment problems or questions about the exercise. These students had clearly mastered many sophisticated uses of technology and were operating, in our opinion, at a level far beyond their grade level. Other observed classes were not quite as advanced or active, but still clearly impressive and superior to what we have seen elsewhere at any school.

## **DO STUDENTS BEHAVE DIFFERENTLY IN A LAPTOP CLASSROOM?**

As described above, Laptop students were more active, autonomous, and collaborative in their classroom behaviors. For example, cooperative learning was observed “frequently” or “extensively” in 35% of the Laptop classes but in only 11% of the Control

classes. Students frequently or extensively engaged in projects in 55% of the Laptop classes compared to only 17% of the Control classes. Laptop teachers confirmed these impressions by describing their students as more independent, active, and engaged. The teachers were highly impressed with students' abilities and interests in using computers to enhance learning.

In their survey and interview responses, students indicated they had increased their computer skills substantially and were much more prepared to do Internet research. About two-thirds of the students generally worked with the laptop alone in the classroom, but they still collaborated frequently with others in sharing information, asking questions, and providing assistance. As a group, the students were less committal about the effects of the laptop in increasing the interest in learning, writing skills, and facilitating collaboration, although about one-third (still a substantial number) felt that they did realize these types of benefits.

## DO STUDENTS ACHIEVE DIFFERENTLY IN A LAPTOP CLASSROOM?

In this study, we assessed student achievement in terms of writing performance on a prompted essay. Grading, using a four-point rubric, was “blind” to students' enrollment in Laptop vs. Control classes. Results significantly favored the Laptop group on all evaluation dimensions—Ideas and Content, Organization, Style, and Conventions. Aside from being statistically significant, the differences across all dimensions reflected relatively strong advantages for the Laptop group, with effect sizes ranging from +0.61 to +0.78.

As noted above, only about one-third of the students indicated on the survey that they believed their writing skills had increased as a result of having a Laptop. Observation data, however, suggested that Laptop students were receiving more opportunity to practice writing than were Control students. For example, sustained writing was extensively observed in 25% of

The Laptop classes compared to 17% of the Control classes. Computers were used extensively for non-creative writing in 28% of the Laptop classes and for creative writing in 14%. By comparison, the parallel percentages for Control classes were only 9% and 0%, respectively.

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## CONCLUSIONS

In this evaluation of the first year of the Laptop Program, the results are consistently supportive of beneficial impacts on students, teachers, and parents. Specifically, all three groups believed that the program was positively changing teaching and learning both at school and at home. These impressions were directly confirmed in visits to Laptop versus Control classrooms. While more research is needed on how the Laptop Program impacts student achievement, the positive results from the writing assessment are highly suggestive. Laptop students were doing more sustained writing in class and were demonstrating more skill in writing, making a causal connection highly likely. Control classes could also increase their emphasis on writing, but it is obvious that continual and immediate access to computers provides the Laptop students and their teachers with a very strong advantage. In future research, we hope to examine whether Laptop students demonstrate comparable advantages in problem solving. We anticipate that they will, given the extensive project and inquiry activities in which they engage. At this point, given the present data, we are most certain of one program result—Laptop students are much more fluent than other students with using the technology of the 21<sup>st</sup> Century for learning, research, and production. For them, computers are fully integrated with and a natural part of their educational experiences both at school and at home.

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## APPENDICES

APPENDIX A  
*School Observation Measure (SOM<sup>®</sup>)*  
*Data Summary*

Contact

Center for Research in Educational Policy  
325 Browning Hall  
University of Memphis  
Memphis, TN 38152

For information on  
*School Observation Measure (SOM<sup>®</sup>)*

APPENDIX B  
Writing Scoring Guide  
and Writing Prompt

## Writing Scoring Guide

	<b>Mature (4)</b>	<b>Capable (3)</b>	<b>Developing (2)</b>	<b>Emerging (1)</b>
<b>Ideas and Content</b>	Central idea is clear and focused. Writer uses creative, insightful detail.	Central idea is clear and focused and the writer adds basic detail.	Central idea is somewhat developed, and the writer includes some detail; however, focus may shift and some details are extraneous.	Writing may show little or no development of the central idea or may be too limited in length to demonstrate proficiency
<b>Organization</b>	Organization helps unify the piece and moves the reader easily through the text.	Organization is apparent but may be too obviously structured; may be extraneous detail which interferes with unity.	An attempt at organization is apparent although ideas may lack a sense of wholeness	Organization may be lacking; or may seem arbitrary.
<b>Style</b>	Voice of writer comes through with rich and precise word choice and effective use of varied sentence structure.	Writing demonstrates varied sentence structure as well as appropriate word choices, including some engaging vocabulary.	Vocabulary is limited or inappropriate to the task; sentence structure may be simple.	Vocabulary is limited; sentences may be choppy, incomplete or rambling
<b>Conventions</b>	Text demonstrates varied use of standard writing conventions with few errors.	Surface feature errors may occasionally distract the reader, but they don't interfere with understanding.	Surface feature errors make understanding difficult.	Numerous surface feature errors may severely interfere with understanding.

# Writing Prompt

## Letter to Next Year's Teacher Format

Date:

Dear 7th Grade Teachers,

- skip a line
- indent 5 spaces or tab once

**Paragraph one: personal information**

- how old you are
- your family, siblings
- where you live
- pets
- hobbies
- sports

**Paragraph two: school**

- Indent 5 spaces or tab once
- What are you favorite subjects and why?
- What you like about Walnut Creek?
- What did you enjoy learning about in sixth grade?
- Do you play an instrument?

**Paragraph three; seventh grade**

- Indent 5 spaces or tab once
- What are you looking forward to?
- Goals for next year?
- Do you plan to play any sports?
- Drama? Music?
- What are your best subjects?

**Paragraph four: summer plans**

- Indent 5 spaces or **tab** once

Closing:

See you next year,  
your name

Remember to:

- Spell Check
- Grammar Check
- Legible Print
- Size 14 font
- You may add dip art
- Remember this is your first impression. Make it a good one!!!

APPENDIX C  
Student Survey

# Technology as a Tool for Learning STUDENT SURVEY

School \_\_\_\_\_ Grade Level \_\_\_\_\_

Please complete this survey to let us know what *YOU* think about having a laptop computer.



## SECTION 1: PERSONAL IMPACT

*Please circle your answers to the following questions.*

**Only circle ONE**

*answer per row.*

My computer skills are better because I have a laptop.....	No	Some	Yes
Using computers at school has made me more interested in learning.....	No	Some	Yes
Using computers at school has made me want to get better grades.....	No	Some	Yes
My writing has improved because I use computers. ....	No	Some	Yes
I can now do Internet research to find information. ....	No	Some	Yes
Using computers at school makes it easier to work with other students. ....	No	Some	Yes
I am very glad that I have the laptop computer. ....	No	Some	Yes
I would like to have a laptop computer again next year. ....	No	Some	Yes

## SECTION 2: CLASSROOM USE

How often do you use the laptop in the following ways while in the classroom?

	Never			Frequently	
By yourself.....	1	2	3	4	5
With one other student.....	1	2	3	4	5
In groups of three or more students.....	1	2	3	4	5

How often do you use the laptop for the following subjects?

	Never			Frequently	
Language Arts .....	1	2	3	4	5
Mathematics .....	1	2	3	4	5
Science.....	1	2	3	4	5
Social Studies .....	1	2	3	4	5

### Section 3: Home Use

	Never				Frequently
About how often do you use the laptop for homework? .....	1	2	3	4	5
How often do you use the laptop for things other than homework?.....	1	2	3	4	5
How often do other family members use the laptop?.....	1	2	3	4	5
Do you have the Internet at your home?					
___Yes ___ No					
If yes, how often do you use the Internet for schoolwork?.....	1	2	3	4	5
If yes, how often do you use the Internet for things other than schoolwork?.....	1	2	3	4	5
If you use the Internet at home, please list examples of how you use it.					
_____					
_____					

### SECTION 4: YOUR COMPUTER SKILLS

How well do you use the following software?

	Not at all		OK		Very well
Authoring: HyperStudio, etc.....	1	2	3	4	5
Database .....	1	2	3	4	5
Draw/graphics.....	1	2	3	4	5
Email.....	1	2	3	4	5
Games.....	1	2	3	4	5
Internet .....	1	2	3	4	5
Power Point Presentation .....	1	2	3	4	5
Spreadsheet .....	1	2	3	4	5
Word Processing .....	1	2	3	4	5
Reference: Encyclopedias, etc.....	1	2	3	4	5
Organization .....	1	2	3	4	5

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## SECTION 5: YOUR REFLECTIONS

*Please write your answers on the lines below each question.*

What is the best thing about using the laptop at school?



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What is the hardest part about using the laptop at school?



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If you could change anything about using the laptop at school, what would you change.

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Any other comments?

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*Thank You!*

APPENDIX D  
Student Focus Group Questions

Anytime, Anywhere Learning  
**STUDENT FOCUS GROUP**

**I. Overall Impressions**

- Overall, how has it been to have a laptop computer for school this year?
- What has been the best part of having the laptop?
- What has been the worst part of having the laptop?

**II. Classroom Level Changes**

How has having laptops changed what happens in the classroom? Specifically, can you give examples of the following:

1. Have you worked on more projects? If yes, briefly tell me about the best one.
2. Have your assignments been more involved and required more thinking... In what way?
3. Have you done more research? If yes, what resources did you use?
4. Have you been required to do more writing? Tell me about some things you've written.
5. Do you work in small groups of students more this year? How do you feel about that?
6. Are you keeping a portfolio of your work? Do you or your teacher use rubrics to "grade" your work? Do you ever have task lists to help you know what to do?

**III. Student Results**

- Can you describe how having the laptop computer has impacted your learning or your grades?
- Has having the laptop computer impacted your relationship with other students? How?
- Has having the laptop computer changed how students and teachers relate to each other. In what ways?
- Can you describe how having a laptop computer has made you feel about going to school or participating in class activities?

**V. Parent Support**

How do your parents feel about you having a laptop computer?

How do other family members feel about your having the laptop?

Have there been any changes in how often your parents visit with or talk to your teacher or the principal now that you have the laptop? If yes, what do they talk about?

**Other Comments:**

APPENDIX E  
Teacher Survey

Technology as a Tool for Learning  
**TEACHER SURVEY**

School \_\_\_\_\_ Grade Level \_\_\_\_\_ Subject \_\_\_\_\_

We would like to find out the degree to which being a teacher with the laptop project has impacted your thinking about and ability to integrate computers into the classroom.

**SECTION 1: PERSONAL IMPACT**

Please rate your agreement with the following questions by circling your response

SD = Strongly Disagree  
D = Disagree  
N = Neutral  
A = Agree  
SA = Strongly Agree

*Because of my participation in the Laptop Project:*

- |  |    |   |   |   |    |
|--|----|---|---|---|----|
| ...I have increased my personal ability to use basic computer applications, such as databases, spreadsheets, and presentation. | SD | D | N | A | SA |
| ...I am better prepared to create lessons that integrate student use of computers.   | SD | D | N | A | SA |
| ...I frequently integrate technology into lessons that I previously taught without the use of computers.                       | SD | D | N | A | SA |
| ...I have increased the frequency or emphasis of higher-level learning in my classroom instruction.                            | SD | D | N | A | SA |
| ... I have increased the frequency or emphasis of project-based learning.  | SD | D | N | A | SA |
| ...my school-related interactions and communication with students and parents have increased.                                  | SD | D | N | A | SA |
| Overall, being a teacher with the laptop project has been beneficial to me.  | SD | D | N | A | SA |
| I would like to participate with the laptop project again next year.   | SD | D | N | A | SA |

**SECTION 2: STUDENT IMPACT**

To what degree has having access to laptop computers impacted the students...

Please circle your answers.

interest in learning?.....	Reduced	Same	Increased
performance and/or grades? .....	Reduced	Same	Increased
writing skills?.....	Reduced	Same	Increased
research skills? .....	Reduced	Same	Increased
ability to work with other students?.....	Reduced	Same	Increased

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### SECTION 3: STUDENT USE

How often do your students use the laptop in the following ways?

	Never			Frequently	
Individually	1	2	3	4	5
In pairs	1	2	3	4	5
In groups of three or more students	1	2	3	4	5

How often do your students use the laptop for the following subjects?

	Never			Frequently	
Language Arts	1	2	3	4	5
Mathematics	1	2	3	4	5
Science	1	2	3	4	5
Social Studies	1	2	3	4	5

How often do your students use the following software?

	Never			Frequently	
Word Processing	1	2	3	4	5
Drill and Practice	1	2	3	4	5
Tutorials	1	2	3	4	5
Games	1	2	3	4	5
Email	1	2	3	4	5
Internet	1	2	3	4	5
Database	1	2	3	4	5
Spreadsheet	1	2	3	4	5
Desktop Publishing	1	2	3	4	5
Presentation (slide shows)	1	2	3	4	5
Draw/graphics	1	2	3	4	5
Authoring: HyperStudio, etc.	1	2	3	4	5

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## SECTION 4 YOUR REFLECTIONS

Please place your responses to the following questions in the space provided.

What do you feel is the greatest benefit of your students having laptop computers?

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What do you feel is the most difficult aspect of your students having laptop computers?

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How could the laptop project be improved?

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Any other comments?

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APPENDIX F  
Teacher Focus Group/Interview

Technology as a Tool for Learning  
**TEACHER FOCUS GROUP/INTERVIEWS**

**I. Overall Impressions**

- How is the implementation of the Laptop Project going this year?
- What are the most effective aspects of the Laptop Project?
- What are the most difficult aspects of this project?

**II. Classroom Level Changes**

How has the laptop project impacted classroom practices? Specifically, are there differences in:

1. Interdisciplinary and project-based learning
2. Higher-level learning in my classroom instruction
3. Development of research skills
4. Development of writing skills
5. Cooperative and team-based approaches
6. Authentic, alternative assessment

**III. Student Results**

- How has the Laptop Project impacted students?
- How has the Laptop Project fostered relationships between students and between students and teachers.
- Are there differences in achievement?
- Can you describe any differences in student motivation or enthusiasm?

**III. Impact on Teachers**

- How has the Laptop Project impacted teachers?
- How has the Laptop Project impacted relationships between teachers?

**V. Parent Support**

- How would you describe parent support for the Laptop Project?
- How has school-related interactions and communication with students and parents been impacted as a result of students having the laptop computers?

**Other Comments:**

APPENDIX G  
Parent Survey

## Technology as a Tool for Learning Parent Survey

Dear Parent: We realize that you are probably very busy, but we would like to know what you think about your child having a laptop computer. Please take a few minutes to complete the following survey.

NOTE: Please complete one survey for EACH child who has a laptop computer through this program.

**DIRECTIONS:** Circle your response or fill-in the requested information in the space provided. Please do not put your name on the survey and share your honest opinions to help us improve this program.

<b>Information about your Child</b>					
School _____	Grade level: 5 6		Gender: Male Female		
Special Education student? Yes No	ESL Student? Yes No				
<b>THE LAPTOP</b>					
1 = Never 2 = Rarely or Occasionally 3 = Usually 1 or 2 days a week 4 = Usually 3 or 4 days a week 5 = Every Day					
<b>Circle your answers</b>					
About how often does your child do school work with the laptop at home? .....	1	2	3	4	5
How frequently does your child use the laptop for things other than homework? .....	1	2	3	4	5
How often does your child take the laptop to school? .....	1	2	3	4	5
<b>OTHER COMPUTERS</b>					
Are other computers in your home? Yes No					
If yes, How many? ____ Type? PC Mac Printer? Yes No					
<b>THE INTERNET</b>					
1 = Never 2 = Rarely or Occasionally 3 = Usually 1 or 2 days a week 4 = Usually 3 or 4 days a week 5 = Every Day					
Can you access the Internet with the laptop at your home? Yes No					
If yes, how often does your child use the Internet for schoolwork?.....	1	2	3	4	5
If yes, how often does he/she use the Internet for things other than schoolwork? .....	1	2	3	4	5
How frequently do you or other family members use the Internet for things other than your child's schoolwork?	1	2	3	4	5
<b>Circle your answers.</b>					
NA = not applicable					
<b>DOES THE LAPTOP HELP?</b>					
To what degree has the laptop computer changed your child's:					
interest in school? .....	NA	Reduced	Same	Increased	
achievement in school?.....	NA	Reduced	Same	Increased	
involvement in project-type school work? .....	NA	Reduced	Same	Increased	
writing skills? .....	NA	Reduced	Same	Increased	
research skills? .....	NA	Reduced	Same	Increased	
ability to work with other students?.....	NA	Reduced	Same	Increased	

**The Laptop and Your Family**

Please respond to the following items to show if the laptop computer has changed the involvement of your family with your child's education. If the item is "not applicable" to your situation, circle "NA."

Which of the following family member(s) attended laptop training? *(please check the appropriate boxes)*

- Father (step-father, male guardian)       Mother (step-mother, female guardian)  
 Other: (Who?) \_\_\_\_\_       No one from our family attended

To what degree has the laptop computer changed the *Father's*:

involvement with your child's schoolwork? .....	NA	Reduced	Same	Increased
interactions with your child? .....	NA	Reduced	Same	Increased
interactions with your child's teacher? .....	NA	Reduced	Same	Increased
communications with other parents? .....	NA	Reduced	Same	Increased

To what degree has the laptop computer changed the *Mother's*:

involvement with your child's schoolwork? .....	NA	Reduced	Same	Increased
interactions with your child? .....	NA	Reduced	Same	Increased
interactions with your child's teacher? .....	NA	Reduced	Same	Increased
communications with other parents? .....	NA	Reduced	Same	Increased

To what degree has the laptop computer changed *other children's*?

involvement with their brother's or sister's schoolwork? .....	NA	Reduced	Same	Increased
interactions with their brother or sister? .....	NA	Reduced	Same	Increased
use of the laptop for their schoolwork? .....	NA	Reduced	Same	Increased
Positive interactions between each other? .....	NA	Reduced	Same	Increased

**YOUR COMMENTS**

Please answer the following questions in the space provided. Again, we are interested in your honest opinions. Please attach an additional sheet if more space is needed.

What is the **Best** thing about having a laptop computer available for your son/daughter?

What is the **Worst** thing having a laptop computer available for your son/daughter?

What **Changes** would you like to see in the Laptop Computer program?

What if any rules have you had to make concerning your child's use of the laptop at home?

What if any rules have you had to make concerning other family member's use of the laptop?

Any other comments?

Thank You!

There are two ways to return this survey.

You can place it in a sealed envelope and have your child return it to the teacher.

Or mail to:  
Dr. Gary R. Morrison  
Laptop Study  
399 Education  
Wayne State University  
Detroit, MI 48202

APPENDIX H  
Parent Interview

## Technology as a Tool for Learning Parent Phone Interview Protocol

Student Name: \_\_\_\_\_  
 School Name: \_\_\_\_\_  
 Parent Name: \_\_\_\_\_

Grade: \_\_\_\_\_  
 Teacher: \_\_\_\_\_  
 Date: \_\_\_\_\_

*NOTE to Interviewer: Please fill in the child's name in the items marked with an \* prior to the interview.*

Hello, I am \_\_\_\_\_, and I am working with Wayne State University and Walled Lake Consolidated school district to interview the parents who have leased laptop computers for their children. Would you please let me take a few minutes of your time to find out what it is like for \* \_\_\_\_\_ to have a laptop computer.

1. When did you get the computer?											
2. * About how often does _____ use the laptop at home?	<table style="width: 100%; text-align: center; border: none;"> <tr> <td style="width: 20%;">Not at all</td> <td style="width: 10%;"></td> <td style="width: 20%;">Sometimes</td> <td style="width: 10%;"></td> <td style="width: 20%;">Every day</td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> </table>	Not at all		Sometimes		Every day	1	2	3	4	5
Not at all		Sometimes		Every day							
1	2	3	4	5							
3. Please tell me the kinds of activities that your (son/daughter) most frequently uses the computer for - Please begin with what (he/she) does the most often. <i>NOTE: Do not give any examples unless the parent cannot think of what their child does - Examples would include type papers, draw, create charts, create presentations, Internet searches, play games, email, etc.</i>	<ul style="list-style-type: none"> <li>▪ _____</li> <li>▪ _____</li> <li>▪ _____</li> <li>▪ _____</li> <li>▪ _____</li> <li>▪ _____</li> <li>▪ _____</li> <li>▪ _____</li> </ul>										
4. Is Internet access available for a computer at your home?	Yes    No										
5. * If yes, how frequently does _____ use the Internet?	<table style="width: 100%; text-align: center; border: none;"> <tr> <td style="width: 20%;">Not at all</td> <td style="width: 10%;"></td> <td style="width: 20%;">Sometimes</td> <td style="width: 10%;"></td> <td style="width: 20%;">Every day</td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> </table>	Not at all		Sometimes		Every day	1	2	3	4	5
Not at all		Sometimes		Every day							
1	2	3	4	5							

6. * If you had to list the top three reasons that your child uses the Internet, what would they be? Please list in order of importance.	
7. To what degree do you feel the laptop computer has had on your child's interest in school?	Not at all      Some      A Lot 1    2    3    4    5
8. Please explain your response	
9. To what degree has the laptop increased your son's/daughter's actual learning?	Not at all      Some      A Lot 1    2    3    4    5
10. Please explain your response	
11. To what degree has your child been involved project-type school work this year as compared to previous years?	Not at all      Some      A Lot 1    2    3    4    5
12. (If rated a 4 or 5) What is your thinking about these projects?	
13. Describe how the laptop computer has impacted your child's work with these projects?	
14. How much time have spent helping your child do projects or other homework?	
15. Did you or another adult family member attend laptop training?	Yes    No
16. To what degree has having the laptop computer changed YOUR involvement with your child's schoolwork?	Not at all      Some      A Lot 1    2    3    4    5
17. Please explain your answer.	

18. To what degree has having the laptop computer changed your interactions with your child's teacher?	Not at all 1	2	Some 3	4	A Lot 5
19. Please explain your answer.					
20. Compared to last year, do you expect to visit or participate more or less in your child's classroom this year?					
21. If you are doing more, how so?					
22. To what degree has having the laptop computer changed your communications with other parents?	Not at all 1	2	Some 3	4	A Lot 5
23. Please explain your answer.					
24. To what degree has the laptop impacted you or other members of your family?	Not at all 1	2	Some 3	4	A Lot 5
25. Please explain your answer.  <i>NOTE: Probe to get them to list specific types of activities they do on the computer.</i>					
26. What do you feel is the greatest benefit of having a laptop computer available for your son/daughter?					
27. What do you feel is the most difficult aspect of having a laptop computer available for your son/daughter?					
28. What could be done to make having a laptop computer a more positive for your son/daughter?					
29. Any other comments?					