RIVERDALE ELEMENTARY "LEARNING WITHOUT LIMITS" 2003-2004 EVALUATION REPORT

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EXECUTIVE SUMMARY

INTRODUCTION

This report discusses the findings from an evaluation study of the *Learning Without Limits* program in the fifth grade at Riverdale Elementary in the Shelby County Schools district. The overall purpose of the evaluation was twofold: (a) to provide formative evaluation data to Riverdale School to use as a basis for improvement planning and to document their accomplishments to demonstrate progress; and (b) to provide cumulative evidence of the implementation progress and outcomes of the participant classes as well as identification of exemplary practice**.**

The *Learning Without Limits* program was a pilot project designed to determine the impact of changing the ways students learn and teachers instruct in a technology-rich environment. The original *Learning Without Limits* concept included a laptop for each student in fifth grade with dedicated technology training for the fifth grade teachers. Unfortunately, costs and lack of significant grant funding prohibited the implementation of the project to this extent.

Instead, the context for the *Learning Without Limits* program and this evaluation consisted of four fifth grade classes in which two Apple iBook wireless laptop carts were shared among the four fifth grade teachers' classrooms. In addition, the four teachers each received a personal Apple PowerBook laptop to use during the initiative and individually focused their professional development opportunities on technology-related training offered through Shelby County Schools.

EVALUATION QUESTIONS

The *Learning Without Limits* program evaluation was structured around five primary research questions that focused on classroom practices, degree and type of technology use, academically focused time, student engagement, teacher technology skills, teacher attitudes toward technology, as well as student and teacher reactions to the program.

1. In what ways has the effectiveness of instruction through the use of student laptop computer been impacted?

2. To what degree and in what ways have teachers integrated technology with classroom instruction?

3. To what degree do *Learning Without Limits* teachers use methodologies that stress higher-order learning and student-centered learning activities?

4. To what degree has the *Learning Without Limits* program impacted teacher attitudes toward technology?

5. What factors appear most instrumental in determining schools' success at achieving the goals and overall implementation of the *Learning Without Limits* program?

DESIGN

The evaluation design was based on both quantitative and qualitative data collected from classroom observations, teacher surveys, and focus groups with teachers and students. The four fifth grade teachers and their intact classrooms at Riverdale Elementary participated in the evaluation.

Instrumentation

Five instruments and focus group interviews were used to collect the evaluation data (three classroom observation measures, two teacher surveys and four interviews).

Classroom Observation Measures

Observations were made focusing on targeted classes (scheduled visits) using three instruments.

School Observation Measure (SOM): Examines frequency of usage of 24 instructional strategies.

Survey of Computer Use (SCU): Examines availability and student use of technology and software applications.

Rubric for Student-Centered Activities (RSCA): Rates the degree of learner engagement in cooperative learning, project-based learning, higher-level questioning, experiential/hands-on learning, student independent inquiry/research, student discussion, and students as producers of knowledge using technology.

Surveys

Teacher Technology Questionnaire (TTQ): Collects teacher perceptions of computers and technology.

Technology Skills Assessment (TSA): Assesses the perceived technological abilities of the teachers in these areas: Computer Basics, Software Basics, Multimedia Basics, Internet Basics, Advanced Skills, Using Technology for Learning, and Attitudes toward the Laptop Program.

Focus Groups

Focus groups were conducted with both teachers and students at the beginning of the *Learning Without Limits* initiative in Fall 2003 and again at the conclusion of the academic year in May 2004. From audio recordings and facilitator notes, themes were derived from the participants.

Procedure

Data for this evaluation study were collected primarily in Spring 2004. The SOM, SCU and RSCA were completed for the targeted observations. These consisted of prearranged one-hour sessions in which the fifth grade teachers demonstrated a prepared lesson using technology. Observation notes forms were completed every 15 minutes of the lesson. A total of 9 visits across the four fifth grade classrooms were completed. The teacher surveys (TTQ and TSA) were administered in May 2004 prior to a focus group interview. Focus group interviews were conducted with students and teachers in Fall 2003 and again in May 2004.

RESULTS

Below is a brief summary of the results grouped by Classroom Observation Results and Survey Results.

Classroom Observation Measures

The data for 9 classroom observations were collected with SOMs, SCUs and RSCAs during prearranged sessions in which teachers implemented a lesson using technology. Results from each measure are described in the sections below.

School Observation Measure (SOM©)

The SOM revealed nine instructional strategies that were observed during the targeted observations. These strategies were observed during 11.1% of the visits to 100% of the visits. Four strategies were observed in over 50% of the visits: project-based learning, technology as a learning tool, teacher acting as coach/facilitator and independent seatwork. Three more instructional strategies were observed in at least 30% of the visits: cooperative/collaborative learning, independent inquiry/research and higher-level instructional feedback. Academically focused class time and student engagement were observed to be high 100% of the time.

Survey of Computer Use (SCU©)

Three computer activities were observed in at least 40% of the classroom visits: Internet browsers, draw/paint/graphics and electronic presentations. Computer activities were observed in all subject areas and meaningful and very meaningful computer applications were observed in at least 30% of the classrooms.

Rubric for Student-Centered Activities (RSCA©)

Five of the seven activities noted on the RSCA were observed during visits. Four of these activities were observed during at least 40% of the time: project-based learning, students as producers of knowledge, cooperative learning, and independent inquiry/research. Notably, project-based learning was observed during all observations and students as producers of knowledge were observed during almost 90% of the visits. Technology was used to support three of these strategies: cooperative learning, project-based learning and independent inquiry/research.

Survey Results

Two surveys (TTQ and TSA) were administered to the teachers prior to a focus group interview in May 2003. Results of the three surveys are presented below.

Teacher Technology Questionnaire (TTQ)

The fifth grade teachers responded very positively to the *Learning Without Limits* program. This indicates the teachers feel this initiative has had a positive impact on classroom instruction, students, their readiness to integrate technology, the school and district's overall support for technology, appropriate technical support and a positive attitude toward the laptop program in general.

Technology Skills Assessment (TSA)

The TSA revealed very high levels of confidence by the fifth grade teachers to use technology throughout all areas. Of the 47 items on the TSA, the teachers rated 30 of the items as able to be completed very easily. Only 4 questions' means were rated below 2 ("Somewhat able to complete the task").

Focus Group Results

Two focus group interviews each were conducted with the four fifth grade teachers and approximately 8 to 10 of the fifth graders. Initial interviews were conducted in Fall 2003 and follow-up interviews in May 2004.

Teacher Focus Group

The teachers primarily discussed two themes: (a) computer use and (b) pressures and concerns. The teachers discussed their uses and their students' uses of the laptops and computer applications. Responsibility for care of the laptops was included as part of the instruction, as well as media literacy skills. Pressures and concerns regarding technical issues, confidence and administrative pressures appeared to have been reconciled by the spring semester. However, concerns over the scope of the curriculum and meeting content standards continued to challenge the teachers.

Student Focus Group

Students' discussions centered on two themes: (2) computer use and (b) students that benefit from using laptops. Students described the types of projects they had completed using the laptops. Using the laptops had made their work "easier," "fun" and required less "writing." But they recognized that some activities were "harder" on the laptops as well. Barriers to computer use included technical problems, such as system crashes, and logistical issues, such as lack of "battery power." The message from the teachers regarding responsibility using the laptops was also discussed. The students who benefited most from using the laptops were another primary topic. The students felt "fast learners," students who were "*into* computers" and "students who are not as smart" benefited the most. They also felt students who were indifferent and lackadaisical, called "goofers," benefited least.

CONCLUSIONS & RECOMMENDATIONS

The conclusions of the study will be presented in association with each of the major research questions in the respective sections below. Recommendations are also included, where appropriate, to suggest improvements.

In what ways has the effectiveness of instruction through the use of student laptop computer been impacted?

While it is difficult to determine increases without baseline, or beginning, data, SOM results indicate extensive uses of cooperative/collaborative learning, project-based learning and the teachers acting as coaches or facilitators. Results from the SCU indicate extensive uses of productivity tools, specifically draw/paint/graphics and electronic presentations, and Internet research with Internet browsers. SCU results also suggest wide use across the content areas. Finally, the overall meaningfulness of the computers was observed to be extensive in approximately one-third to fifty percent of the classroom visits. The results from the SOM coupled with these results from the SCU point to activities that result in meaningful uses of computers that were based on meaningful problems, required critical thinking skills and used computer applications to locate, process and/or manipulate information. Despite the limited scope of technology tools, those tools observed were seen to meaningfully integrate technology to enhance student learning.

Moreover, data from the RSCA revealed that teachers used technology with over 40% of their student-centered learning activities. This finding is not surprising given that the observations were conducted with targeted lessons, where the teachers were asked to demonstrate technology integration. However, specifically notable is that technology was observed in every instance with project-based learning. This is a significant accomplishment given the focus of the initiative on using technology to impact teaching and learning. Plus, technology for student use is often employed best during more unstructured learning such as projects.

It is important to indicate that during two of the observations as noted in the SCU, the school network access was intermittent. As the *Learning Without Limits* program continues and potentially expands, school network reliability will affect the effectiveness of instruction with the increased dependence on digital resources, such as the Internet, email and school servers.

To what degree and in what ways have teachers integrated technology with classroom instruction?

The original *Learning Without Limits* program included directed technology integration training for the fifth grade teachers; this was not implemented due to cost and lack of grants support. While no extensive *Learning Without Limits* training was conducted, the fifth grade teachers participated in a workshop on using Microsoft PowerPoint in Fall 2003 and informal discussions about classroom management with laptops during Spring 2003. Moreover, the teachers through focus group interviews indicated they had participated in professional development workshops offered through Shelby County Schools. They also relied on one

another to extend their expertise, creating a learning community. So, primarily the teachers used their educational philosophies and pedagogy to envision effective technology integration.

As discussed above, SOM and SCU data indicate the teachers implemented instructional activities that resulted in meaningful uses of computers and required critical thinking skills. Productivity tools (e.g., word processing, draw/paint/graphics, electronic presentations and Timeliner®) and Internet research tools (e.g., Netscape Navigator) were used in all subject areas and educational software (e.g., drill and practice) was used in Mathematics. In addition, SOM and RSCA data revealed that the teachers employed project-based learning during all (100%) of the targeted classroom visits to varying degrees (limited to strong applications) and technology was used in every instance (100%). These results are suggestive that the *Learning Without Limits* program is effectively impacting technology integration efforts at Riverdale Elementary.

To extend the teachers' effectiveness and expertise with technology integration and the instructional strategies that support technology, the teachers should participate in professional development targeted at pedagogy and technology integration, such as the training proposed in the original *Learning Without Limits* proposal plan. This training may offer the teachers a broader vision for technology integration with the school curricula and provide added support for changing teaching and learning with laptops.

To what degree do Learning Without Limits teachers use methodologies that stress higher-order learning and student-centered learning activities?

In almost 90% (88.9%) of the targeted classroom visits, teachers were observed extensively to be acting as a coach or facilitator of learning. Other activities indicative of critical thinking and student engagement were seen in over 30% of the visits. Cooperative/collaborative learning, which was observed extensively in 33.3% of the visits, was observed to be a somewhat strong or strong application in over 40% of the observations (44.4%). Project-based learning, which was observed in 100% of the visits, was observed to be somewhat strong or strong application in almost 75% of the visits (77.7%). Finally, independent inquiry/research, which was observed in over 40% of the visits (44.4%), was observed to be a somewhat strong or strong application in approximately 10% of the visits (11.1%). These data indicate some use of non-traditional, or more student-centered, instructional methods. However, professional development efforts or goals focus more on these strategies to increase the frequency with which they are used.

To what degree has the Learning Without Limits program impacted teacher attitudes toward technology?

The fifth grade teachers are enthusiastic about the *Learning Without Limits* program. Succinctly, the teachers feel the program has positively impacted their classroom instruction and positively impacted the fifth grade students. Moreover, the teachers

feel they are ready to integrate technology into their instruction. This is corroborated by the focus group interviews as the teachers discussed their "confidence" with the laptops and reconciliation with previous intrinsic and extrinsic pressures. The TSA highlighted the teachers' expertise in computer basics, software basics, multimedia basics, Internet basics, advanced skills and using technology to support learning. Personal professional development objectives or grade level professional development goals should consider the few technology skills, such as Boolean strategy searches, electronic communications other than email and electronic teaching portfolios, that received mean scores below 2 (between "Not at All" and "Somewhat"). These skills should be evaluated for their value to the teachers, students and relevance to the program as the initiative continues.

Finally, the teachers felt they have the support of parents, the community, the administration and the technical support necessary to be effective with technology integration and improve student learning.

What factors appear most instrumental in determining schools' success at achieving the goals and overall implementation of the Learning Without Limits program?

From the results of the observation instruments (i.e., SOM, SCU, RSCA), teacher surveys (i.e., TTQ, TSA) and focus group interviews (with both teachers and students), the fifth grade teachers and students are making marked progress to their goals. Below is a list of key factors from this evaluation that appear to have influenced the progress being made toward achieving the *Learning Without Limits* program implementation and goals. These factors represent high frequencies of occurrence and quality of implementation in observations. As seen, the factors cross key elements that are critical for program success:

- Types of instructional practices
- Quality of instructional practices
- Teacher attitudes and beliefs regarding technology integration
- Teacher technology skills

Overall, the triangulation of positive results suggest a strong synergy among the diverse factors that appear to have contributed to the *Learning Without Limits* goals during the 2003-2004 school year. The fifth grade teachers and administration should be proud of the progress the program has made in a short time. As seen, the school had positive teacher technology competence and confidence, used instructional strategies that centered on and facilitated student learning and employed classroom practices that engaged students in meaningful technology-supported activities.

"LEARNING WITHOUT LIMITS" EVALUATION REPORT

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The *Learning Without Limits* program was a pilot project designed to determine the impact of changing the ways students learn and teachers instruct in a technology-rich environment. The original *Learning Without Limits* concept included a laptop for each student in fifth grade with dedicated technology training for the fifth grade teachers. Unfortunately, costs and lack of significant grant funding prohibited the implementation of the project to this extent.

Instead, the context for the *Learning Without Limits* program and this evaluation consists of four fifth grade classes in which two Apple iBook wireless laptop carts were shared among the four fifth grade teachers' classrooms. In addition, the four teachers each received a personal Apple PowerBook laptop to use during the initiative and individually focused their professional development opportunities on technology-related training offered through Shelby County Schools.

This evaluation concentrated on the progress of the four fifth grade classes in achieving the *Learning Without Limits* goals and objectives. As a means of examining this progress, data were collected primarily at the end-of-year. Suggestions for improvement are offered on the basis of the findings. Specific evaluation questions that guided the methodology, data collection and reporting are listed in the next section.

EVALUATION QUESTIONS

1. In what ways has the effectiveness of instruction through the use of student laptop computer been impacted?

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5. What factors appear most instrumental in determining schools' success at achieving the goals and overall implementation of the *Learning Without Limits* program?

EVALUATION DESIGN & MEASURES

To address the above questions, the basic evaluation design employed targeted visits to each fifth grade classroom by trained researchers. Nine classroom visits were conducted during Spring 2004. This yielded nine end-of-year observation periods. Reliability data indicate that consistent results are obtained with 6 visits.

The researchers spent the major part of their time observing classrooms during Spring 2004, but also facilitated administration of teacher surveys in May 2004, as well as teacher and student focus groups in both Fall 2003 and Spring 2004. Descriptions of each measure and its administration procedure are given below.

Instrumentation

Five instruments were used to collect the evaluation data: three classroom observation measures and two teacher surveys. The instruments used in the study are fully developed and validated as appropriate. They are as follows:

Classroom Observation Measures

Trained observers conducted targeted classroom visits to collect frequency data regarding observed instructional practices. The visits were considered targeted because observations were scheduled in advance with randomly selected teachers (from those who participated in the program's technology training) who were instructed to deliver a lesson that integrates the use of technology. The data collection instruments were the **School Observation Measure (SOM)**, the **Survey of Computer Use (SCU)**, and the **Rubric for Student-Centered Activities (RSCA)**. The SOM was used to collect data regarding overall classroom activities, the SCU for student use of computers, and the RSCA to capture more detailed information about student-centered activities during the targeted observations. The classroom observation instruments are described below.

SOM. The SOM was developed to determine the extent to which different common and alternative teaching practices are used throughout an entire school (Ross, Smith, & Alberg, 1999). The standard, or *whole-school SOM*© 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 target strategies. 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 a data summary form. The frequency is recorded via a 5-point rubric that ranges from (0) Not Observed to (4) Extensively. Two global items use three-point scales (low, moderate, high) to rate, respectively, the use of academically focused instructional time and degree of student attention and interest.

Targeted observations were conducted in this evaluation to examine classroom instruction during prearranged one-hour sessions in which the teachers demonstrated a prepared lesson using technology. The notes forms were completed every 15 minutes of the lesson then were summarized on a SOM Data Summary Form. To triangulate the reliability of these results, multiple researchers observed class sessions.

To ensure the reliability of data, observers receive a manual providing definitions of terms, examples and explanations of the target strategies, and a description of procedures for completing the instrument. The target strategies include traditional practices (e.g., direct instruction and independent seatwork) and alternative, predominately student-centered methods associated with educational reforms (e.g., cooperative learning, project-based learning, inquiry, discussion, using technology as a learning tool). The strategies were identified through surveys and discussions involving policy makers, researchers, administrators, and teachers, as those most useful in providing indicators of schools' instructional philosophies and implementations of commonly used reform designs (Ross, Smith, Alberg, & Lowther, 2001).

To ensure the reliability of data, observers receive training, a manual providing definitions of terms, examples and explanations of the strategies, and a description of procedures for completing the instrument. After receiving the manual and 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*© are provided in the Lewis et al. (1999) report. In a reliability study using Generalizability Theory, Sterbinsky (2003) found reliability at the .74 level for 5 SOMs conducted at a school. Reliability increased to .82 with 8 SOMs and to .85 with 10 SOMs conducted at a school.

SCU. A companion instrument to SOM is the Survey of Computer Use (SCU) (Lowther & Ross, 2001). The SCU was completed as part of the SOM observation sessions, where SCU data was also recorded in 15-minute intervals and then summarized on an overall data form.

The SCU was designed to capture exclusively *student* access to, ability with, and use of computers rather than teacher use of technology. Therefore, four primary types of data are recorded: (a) computer capacity and currency, (b) configuration, (c) student computer ability and (b) student activities while using computers. Computer capacity and currency is defined as the age and type of computers available for student use and whether or not Internet access is available. Configuration refers to the number of students working at each computer (e.g., alone, in pairs, in small groups). Student computer ability is assessed by recording

the number of students who are computer literate (e.g., easily used software features/menus, saved or printed documents) and the number of students who easily use the keyboard to enter text or numerical information.

The next section of the *SCU* focuses on student use of computers with regard to: the types of activities, subject areas of activities, and software being used. The computer activities are divided into three categories based on the type of software tool: production tools, Internet/research tools, and educational software. Within each category, primary types of software are identified. For example, under Production Tools, the software includes: word processing, databases, spreadsheets, draw/paint/graphics, presentation (e.g., Microsoft PowerPoint ™), authoring (e.g., KidPix™), concept mapping (e.g., Inspiration), and planning (Microsoft Project™). For the Internet/research tools, three types of software are included: Internet browser, CD reference materials, and communications (e.g., email, listservs, chat rooms). The Educational Software also has three types of software: drill/practice/tutorial, problem-solving (e.g., Riverdeep™) and process tools (e.g., Author's Toolkit™). With this type of recording system, several activities can be noted during the observation of one student working on a computer. For example, if a student gathered data from the Internet, created a graph from the data, then imported the graph into a PowerPoint presentation, the observer would record three types of software tools as being observed: Internet browser, spreadsheet, and presentation. This section ends by identifying the subject area of each computer activity. The categories include: language arts, mathematics, science, social studies, other, and none. The computer activities and software being used are summarized and recorded using a five-point rubric that ranges from (0) Not Observed to (4) Extensively observed.

The final section of the SCU is an "Overall Rubric" designed to assess the degree to which the activity reflects "meaningful use" of computers *as a tool* to enhance learning. The rubric has four levels: 1 – Low-level use of computers, 2 – Somewhat meaningful, 3 – Meaningful, and 4 - Very meaningful.

RSCA. The Rubric for Student-Centered Activities was developed by CREP (Lowther, Ross, & Plants, 2000) as an extension to SOM and SCU. The RSCA was used by observers to more closely evaluate the degree of learner engagement in seven selected areas considered fundamental to the goals of increasing student-centered learning activities (cooperative learning, project-based learning, higher-level questioning, experiential/hands-on learning, student independent inquiry/research, student discussion, and students as producers of knowledge using technology). These strategies reflect emphasis on higher-order learning and attainment of deep understanding of content and whether or not technology was utilized as a component of the strategy. Such learning outcomes seem consistent with those likely to be engendered by well-designed, real-world linked exercises, projects, or problems utilizing technology as a learning tool. Each item includes a two-part rating scale. The first is a four-point scale, with 1 indicating a very low level of application, and 5 representing a high level of application. The second is a

Yes/No option to the question: "Was technology used?" with space provided to write a brief description of the technology use. The RSCA was completed as part of SOM/SCU observation periods.

Teacher Surveys

Two surveys were used to collect impressions of the *Learning Without Limits* program: the **Teacher Technology Questionnaire (TTQ)**, and the **Technology Skills Assessment (TSA)**. Each of the four fifth grade teachers completes the surveys in May 2004. The surveys are described below.

TTQ. The Teacher Technology Questionnaire is an instrument used to collect teacher perceptions of computers and technology. In the first section, teachers rate their level of agreement with 20 statements regarding five technology-related areas: impact on classroom instruction, impact on students, teacher readiness to integrate technology, overall support for technology in the school, and technical support. Items are rated with a five-point Likert-type scale that ranges from (1) Strongly Disagree to (5) Strongly Agree. A sixth section was added specifically to address perceptions of the laptop program also rated on a five-point scale from (1) Strongly Disagree to (5) Strongly Agree.

TSA. The Technology Skills Assessment (TSA) is a 47-item survey that includes three-point Likert-type questions. The three-point questions are designed to assess the perceived technological abilities of the participants. All of the questions are arranged into six categories, which are aligned to the International Society for Technology in Education's (ISTE) National Educational Technology Standards (NETS). The categories of the survey are as follows: Computer Basics, Software Basics, Multimedia Basics, Internet Basics, Advanced Skills, and Using Technology for Learning.

Focus Groups

Student Reactions

To increase understanding of the implementation processes and outcomes of the *Learning Without Limits* program, focus groups were conducted with eight to ten fifth grade students participating in the program. A semi-structured interview protocol was used in order to variation in the order and phrasing of the questions, as well as probes to specific individuals (Patton, 1990). These occurred in Fall 2003 and in the Spring 2004.

Teacher Reactions

Like the students, teacher focus groups were conducted with all four fifth grade teachers twice, both in Fall 2003 and in Spring 2004. The teacher interview also used a semi-structured interview (Patton, 1990) and centered on three areas of questions: Using the Technology, Expectations and Reservations.

Data Collection

Table 1 provides the type of measures, instruments, number collected, administration timeline and a brief description for each of the instruments described in the previous section.

Table 1. Data Collection Summary

Type of Measure	Instrument	Number Collected	Timeline	Description
Classroom Observations	SOM SCU RSCA	9 9 9	Spring 2004	Pre-arranged one-hour sessions in which teachers demonstrated a prepared lesson using technology Notes forms were completed every 15 minutes of the lesson. The four, 15-minute notes forms were aggregated onto a summary sheet.
Surveys	TTQ TSA	4 4	Spring 2004	Administered prior to focus group in May 2004
Focus Group Interviews	Semi-structured interviews	4	Fall 2003 Spring 2004	Two student focus group interviews were conducted with 8-10 fifth grade students in fall and spring semesters. Two teacher focus group interviews were conducted with all 4 fifth grade teachers in fall and spring semesters.

CLASSROOM OBSERVATION RESULTS

The data for 9 classroom observations were collected with SOMs, SCUs, and RSCAs during prearranged sessions in which teachers implemented a lesson using technology. Results from each measure are described in the section below. This is followed with survey results.

School Observation Measure (SOM©)

Observed v. not observed. As indicated in the description of SOM, the observation procedure primarily focused on 24 instructional strategies using a five-point rubric (0 = not observed, 1 = rarely, 2 = occasionally, 3 = frequently, and 4 = extensively). In an initial analysis (Table 2), we computed the percentage of times a strategy was not observed (rubric category = 0, Not Observed) vs. observed (categories = 1-4 combined, Rarely, Occasionally, Frequently, Extensively). This offers schools the opportunity to note which instructional strategies were observed to determine if their goals are being met by what the researchers observed during lessons.

Table 2. School Observation Measure (SOM) Proportion of Not Observed v. Observed Strategies

Strategies	Percent Not Observed	Percent Observed
Project-based learning	0.0	100.0
Technology as a learning tool or resource (e.g. Internet research, spreadsheet or database creation, multi-media, CD ROM, Laser disk)	0.0	100.0
Teacher acting as coach/facilitator	11.1	88.9
Independent seatwork (self-paced worksheets, individual assignments)	44.4	55.6
Cooperative/collaborative learning	55.6	44.4
Independent inquiry/research on the part of the students	55.6	44.4
Higher level instructional feedback (written or verbal) to enhance student learning	66.7	33.3
Use of higher-level questioning strategies	77.8	22.2
Direct instruction	88.9	11.1

The most frequently observed strategies were “project-based learning” and “technology as a learning tool or resource.” These were observed in every instance (100%). The next most often observed strategy was “teacher acting as coach/facilitator,” observed in 88.9% of the classrooms.

Ratings. Table 3 presents the full, five-category breakdown of the SOM results. These results allow school to discern the extent to which instructional strategies were observed (i.e., from "Percent None" through "Percent Extensively"). Along with the results from Riverdale Elementary, three other measures are included: Laptop schools norms (N=10), Elementary schools national norms (N=624) and Secondary schools national norms (N=1,230). These scores are provided as a courtesy for comparison with Riverdale Elementary's results; however, no inferential statistics were computed. The results from the Laptop schools norms included targeted observations only, like those used in this evaluation; however, the Elementary and Secondary schools norms included both targeted and whole-school observations.

Six strategies were discerned frequently or extensively in at least 30% of the observations. Four of these were observed in over 50% of the classroom visits: "project-based learning" (100%), "teacher acting as coach/facilitator" (88.9%), "independent seatwork" (55.6%) and "technology as a learning tool or resource (100%). The remaining two strategies were: "cooperative/collaborative learning" (33.3%) and "independent inquiry/research on the part of the student" (44.4%).

In the final section of the SOM, "academically focused class time" and "level of student attention/interest/engagement" were both rated as high in every classroom visit (100%).

Table 3. School Observation Measure (SOM) Data Summary

River = Riverdale Elementary, N = 9; Lap = Laptop School Norms, N=10;

Elm = Elementary Schools National Norms, N=624; Sec = Secondary Schools National Norms, N=1,230

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			
Instructional Orientation	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**
Direct instruction (lecture)	88.9	90.0	3.1	0.6	11.1	10.0	9.4	10.4	0.0	0.0	21.1	27.1	0.0	0.0	38.4	44.3	0.0	0.0	28.1	17.5
Team teaching	100.0	100.0	40.1	66.5	0.0	0.0	35.0	25.1	0.0	0.0	17.6	7.0	0.0	0.0	6.4	1.0	0.0	0.0	0.8	0.5
Cooperative/collaborative learning	55.6	90.0	33.6	27.9	11.1	0.0	39.1	43.6	0.0	10.0	19.7	20.4	0.0	0.0	6.9	5.7	33.3	0.0	0.7	2.4
Individual tutoring (teacher, peer, aide, adult volunteer)	100.0	90.0	40.8	64.5	0.0	0.0	35.2	20.1	0.0	0.0	15.9	10.5	0.0	0.0	6.0	2.8	0.0	10.0	2.0	2.1
Classroom Organization	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**
Ability groups	100.0	100.0	40.3	39.5	0.0	0.0	25.7	31.0	0.0	0.0	15.8	17.3	0.0	0.0	12.0	7.3	0.0	0.0	6.2	4.9
Multi-age grouping	100.0	100.0	66.1	57.9	0.0	0.0	19.1	12.2	0.0	0.0	8.0	11.3	0.0	0.0	4.6	10.2	0.0	0.0	2.1	8.4
Work centers (for individuals or groups)	100.0	100.0	26.1	64.6	0.0	0.0	33.4	23.9	0.0	0.0	25.2	9.9	0.0	0.0	12.1	1.5	0.0	0.0	3.2	0.2
Instructional Strategies	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**
Higher level instructional feedback (written or verbal) to enhance student learning	66.7	50.0	25.2	16.3	11.1	30.0	24.5	25.4	0.0	10.0	22.0	29.6	22.2	0.0	16.9	19.0	0.0	10.0	11.4	9.7
Integration of subject areas (interdisciplinary/thematic units)	100.0	100.0	56.7	65.5	0.0	0.0	28.7	25.6	0.0	0.0	11.2	5.5	0.0	0.0	3.0	2.7	0.0	0.0	0.4	0.6
Project-based learning	0.0	90.0	69.1	50.8	0.0	0.0	21.4	33.2	0.0	0.0	7.1	12.7	0.0	0.0	2.1	3.1	100.0	10.0	0.2	0.2
Use of higher-level questioning strategies	77.8	80.0	24.4	20.0	22.2	10.0	32.3	40.4	0.0	0.0	26.6	24.9	0.0	10.0	13.9	12.4	0.0	0.0	2.8	2.3
Teacher acting as a coach/facilitator	11.1	20.0	11.1	12.9	0.0	10.0	21.9	23.7	0.0	10.0	22.5	27.1	0.0	10.0	27.2	21.1	88.9	50.0	17.4	15.2
Parent/community involvement in learning activities	100.0	100.0	71.5	90.8	0.0	0.0	20.8	7.4	0.0	0.0	5.9	1.6	0.0	0.0	1.6	0.2	0.0	0.0	0.2	0.0
Student Activities	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**
Independent seatwork (self-paced worksheets, individual assignments)	44.4	50.0	2.5	3.1	0.0	0.0	12.1	14.1	0.0	0.0	29.4	32.6	0.0	0.0	41.4	35.4	55.6	50.0	14.6	14.8
Experiential, hands-on learning	100.0	100.0	23.2	30.2	0.0	0.0	40.0	43.0	0.0	0.0	26.1	20.4	0.0	0.0	8.7	5.0	0.0	0.0	2.0	1.5
Systematic individual instruction (differential assignments geared to individual needs)	100.0	100.0	67.4	77.3	0.0	0.0	22.7	13.5	0.0	0.0	6.9	5.7	0.0	0.0	2.9	2.9	0.0	0.0	0.2	0.6

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			
Sustained writing/composition (self-selected or teacher-generated topics)	100.0	60.0	44.9	59.0	0.0	0.0	36.7	30.5	0.0	0.0	14.4	8.8	0.0	0.0	3.8	1.4	0.0	40.0	0.2	0.2
Sustained reading	100.0	100.0	27.9	49.8	0.0	0.0	41.8	37.3	0.0	0.0	23.3	11.8	0.0	0.0	6.2	1.1	0.0	0.0	0.7	0.0
Independent inquiry/research on the part of students	55.6	50.0	76.0	66.6	0.0	0.0	17.6	24.4	0.0	10.0	4.5	6.9	11.1	20.0	1.8	2.3	33.3	20.0	0.1	0.0
Student discussion	100.0	100.0	54.2	55.0	0.0	0.0	23.8	28.1	0.0	0.0	12.3	9.5	0.0	0.0	7.1	5.3	0.0	0.0	2.5	2.1
Technology Use	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**
Computer for instructional delivery (e.g. CAI, drill & practice)	100.0	80.0	40.5	57.8	0.0	0.0	34.9	33.8	0.0	10.0	17.1	7.6	0.0	0.0	6.7	0.6	0.0	10.0	0.8	0.2
Technology as a learning tool or resource (e.g. Internet research, spreadsheet or database creation, multi-media, CD ROM, Laser disk)	0.0	20.0	53.3	36.4	0.0	0.0	30.7	40.1	0.0	20.0	11.9	17.6	0.0	0.0	4.0	17.6	100.0	60.0	0.1	0.8
Assessment	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**
Performance assessment strategies	100.0	90.0	67.1	65.1	0.0	0.0	21.9	26.8	0.0	0.0	7.3	5.2	0.0	0.0	3.3	2.1	0.0	10.0	0.4	0.8
Student self-assessment (portfolios, individual record books)	100.0	100.0	73.0	72.2	0.0	0.0	18.0	20.9	0.0	0.0	6.5	5.7	0.0	0.0	1.9	1.0	0.0	0.0	0.5	0.2
							Percent Observed Low						Percent Observed Moderate				Percent Observed High			
Summary Items							**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**	**River**	**Lap**	**Elm**	**Sec**		
Academically focused class time							0.0	0.0	1.1	1.1	0.0	0.0	21.5	35.3	100.0	100.0	77.4	63.5		
Level of student attention/ interest/engagement							0.0	0.0	1.5	2.7	0.0	40.0	34.3	54.4	100.0	60.0	64.2	42.9		

Survey of Computer Use (SCU)

As with the SOM, data from the SCU were collected during prescheduled lessons in which teachers were asked to use technology. A summary of the observation results is provided in Table 5 at the end of this section. Along with the results from Riverdale Elementary, two other measures are included: Laptop schools norms (N=10) and Elementary and Secondary schools national norms (N=1,867). These scores are provided as a courtesy for comparison with Riverdale Elementary's results; however, no inferential statistics were computed. The results from the Laptop schools norms included targeted observations only, like those used in this evaluation; however, the Elementary and Secondary schools norms include both targeted and whole-school observations.

Computer Configuration. In all of the visits (100%), 11 or more computers were available for student use in the classrooms. All of the computers (100%) were observed to be up-to-date, and all the computers (100%) were connected to the Internet. It is important to note that during two of the pre-arranged visits, the school's internal network was intermittent. So while the computers were capable of accessing the intranet and Internet, students were unable to do so consistently.

Student computer activities. An initial analysis compared those computer activities that were not observed (rating = 0) v. those observed (rating = 1 thru 4). These are listed in Table 4. Six activities were observed from 11.1% to 66.7% of the classroom visits.

Table 4. Survey of Computer Use Proportion of Not Observed v. Observed Activities

Student Computer Activities	Percent Not Observed	Percent Observed
Internet Browser (e.g., Netscape)	33.3	66.7
Draw/Paint/Graphics	55.6	44.4
Presentation (e.g., MS PowerPoint)	55.6	44.4
Word Processing	77.8	22.2
Other (i.e., Timeliner)	88.9	11.1
Drill/Practice/Tutorial	88.9	11.1

Production tools used by students. As shown in Table 5, four of the nine different computer activities were observed: word processing, draw/paint/graphics, presentation and other (i.e., Timeliner®). Draw/paint/graphics and presentation activities were extensively observed in over 30% of the visits. With regard to the subject area focus, the majority of production tool activities were in language arts (33.3%) and mathematics (33.3%). Fewer production tool activities involved social studies (22.2%), and science (11.1%).

Internet/research tools used by students. Internet browsers (e.g., Netscape Navigator) were the only research tools observed. Internet browsers were frequently and extensively observed in 44.4% of the classroom visits. The research activities covered all subject areas, however, the majority were focused on language arts (22.2%) and social studies (22.2%). The remainder of the subject areas was seen in only approximately 11.1% of the visits.

Educational software use by students. Drill/practice/tutorial activities were the only educational software occasionally observed (11.1%). Mathematics software was the only subject observed in approximately 11% (11.1%) of the visits.

Testing software use by students. As seen, testing software was not observed during the classroom visits.

Overall Meaningful Use of Computers. The culminating assessment on the SCU was the observer's evaluation of the meaningfulness of the way in which technology was integrated with teaching and learning. To do this, they were asked to indicate how often they observed computer activities at each level of the rubric; e.g., how often was *very meaningful* use of computers observed. As can be seen in Table 5, low levels of computer use and somewhat meaningful uses were rarely observed during the classroom visits (11.1% each). However, meaningful uses of computers were occasionally observed in 11.1% of the visits while meaningful uses were extensively observed in over 50% of the visits (55.6%). Similarly, very meaningful uses of computers were extensively observed in over a third of the visits (33.3%). Combined, meaningful and very meaningful uses of computers were observed between approximately 30% (33.3%) and 65% (66.7%) of the visits.

Table 5. Survey of Computer Use (SCU) Data Summary

Riverdale Elementary, N = 9; Laptop School Norms, N=40; National School Norms, N=1,867

Computer Configuration (in percentages)	**Riverdale**	**Laptop**	**National**
Classrooms most frequently had the following number of computers or digital tools:			
0	0.0	0.0	1.4
1	0.0	0.0	26.6
2 – 4	0.0	0.0	47.3
5 – 10	0.0	0.0	15.0
11 or more	100.0	100.0	9.7
Classroom computers were most frequently:			
Up-to-date	100.0	100.0	59.3
Aging but adequate	0.0	0.0	39.7
Outdated/limited capacity	0.0	0.0	0.5
No computers were observed	0.0	0.0	0.5
Classroom computers were most frequently:			
Connected to the Internet	100.0	100.0	89.4
Not connected to the Internet	0.0	0.0	10.1
No computers were observed	0.0	0.0	0.5
Computer Use (in percentages)	**Riverdale**	**Laptop**	**National**
Classroom computers or digital tools were most frequently used by:			
Few (less than 10%) students	0.0	0.0	33.5
Some (about 10-50%) students	0.0	0.0	20.2
Most (about 51-90%) students	0.0	0.0	9.2
Nearly all (91-100%) students	100.0	100.0	24.6
Students did not use computers	0.0	0.0	12.3
Students most frequently worked with computers or digital tools:			
Alone	88.9	100.0	66.5
In pairs	11.1	20.0	11.8
In small groups	0.0	80.0	5.9
Students did not use computers	0.0	0.0	15.8
Student computer literacy skills were most frequently:			
Poor	0.0	0.0	10.8
Moderate	0.0	20.0	34.5
Very good	100	80.0	31.5
Not observed	0.0	0.0	23.2
Student keyboarding skills were most frequently:			
Poor	0.0	0.0	13.4
Moderate	0.0	30.0	21.4
Very good	100	70.0	29.4
Not observed	0.0	0.0	35.8

Table 5. Survey of Computer Use (SCU) Data Summary continued

River=Riverdale Elementary, N = 9; Lap=Laptop School Norms, N=40; Nat=National School Norms, N=1,867

Student Computer Activities by Software Used	Percent Not Observed			Percent Rarely			Percent Occasionally			Percent Frequently			Percent Extensively		
Production Tools	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**
Word Processing	77.8	20.0	63.5	11.1	0.0	12.8	11.1	20.0	11.8	0.0	0.0	5.9	0.0	60.0	5.9
Database	100.0	100.0	98.2	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spreadsheet	100.0	100.0	92.6	0.0	0.0	4.9	0.0	0.0	1.0	0.0	0.0	0.5	0.0	0.0	1.0
Draw/Paint/Graphics	55.6	60.0	86.5	11.1	10.0	6.0	11.1	30.0	5.5	0.0	0.0	0.5	33.3	0.0	1.5
Presentation (e.g., MS PowerPoint)	55.6	40.0	73.8	0.0	40.0	10.8	0.0	0.0	7.2	0.0	0.0	4.6	44.4	20.0	3.6
Authoring (e.g., HyperStudio)	100.0	100.0	99.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Concept Mapping (e.g., Inspiration)	100.0	100.0	94.9	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Planning (e.g., MS Project)	100.0	100.0	97.5	0.0	10.0	1.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	1.0
Other: (e.g., Timeliner)	88.9	90.0	88.8	0.0	10.0	5.9	0.0	0.0	2.9	0.0	0.0	1.2	11.1	0.0	1.2
Internet/Research Tools	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**
Internet Browser (e.g., Netscape)	33.3	30.0	62.3	0.0	10.0	17.1	22.2	10.0	5.5	11.1	10.0	10.1	33.3	40.0	5.0
CD Reference (encyclopedias, etc.)	100.0	100.0	92.5	0.0	0.0	5.4	0.0	0.0	1.1	0.0	0.0	1.1	0.0	0.0	0.0
Communications	100.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Educational Software	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**
Drill/Practice/Tutorial	88.9	90.0	70.1	0.0	0.0	17.3	11.1	0.0	3.6	0.0	0.0	4.6	0.0	10.0	4.6
Problem Solving (e.g., SimCity)	100.0	100.0	69.4	0.0	0.0	2.1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.5
Process Tools (Geometer's Sketchpad, etc.)	100.0	100.0	99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5
Testing Software	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**
Individualized/Tracked (e.g., Accelerated Reader)	100.0	100.0	70.3	0.0	0.0	22.6	0.0	0.0	3.1	0.0	0.0	3.1	0.0	0.0	1.0
Generic	100.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 5. Survey of Computer Use (SCU) Data Summary continued

River=Riverdale Elementary, N = 9; Lap=Laptop School Norms, N=40; Nat=National School Norms, N=1,867

Subject Areas of Computer Activities (in percentages)	**Language Arts**			**Mathematics**			**Science**			**Social Studies**			**Other**			**None**		
	River	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**
Production Tools	33.3	80.0	39.1	33.3	20.0	11.6	11.1	20.0	15.5	22.2	30.0	22.7	0.0	0.0	11.6	0.0	10.0	35.7
Internet/Research Tools	22.2	30.0	19.8	11.1	10.0	6.3	11.1	20.0	13.5	22.2	20.0	16.9	0.0	0.0	1.9	33.3	40.0	45.9
Educational Software	0.0	0.0	26.6	11.1	10.0	11.1	0.0	0.0	5.3	0.0	0.0	3.9	0.0	0.0	3.4	88.9	90.0	48.8
Testing Software	0.0	0.0	27.5	0.0	0.0	3.4	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	2.9	100.0	100.0	54.6

Overall meaningful use of computers	**Percent Not Observed**			**Percent Rarely**			**Percent Occasionally**			**Percent Frequently**			**Percent Extensively**		
	River	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**	**River**	**Lap**	**Nat**
Low level use of computers	88.9	70.0	56.9	11.1	10.0	23.4	0.0	0.0	7.4	0.0	10.0	6.4	0.0	10.0	5.9
Somewhat meaningful use of computers	88.9	20.0	51.3	11.1	0.0	24.6	0.0	10.0	10.2	0.0	20.0	11.2	0.0	50.0	2.7
Meaningful use of computers	22.2	70.0	58.3	0.0	0.0	11.2	11.1	20.0	11.8	0.0	10.0	12.3	55.6	20.0	6.4
Very meaningful use of computers	66.7	80.0	72.8	0.0	0.0	14.1	0.0	0.0	3.3	0.0	0.0	3.3	33.3	20.0	7.6

Rubric for Student-Centered Activities (RSCA)

Results address the percentage of sessions in which each RSCA strategy was observed at least once, the quality/depth of observed strategy applications, and the percentage of sessions in which technology was used with the observed strategy. Because the RSCA was used in targeted observations of lessons that were to include the use of technology to support learning, computer use was expected to be viewed at sometime during the lesson.

Observed vs. not observed. The first question on each RSCA item asked whether or not the particular strategy was observed. To help schools determine if their goals and objectives are being met, it is easiest to note those activities that were observed at least once during the classroom visits. These activities observed are summarized in Table 6. As indicated in the SOM, project-based learning was observed during all classroom visits (100%). The next most often observed activity was "students as producers of knowledge" in 88.9% of the visits.

Table 6. Rubric for Student-Centered Activities Proportion of Not Observed v. Observed Activities

Student-Centered Activities	Percent Not Observed	Percent Observed
Project-Based Learning	0.0	100.0
Students as Producers of Knowledge	11.1	88.9
Cooperative Learning	55.6	44.4
Independent Inquiry / Research	55.6	44.4
Higher-Level Questioning Strategies	88.9	11.1

Ratings. Table 7 summarizes the complete results for the RSCA. These results allow school to discern the extent to which instructional strategies were observed (i.e., from "Not Observed" through "Strong Application"). All the activities specific to the RSCA except for student discussions and experiential hands-on learning were observed during the fifth grade classroom visits. Along with the results from Riverdale Elementary, two other measures are included: Laptop schools norms (N=10) and Elementary and Secondary schools national norms (N=1,788). These scores are provided as a courtesy for comparison with Riverdale Elementary's results; however, no inferential statistics were computed. The results from the Laptop schools norms included targeted observations only, like those used in this evaluation; however, the Elementary and Secondary schools norms include both targeted and whole-school observations.

The most meaningful applications, that is those activities where somewhat strong and strong applications were observed in at least 30% of the classroom visits,

included cooperative learning (44.4%), project-based learning (77.7%) and students as producers of knowledge (77.8%).

Technology use. Students used technology to support learning during cooperative learning (44.4%), project-based learning (100%) and independent inquiry/research (44.4%). It is important to note that technology was used in combination with cooperative learning and independent inquiry/research almost in almost half of the observations. Moreover, technology was used to support learning with project-based learning during 100% of the observations. All the results for technology use are summarized in Table 8.

Table 7. Rubric for Student Centered Activities (RSCA) Data Summary

River=Riverdale Elementary, N = 9; Lap=Laptop School Norms, N=10; Nat=National School Norms, N=1,788

Items	Not Observed (%)			Limited Application (% Observed)			Somewhat Limited Application (% Observed)			Somewhat Strong Application (% Observed)			Strong Application (% Observed)		
	River	Lap	Nat	River	Lap	Nat	River	Lap	Nat	River	Lap	Nat	River	Lap	Nat
Cooperative Learning	55.6	90.0	73.9	0.0	0.0	8.1	0.0	10.0	6.7	22.2	0.0	5.4	22.2	0.0	5.9
Project-Based Learning	0.0	90.0	81.8	11.1	0.0	2.3	11.1	10.0	3.8	44.4	0.0	6.3	33.3	10.0	5.8
Higher-Level Questioning Strategies	88.9	70.0	67.4	0.0	20.0	11.1	0.0	0.0	11.7	11.1	0.0	5.6	0.0	10.0	4.1
Experiential, Hands-On Learning	100.0	100.0	74.0	0.0	0.0	5.2	0.0	0.0	5.5	0.0	0.0	6.1	0.0	0.0	9.3
Independent Inquiry / Research	55.6	50.0	81.3	33.3	20.0	7.4	0.0	10.0	3.2	0.0	10.0	4.0	11.1	10.0	4.1
Student Discussion	100.0	100.0	74.0	0.0	0.0	9.7	0.0	0.0	6.2	0.0	0.0	6.1	0.0	0.0	4.0
Students as Producers of Knowledge	11.1	10.0	85.1	11.1	70.0	3.2	0.0	0.0	4.9	11.1	0.0	3.4	66.7	20.0	3.4

Table 8. Rubric for Student Centered Activities (RSCA) Data Summary

Riverdale=Riverdale Elementary, N = 9; Laptop=Laptop School Norms, N=10; National=National School Norms, N=1,788

Items	Technology Use (% Yes)		
	Riverdale	**Laptop**	**National**
Cooperative Learning	44.4	10.0	13.1
Project-Based Learning	100.0	10.0	15.9
Higher-Level Questioning Strategies	0.0	0.0	7.7
Experiential, Hands-On Learning	0.0	0.0	16.3
Independent Inquiry / Research	44.4	50.0	15.3
Student Discussion	0.0	0.0	8.5

TEACHER SURVEY RESULTS

Two surveys (TTQ, and TSA) were administered to the fifth grade teachers during prior to a focus group interview in May 2003.

Teacher Technology Questionnaire (TTQ)

The Teacher Technology Questionnaire (TTQ) was designed to capture teacher perceptions regarding their personal beliefs and practices regarding five areas: impact of technology on classroom instruction, impact of technology on students, teacher readiness to integrate technology, overall support for technology, technical support and attitude toward the laptop program. The four fifth grade teachers completed the survey.

As seen in Table 9, mean scores for all six sections were between 4 ("Agree") and 5 ("Strongly Agree"). This indicates the teachers feel the *Learning Without Limits* program has had a positive impact on classroom instruction, a positive impact of technology on students, the teachers' readiness to integrate technology, the school and district's overall support for technology, appropriate technical support and a positive attitude toward the laptop program.

Notable are the questions that the teachers responded in unison. Within the section on overall support for technology in the school, Questions 4 and 13 address the parent, community and administrative support necessary for technology to impact teaching and learning, both with scores of 5 = "Strongly Agree." Within the technical support section, the teachers concurred on Question 2 that they could readily answer technology related questions with a score of 4 = "Agree." Within the section on attitudes toward the laptop program, Questions 21 and 23 represent the teachers' enthusiasm for the program and confidence about their abilities, both with scores of 5 = Strongly Agree. Also notable is Question 1, which received the lowest mean score of 3.75 between "Neither Disagree nor Agree" (3) and "Agree" (4). This question related to the maintenance of the school computers. This question while receiving the lowest mean score also had the largest amount of variance among the respondents (SD = 1.26).

Table 9. Teacher Technology Questionnaire (TTQ) (N=4)

Category and Related TTQ Items		Means	Standard Deviations
Impact on Classroom Instruction			
14.	My teaching is more student-centered when technology is integrated into the lessons.	4.75	.50
16.	I routinely integrate the use of technology into my instruction.	4.25	.50
18.	Technology integration efforts have changed classroom learning activities in a very positive way.	4.50	.58
20.	My teaching is more interactive when technology is integrated into the lessons.	4.25	.50
	Overall	**4.44**	**.24**
Impact on Students			
3.	The use of computers has increased the level of student interaction and/or collaboration.	4.50	.58
8.	The integration of technology has positively impacted student learning and achievement.	4.75	.50
10.	Most of my students can capably use computers at an age-appropriate level.	4.50	.58
19.	The use of technology has improved the quality of student work.	4.75	.50
	Overall	**4.63**	**.32**
Teacher Readiness to Integrate Technology			
5.	I know how to meaningfully integrate technology into lessons.	4.50	.58
9.	I am able to align technology use with my district's standards-based curriculum.	4.00	.82
11.	I have received adequate training to incorporate technology into my instruction.	4.25	.50
12.	My computer skills are adequate to conduct classes that have students using technology.	4.50	.58
	Overall	**4.31**	**.38**
Overall Support for Technology in the School			
4.	Parents and community members support our school's emphasis on technology.	5.00	.00
13.	Teachers receive adequate administrative support to integrate technology into classroom practices.	5.00	.00
15.	Our school has a well-developed technology plan that guides all technology integration efforts.	4.75	.50
17.	Teachers in this school are generally supportive of technology integration efforts.	4.50	.58
	Overall	**4.81**	**.24**
Technical Support			
1.	Most of our school computers are kept in good working condition.	3.75	1.26
2.	I can readily obtain answers to technology-related questions.	4.00	.00
6.	My students have adequate access to up-to-date technology resources.	4.50	.58
7.	Materials (e.g., software, printer supplies) for classroom use of computers are readily available.	4.50	.58
	Overall	**4.19**	**.38**

Category and Related TTQ Items		Means	Standard Deviations
Attitude toward the Laptop Program			
21.	I feel enthusiastic about the laptop program.	5.00	.00
22.	I feel my teaching benefited from laptop use this year.	4.75	.50
23.	I feel confident about my ability with the laptop.	5.00	.00
24.	I feel like I need to learn more skills before I can effectively use the laptop for teaching.*	2.25	.50
25.	Laptop use has essentially changed my teaching.	4.00	.82
	Overall	**4.20**	**.28**

* Item reversed.

Technology Skills Assessment (TSA)

The primary purpose for the TSA was to assess teacher perceptions of their technology ability. The survey begins by asking the teachers to rate "How easily…" (Not at all, Somewhat, Very Easily) they could use or complete 47 computer-related tasks divided into six basic areas: computers, software, multimedia, Internet, advanced skills, and using technology for learning. A summary of the results from the four fifth grade teacher surveys is presented in Table 10.

Teacher confidence was high in all six areas with mean scores of 2.5 or higher, between Somewhat and Very Easily. The teachers rated themselves highest in Computer Basics (2.98) and Software Basics (2.96). Remarkable is that of the 47 questions on the TSA, the teachers rated their confidence in 30 of the tasks very easily, which constitutes 63.8% of the tasks. Moreover, of the 47 questions, only 4 questions (# 23, 44, 45 and 46) were rated below 2 ("Somewhat").

Table 10. Technology Skills Assessment Data Summary

Category and Related TSA Items	Means	Standard Deviations
Computer Basics: How easily can you …		
1.Use a spell check tool.	3.00	.00
2.Create basic computer documents (word processed) in a timely manner.	3.00	.00
3.Use help menus for software programs.	2.75	.50
4.Use basic computer terms like mouse, keyboard, hard drive, CD-ROM, and monitor.	3.00	.00
5.Save documents so they can be opened on both a Macintosh and PC.	3.00	.00
6.Create folders on a hard drive or disk.	3.00	.00
7.Save files to specific folders.	3.00	.00
8.Locate and delete unwanted files.	3.00	.00
9.Use keyboard commands to cut, copy, or delete text.	3.00	.00
10.Proficiently use a mouse and keyboard.	3.00	.00
11.Print a document using "Print" from the File menu and/or the toolbar icon.	3.00	.00
Computer Basics: Overall	**2.98**	**.05**
Software Basics: How easily can you …		
12.Use software preview features to check work.	3.00	.00
13.Open and use software programs that are installed on your computer.	3.00	.00
14.Work with and move between two open programs (e.g., Internet and database) to create a product.	2.75	.50
15.Describe the difference between downloading and installing software.	3.00	.00
16.Save documents so they can be opened in a different program (e.g., from Word to Word Perfect).	3.00	.00
17.Install software.	3.00	.00
Software Basics: Overall	**2.96**	**.08**
Multimedia Basics: How easily can you …		
18.Import digital video from a camera to a computer.	3.00	.00
19.Record and save your voice onto a computer.	2.67	.58
20.Use a scanner to import a photo or document into a computer.	2.50	.58
21.Play a music CD on the computer.	3.00	.00
Multimedia Basics: Overall	**2.81**	**.24**
Internet Basics: How easily can you …		
22.Connect to the Internet with a modem (phone, cable).	3.00	.00
23.Use Boolean strategies for Internet searches.	1.75	.50
24.Use appropriate software and the Internet to find audio, video, and graphics for lesson plans.	2.75	.50
25.Use the Internet to find help when you have a computer problem.	2.25	.96
26.Determine if information you find on the Internet is accurate and valid.	3.00	.00
27.Evaluate Internet search strategies to determine those that are most efficient.	3.00	.00
28.Determine the usefulness and appropriateness of digital information.	2.50	.58
Internet Basics: Overall	**2.61**	**.21**

Category and Related TSA Items	Means	Standard Deviations
Advanced Skills		
29. Use more advanced computer terms like megahertz, gigabytes, and RAM.	3.00	.00
30. Access information on local area networks (LANs) and wide area networks (WANs).	3.00	.00
31. Use appropriate digital layout and design to meet the needs of defined audiences.	2.75	.50
32. Use appropriate digital layout and design for the selected media (e.g., multimedia, web, print).	2.75	.50
33. Publish information in a variety of media (e.g., printed, monitor display, web-based, video).	2.75	.50
34. Connect a computer to a local server to share files.	3.00	.00
35. Determine if a software program works with an operating system.	2.50	.58
36. Print to a specific printer when connected to a network that has more than one printer.	3.00	.00
37. Use presentation software to share information with specific audiences.	3.00	.00
Advanced Skills: Overall	**2.86**	**.11**
Using Technology for Learning		
38. Use multimedia software to enhance learning experiences.	3.00	.00
39. Use appropriate software (e.g., word processing, graphics, databases, spreadsheets, simulations, and multimedia) to express ideas and solve problems.	3.00	.00
40. Use text and graphics to create and modify solutions to problems.	3.00	.00
41. Use digital audio and video to create and modify solutions to problems.	2.25	.50
42. Use communication tools to participate in group projects.	3.00	.00
43. Manipulate information in interactive digital environments (e.g., simulations, virtual labs, field trips).	2.50	.58
44. Participate in a listserv, chat, and bulletin board session.	1.75	.96
45. Create an electronic teaching portfolio to evaluate your work.	1.75	.96
46. Evaluate electronic portfolio products.	1.75	.96
47. Create technology tools to assess student work (e.g., checklists, timelines, rubrics).	3.00	.00
Using Technology for Learning: Overall	**2.50**	**.38**

Focus Groups

Focus groups were conducted with both teachers and students at the beginning of the *Learning Without Limits* program initiative in fall 2003 and again at the conclusion of the academic year in May 2004. Interview questions centered on three topic areas: (a) uses of technology, (b) expectations of the initiative and (c) reservations with the initiative. From audio recordings and facilitator notes, themes were derived from the participants. These are presented below as well as discussed later to corroborate and answer the primary evaluation questions. Verbatim comments are enclosed in quotation marks to represent most accurately the voice of the students and teachers.

Teacher Reactions

Computer use. The teachers identified online tests, publishing stories, information seeking and research on the Internet, word processing, electronic presentations, and draw/paint applications as the computer uses they had implemented. They also considered it their responsibility to teach the students about trustworthiness with the laptops and the "upkeep" for the laptops. The teachers were proud of the very few numbers of computers that had been "dropped" by the students. They also felt in order to leverage the use of the laptops, it was necessary to teach "saving," "how to save" and management routines for using the laptops.

The teachers described that they would like to use the laptops for about "50%" of the time, about "two to three hours a day." However, they felt some challenges prevented them from achieving this goal. Specifically, the scope of the curriculum, as well as state and district standards (i.e., "student performance indicators"), was difficult to achieve with and without using the laptops. Changes in the district curriculum also made it "difficult to schedule" and plan ahead for the next year.

Pressures and concerns. In the fall semester, the teachers were concerned about the keyboarding skills of the students, as well as "maintenance," "upkeep" and "technical support" for using the laptops. However, in the spring semester, the teachers voiced that they were "confident" in the use of the laptops for instruction and that they could "figure out" most of the technical problems or questions that arose. They also noted that they depended on one another for expertise. Proximity to one another's classrooms facilitated this learning community.

Similarly, in the fall semester, they described that their colleagues were "jealous" toward the fact that they have laptops; however, their colleagues were glad that they "did not have to deal with the responsibilities and/or tasks" that accompany using the laptops for learning. In the spring, this perception continued. One teacher described it as "laptop envy." They felt that some teachers perceived the *Learning Without Limits* program as an "extra burden." Indicative of their growth and comfort levels, however, the teachers noted that colleagues "come to us for questions" about using computers or technical problems.

In the fall semester, the teachers expressed "meeting expectations of the administration" as pressure toward using and "meeting standards" as pressures they felt toward not using the laptops. However, in the spring semester they seemed to have reconciled these. The teachers concurred that they did not feel "as much pressure as in the beginning." Some pressure may have been intrinsic—applied by the teachers—in addition to the extrinsic pressures.

In the fall semester, concerns about the laptop program centered on covering content and teaching skills and knowledge that specifically may not be revisited until later grades. The teachers were also concerned that they would be teaching computer skills that the students "will not use in other grade levels." In the spring, concerns shifted to improvements for the following school year. For example, another teacher would be added to the fifth grade. Currently, the core subject areas (language arts, mathematics, science and social studies) were taught by one of each of the fifth grade teachers. So, all the fifth grade students rotated through each of the teachers. In fall 2004, another teacher will be added and she will most likely share teaching responsibilities for one or more content areas. Integrating this teacher into the learning community and "logistically figuring it out" how to use the laptops when the same subject matter is taught in two different classrooms were indicated as challenges and concerns. In addition, technical difficulties, such as reliability with internal network, external Internet and server access, continue to be concerns for the teachers. They do feel, however, that they are more sensitive to these challenges given their reliance on these resources.

Student Reactions

Computer use. The students identified electronic presentations, writing "stories," graphing such as an ordered pairs lesson in mathematics, draw/paint to create an original flower in science and visiting Internet sites for information seeking/research as ways they had used the laptop computers in class. They said in many instances using the laptop computers was "easier," "fun and faster" and required less "writing." But they also recognized that in some in cases, such as with the flower project in science, it was "harder" than completing the assignment on paper, where they previously used craft materials.

The students reported issues or concerns that they felt prevented from using them more in class. These related to technical and logistical topics as well as personal responsibility. Technical problems, such as system crashes, "freezing," glitches in the application programs, system updates, as well as broken keypads and broken cords requiring "repair time," continued to be challenges throughout the school year. Logistical issues primarily centered on lack of "battery power," which sometimes caused delays in instruction and in a few instances resulted in lost work.

A very strong theme for the students' use was personal responsibility for the laptops. This message as described by the teachers in their interviews appeared to have been respected by the students. Many students felt that they "had to be careful when using the laptops" so they would not damage them. They also felt

that "not being responsible" would prevent them from being able to use them. Likewise, "dropping the laptops" was also a concern for the students. But, they also felt like they were "gaining responsibility" with using the laptops and taking care of them.

At the beginning of the school year, students thought typing, or keyboarding, skills were a problem for students, preventing use or slowing use. They even suggested requiring "a typing class." However, at the end of the year, the students did not include this with their challenges to using the laptops or with the students they felt benefited most from the laptops' use.

It is also interesting to note that a few students also felt that they "can't work on [the laptops] all day." They felt it just wasn't possible. Similarly, students thought if they used the laptops "all day" it "might get boring."

Students that benefit from using laptops. The fifth graders felt that the types of students who benefited most from using the laptops were those that were fast learners or "students who learn more." They also thought those peers that had prior knowledge about computers or were "*into computers*" also benefited. In the fall they felt that students who had "high IQs" benefited, but in the spring, students mentioned that "students who are not as smart" were the ones benefiting most.

The students agreed in the fall and spring that the type of students who did not benefit from using the laptops were those students who "don't care" and those who "don't listen" or do not pay attention. One student called these students "goofers:" they "sit there and do nothing." They also felt that the "smartest kids in class" benefited least, because "they already know" how to use the laptops and are confident with the content. Similarly, the "fast learners" they felt should have additional resources, because they are "held back" when skills are retaught.

CONCLUSIONS & RECOMMENDATIONS

The conclusions of the study will be presented in association with each of the major research questions in the respective sections below. Recommendations are also included, where appropriate, to suggest improvements to the program.

In what ways has the effectiveness of instruction through the use of student laptop computer been impacted?

While it is difficult to determine increases without baseline, or beginning, data, SOM results indicate extensive uses of cooperative/collaborative learning, project-based learning and the teachers acting as coaches or facilitators. Results from the SCU indicate extensive uses of productivity tools, specifically draw/paint/graphics and electronic presentations, and Internet research with Internet browsers. SCU results also suggest wide use across the content areas. Finally, the overall meaningfulness of the computers was observed to be extensive in approximately one-third to fifty percent of the classroom visits. The results from the SOM coupled with these results from the SCU point to activities that result in meaningful uses of computers that were based on meaningful problems, required critical thinking skills and used computer applications to locate, process and/or manipulate information. Despite the limited scope of technology tools, those tools observed were seen to meaningfully integrate technology to enhance student learning.

Moreover, data from the RSCA revealed that teachers used technology with over 40% of their student-centered learning activities. This finding is not surprising given that the observations were conducted with targeted lessons, where the teachers were asked to demonstrate technology integration. However, specifically notable is that technology was observed in every instance with project-based learning. This is a significant accomplishment given the focus of the initiative on using technology to impact teaching and learning. Plus, technology for student use is often employed best during more unstructured learning such as projects.

It is important to indicate that during two of the observations as noted in the SCU, the school network access was intermittent. As the *Learning Without Limits* program continues and potentially expands, school network reliability will affect the effectiveness of instruction with the increased dependence on digital resources, such as the Internet, email and school servers.

To what degree and in what ways have teachers integrated technology with classroom instruction?

The original *Learning Without Limits* program included directed technology integration training for the fifth grade teachers; this was not implemented due to cost and lack of grants support. While no extensive *Learning Without Limits* training was conducted, the fifth grade teachers participated in a workshop on using Microsoft PowerPoint in Fall 2003 and informal discussions about classroom management with laptops during Spring 2003. Moreover, the teachers through focus group interviews indicated they had participated in professional development

workshops offered through Shelby County Schools. They also relied on one another to extend their expertise, creating a learning community. So, primarily the teachers used their educational philosophies and pedagogy to envision effective technology integration.

As discussed above, SOM and SCU data indicate the teachers implemented instructional activities that resulted in meaningful uses of computers and required critical thinking skills. Productivity tools (e.g., word processing, draw/paint/graphics, electronic presentations and Timeliner®) and Internet research tools (e.g., Netscape Navigator) were used in all subject areas and educational software (e.g., drill and practice) was used in Mathematics. In addition, SOM and RSCA data revealed that the teachers employed project-based learning during all (100%) of the targeted classroom visits to varying degrees (limited to strong applications) and technology was used in every instance (100%). These results are suggestive that the *Learning Without Limits* program is effectively impacting technology integration efforts at Riverdale Elementary.

To extend the teachers' effectiveness and expertise with technology integration and the instructional strategies that support technology, the teachers should participate in professional development targeted at pedagogy and technology integration, such as the training proposed in the original *Learning Without Limits* proposal plan. This training may offer the teachers a broader vision for technology integration with the school curricula and provide added support for changing teaching and learning with laptops.

To what degree do Learning Without Limits teachers use methodologies that stress higher-order learning and student-centered learning activities?

In almost 90% (88.9%) of the targeted classroom visits, teachers were observed extensively to be acting as a coach or facilitator of learning. Other activities indicative of critical thinking and student engagement were seen in over 30% of the visits. Cooperative/collaborative learning, which was observed extensively in 33.3% of the visits, was observed to be a somewhat strong or strong application in over 40% of the observations (44.4%). Project-based learning, which was observed in 100% of the visits, was observed to be somewhat strong or strong application in almost 75% of the visits (77.7%). Finally, independent inquiry/research, which was observed in over 40% of the visits (44.4%), was observed to be a somewhat strong or strong application in approximately 10% of the visits (11.1%). These data indicate some use of non-traditional, or more student-centered, instructional methods. However, professional development efforts or goals focus more on these strategies to increase the frequency with which they are used.

To what degree has the Learning Without Limits program impacted teacher attitudes toward technology?

The fifth grade teachers are enthusiastic about the *Learning Without Limits* program. Succinctly, the teachers feel the program has positively impacted their classroom

instruction and positively impacted the fifth grade students. Moreover, the teachers feel they are ready to integrate technology into their instruction. This is corroborated by the focus group interviews as the teachers discussed their "confidence" with the laptops and reconciliation with previous intrinsic and extrinsic pressures. The TSA highlighted the teachers' expertise in computer basics, software basics, multimedia basics, Internet basics, advanced skills and using technology to support learning. Personal professional development objectives or grade level professional development goals should consider the few technology skills, such as Boolean strategy searches, electronic communications other than email and electronic teaching portfolios, that received mean scores below 2 (between "Not at All" and "Somewhat"). These skills should be evaluated for their value to the teachers, students and relevance to the program as the initiative continues.

Finally, the teachers felt they have the support of parents, the community, the administration and the technical support necessary to be effective with technology integration and improve student learning.

What factors appear most instrumental in determining schools' success at achieving the goals and overall implementation of the Learning Without Limits program?

From the results of the observation instruments (i.e., SOM, SCU, RSCA), teacher surveys (i.e., TTQ, TSA) and focus group interviews (with both teachers and students), the fifth grade teachers and students are making marked progress to their goals. Below is a list of key factors from this evaluation that appear to have influenced the progress being made toward achieving the *Learning Without Limits* program implementation and goals. These factors represent high frequencies of occurrence and quality of implementation in observations. As seen, these factors cross key elements that are critical for program success:

- Types of instructional practices
  – Use of student-centered learning
  – Use of technology as a learning tool

- Quality of instructional practices
  – Use of meaningful and very meaningful computer activities

- Teacher attitudes and beliefs regarding technology integration
  – Teachers feel ready to integrate technology
  – Teachers believe technology positively impact classroom instruction and student learning
  – Teachers agreed technology efforts are well-supported

- Teacher technology skills
  – Teachers reported confidence with technology tasks
  – Teachers implemented lessons that used a variety of technology tasks

Overall, the triangulation of positive results suggest a strong synergy among the diverse factors that appear to have contributed to the *Learning Without Limits* goals during the 2003-2004 school year. The fifth grade teachers and administration should be proud of the progress the program has made in a short time. As seen, the school had positive teacher technology competence and confidence, used instructional strategies that centered on and facilitated student learning and employed classroom practices that engaged students in meaningful technology-supported activities.

REFERENCES

Lewis, E. M., Ross, S. M., Alberg, M. J. (1999). *School observation measure reliability analysis*. Memphis, TN: The University of Memphis, Center for Research in Educational Policy.

Lowther, D.L. & Ross, S.M. (1999). *Survey of Computer Use: Reliability Analysis*. Memphis, TN: Center for Research in Educational Policy, The University of Memphis.

Lowther, D. L., Ross, S. M., & Plants, R. (2000). *Expanded Rubric (ER)*. Memphis, TN: Center for Research in Educational Policy, The University of Memphis.

Lowther, D. L. & Ross, S.M (2001). *Survey of computer use*. Memphis, TN: Center for Research in Educational Policy, The University of Memphis.

Patton, M.Q. (1990). *Qualitative evaluation and research methods (2nd ed.)*. Newbury Park, CA: Sage.

Ross, S. M., Smith, L. J., & Alberg, M. (1999). *The School Observation Measure (SOM)*. Memphis, TN: Center for Research in Educational Policy, The University of Memphis.

Ross, S.M., Smith, L.J., Alberg, M., & Lowther, D.L. (2000). Using Classroom Observations as a Research and Formative Evaluation Tool in Educational Reform: The School Observation Measure. In S. Hilberg and H. Waxman (Eds.) *New Directions for Observational Research in Culturally and Linguistically Diverse Classrooms*. Santa Cruz, CA: Center for Research on Education, Diversity & Excellence.

Sterbinsky, A. (2003). *School Observation Measure Reliability Study*. Memphis, TN: Center for Research in Educational Policy, The University of Memphis.