

The Colorado Literacy Tutor
Center for Spoken Language Research (CSLR) Reading Project
Spring 2003 – Spring 2004 Research Report

Presented to:

The Institute of Cognitive Science (ICS)
&
The Center for Spoken Language Research (CSLR)

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Executive Summary

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1 Introduction

The Colorado Vocabulary Tutor project, developed by the University of Colorado’s Institute of Cognitive Science and the Center for Spoken Language Research, integrates two sets of literacy tools, one based on speech and animation technology (CSLR Reading Project), and one based on language comprehension technology (Summary Street). This report focuses on research conducted in support of the CSLR Reading Project.

The CSLR Reading Project’s primary purpose is to improve student literacy achievement by developing educational software that helps students learn to read and comprehend text. More specifically, the CSLR Reading Project, by combining interactive animated agents and multimedia learning environments, seeks to improve students’ foundational reading skills (e.g., phonological awareness), fluency and comprehension.

Placement of the CSLR Reading Project’s software in schools covers a broad range of school and classroom types, thus providing an opportunity to study implementation over a range of settings and grade levels. As of March 2004, the Reading Project tutoring software has been placed in 22 K-2, ESL and special education classrooms in six different elementary and K-8 schools in Colorado. Within the six participating schools, the tutoring software has been placed in four kindergarten classrooms, five first grade classrooms, five second grade classrooms, three ESL classrooms, and three special education classrooms (see Table 1).

Table 1: Participating Schools and Classrooms

School Names	Participating Classroom Types	Total Participating Classrooms
Aspen Creek Elementary	1 – Special Education	1
Columbine Elementary	1 - Kindergarten 1 - 1st grade 1 - 2 nd grade 1 - ESL	4
Creekside Elementary	1 - Kindergarten 2 - 1st grade 2 - 2 nd grade 1 – Special Education	6
Monarch K-8	*	
Pioneer Elementary	1 - Kindergarten 1 - 1st grade 1 - 2 nd grade 1 – Special Education	4

* Accurate information was not available at the time of this report.

Sanchez Elementary	1 - Kindergarten 1 - 1st grade 1 - 2 nd grade 2 - ESL	5
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Demographically, the participating schools had 2002-2003 student populations ranging from 817 students at Aspen Creek Elementary School, to 288 students at Sanchez Elementary School (see Table 2). Additionally, Table 2 shows that, for the 2002-2003 school year, Aspen Creek and Monarch enrolled a majority of Caucasian students (89% for both schools), while Columbine and Pioneer enrolled a majority of Hispanic students (76% and 66%, respectively) (Colorado Department of Education, 2003).

Table 2: 2002-2003 Student Enrollment by Race/Ethnicity

School Names	Student Enrollment	% Caucasian	% Hispanic	% Asian	% Black	% Native American
Aspen Creek Elementary	817	88.9	6.1	2.4	2	0.6
Monarch K-8	719	88.7	6.1	4.9	0.3	0
Pioneer Elementary	355	30.7	67.5	0.6	0.6	0.6
Columbine Elementary	315	14.8	76.1	5.8	2.6	0.7
Creekside Elementary	292	51.1	31.4	12.6	2	2.9
Sanchez Elementary	288	47	43.6	4.4	3	2

Most of the participating schools, with the exception of Aspen Creek and Monarch K-8, had a relatively high percentage of students participating in a free or reduced lunch program (see Table 3). During the 2002-2003 school year, over 75% of Columbine's students, and over 50% of Pioneer's and Sanchez's students, participated in a free or reduced lunch program. In comparison, less than 4% of Monarch's students, and less than 6% of Aspen Creek's students, participated in such a program (Colorado Department of Education, 2003).

Table 3: 2002-2003 Free /Reduced Lunch

School Name	% Free Lunch	% Reduced Lunch	Total % Free/Reduced Lunch
Columbine Elementary	78.4	7.2	85.6
Sanchez Elementary	48	8.1	56.1
Pioneer Elementary	45.4	10.6	56
Creekside Elementary	38.5	3.6	42.1
Aspen Creek Elementary	3.6	2.2	5.8
Monarch K-8	2.4	1.2	3.6

Currently, many states, including Colorado, have designed and/or adopted large assessment systems and use the results to identify schools for reward or reform. More

specifically, schools are given report cards that, for example, provide parents and the public with student scores in core academic areas (e.g., reading, writing and math) and overall academic performance and improvement ratings. The six schools participating in this study take part in the Colorado State Assessment Program (CSAP), which tests 3rd - 5th grade students in reading, writing and math. If considered as an indicator of need for alternate approaches to helping students achieve literacy in grades k-3, Table 4 indicates that participating schools span a range of literacy needs. However, CSAP literacy scores at the third grade level for the schools participating in the project indicate that the software has been installed in schools where most students test at the “Proficient” level. Table 4 shows that all six participating schools have 50% or more of their students rated as “Proficient” in reading and three of the six schools have over two-thirds of their students rated as “Proficient” in reading (Colorado Department of Education, 2004).¹

Table 4: 2004 3rd Grade CSAP Reading Results

School Name	% Advanced	% Proficient	% Partially Proficient	% Unsatisfactory	% No Score
Monarch K-8	10	79	9	2	0
Aspen Creek Elementary	14	76	10	0	0
Pioneer Elementary	4	74	11	11	0
Creekside Elementary	9	50	15	18	9
Columbine Elementary	0	50	15	25	10
Sanchez Elementary	6	51	24	8	10

2 Purpose

Research on scale-up is designed to examine the widespread implementation of learning tools and approaches that already have a successful track record in terms of learning gains and adoption in at least one classroom environment. In the case of the changing needs of this particular project, the ATLAS Evaluation and Research Team studied students using the tutors and books in the context of existing classroom literacy practices. Our goal was to discover ways in which the CSLR tools could be designed, introduced and implemented to enhance the

¹ Third grade students are only assessed in reading comprehension. Third grade students are *proficient* in reading comprehension when they can comprehend longer and increasingly difficult text, including poetry (Colorado Department of Education, 2002).

likelihood of their adoption in a wide variety of learning settings (ESL classrooms, regular k-2 classrooms, and special education classrooms).

Interaction among key project personnel from all teams involved in the project and careful study of existing research on successfully scaling up educational initiatives led our team to narrow this study by focusing on four critical factors: cognitive gain or learning, usability/infrastructure, implementation, and adoption (see Figure 1).

Figure 1: Critical Factors Impacting the Scaling up of Educational Initiatives



In the context of this study, *cognitive gain* addresses the questions of whether the software “works” by leading to learning and, if it does, then does it work as well or better than existing practices. *Usability/infrastructure* addresses the questions of whether the software works without problems, and whether there is an infrastructure in place that permits teachers and students to use the software. *Implementation* addresses the questions of in what settings does the software work and what are the contributing factors. Finally, *adoption* addresses the questions of what motivates teachers to use the software and how can they be convinced of the utility of the software to their existing literacy practices (see Table 5).

Table 5: Focus Questions Addressed by Four Scaling Factors

Factor	Focus Questions
Cognitive Gain	Does the software work for learning and, if it does, then does it work as well or better than existing practices?
Usability/Infrastructure	Does the software work without problems and is there an infrastructure in place that permits teachers and students to use the software?
Implementation	In what settings does the software work and what are the contributing factors?
Adoption	What motivates teachers to use the software and how can they be convinced of the utility of the software vis-à-vis their existing classroom literacy practices?

The category of cognitive gain falls outside the mandate of this study, but has been covered by a specialized group participating in the project. The issues of usability/infrastructure, implementation, and adoption are discussed here.

2.1 Methodology

In general, the ATLAS Team focused on *thickly describing* (Geertz, 1973) the classrooms participating in the study, seeking to capture as many contextualized details of literacy-related activities, including use of the CSLR tools, as possible. Using this approach, the ATLAS Team took more of a participatory observer role, paying close attention to what teachers and students say and do, and answering questions when asked.

However, in order to thickly describe the classroom settings without being overly influenced by our level of participation, the ATLAS Team also focused on tacking between non- or partial-, and full-participant observation. Known as *dialectical tacking* (Geertz, 1983), this approach forces the observer to continually shift their focus between the contextualized details and generalized structures of social scenes or events. Using this approach, the ATLAS Team occasionally pulled back from a participatory observer role and, for example, focused on the layout of the classroom (e.g., where the computers are in relation to the classroom workspaces), the resources used to support literacy activities (e.g., computers, CSLR tools, charts, books), and how and where students form workgroups.

Several excerpts from our fieldnotes exemplify our use of these approaches:²

Excerpt one: Classroom layout

The room is set up with 3 separate clusters of tables spread throughout the room. There are 2 computers against one wall. There are signs all over the room labeling what everything is...table, computer, bathroom, clock...

Excerpt two: Student using CSLR Reading Tutor

Sarah puts Jim on the living books "Cat in the Hat." He does use headphones. It reads him the story - it looks just like a cartoon with words on the top that get highlighted as they are read. The graphics are animated. There is also music in the background. Jim doesn't really pay attention to the book at all. He looks around the room to see what the teachers are doing.

² All names in the following excerpts have been changed to protect the identity of study participants.

Excerpt three: Classroom literacy activities

Teacher gathers students on rug by counting to ten. Students hurry to reach the rug, but all do before diez is reached by the teacher. Teacher passes out common reader and then gives instructions in Spanish. Teacher asks students questions in Spanish and several students begin to talk at once. Teacher chooses one student and student reads several sentences from reader. After the students is finished, teacher leads group in reading a part of the book that is much like the chorus of a song. Group reads “chorus” in singsong voice. This process continues for about 15 minutes.

Students have broken into gender-specific groups [four boys work at my table, one boy works with teacher and three girls work at another table] and have started to color their drawings. A nearby boy draws tears on his bookworm. He tells me it is because its mom is gone.

The group I observe is reading the book “Nathan and Nicholas Alexander”. They read silently to themselves and answer questions about the story on a “book report”. They also report on their feelings about the book and how it relates to their own lives. The teacher sits at the pod with them and helps them complete their reports, assists with spelling, and asks questions. The report also asks them to identify verbs, give definitions of difficult words, and group ideas according to “alike and different”. She uses “chunking” the words to assist the students with figuring out what word it is and how to spell the words.

2.1.1 [Sample](#)

A total of 29 K-2, ESL and special education classrooms in all five participating schools were observed. Within these classrooms, 29 teachers, and approximately 440 students, were observed using the CSLR tools and/or participating in general literacy activities.³

2.1.2 [Data Types](#)

Several types of data were used in this report, including participant and non-participant observations, online reports of technical issues and teacher comments, and a survey of teacher attitudes toward teaching with technology, the technologies they currently use in their classrooms, and their interest in the integration of technology with teaching.⁴

Six different observers conducted 35 observations of software use and/or general literacy activities in both treatment and control classrooms (see Table 6).⁵ Treatment classrooms were

³ Principals and teachers at participating schools were contacted in order to schedule classroom observations that corresponded with use of the tutors and/or general literacy activities.

⁴ Raw survey results are reported in Appendix C. These results were primarily used to inform our interpretation of the observational data and will not be reported in further detail in this report.

⁵ Treatment observations were conducted March – April 2003 and February - March 2004. Control observations were conducted February – March 2004. See Appendix A for protocols used in the 2003 and 2004 observations.

ones in which the project software was installed and being used to support literacy learning. Control classroom were those in which the tutoring software was not installed or being used by students to support literacy learning. However, the line between treatment and control classrooms should not be considered an impermeable one. Treatment observations often became control observations when the teacher did not use the tutoring software as originally scheduled. In these cases, observations of general literacy activities replaced a more specific focus on use of the tutoring software and its “fit” with existing literacy practices.

Table 6: Spring 2003 – Spring 2004 Observations

Classroom Type	# Observations
Treatment 2003	10
Treatment 2004	19
Control 2004	6
Total:	35

During the 2004 observations, the observation team filed 18 html reports of technical issues occurring during scheduled observations. The reports also contained teacher comments regarding the tutoring software. These reports were compiled through March 2004.

2.1.3 Data Analysis

The data for this study were analyzed in three stages. First, four researchers read through observation notes and tracked recurring patterns and themes. Initial coding generally starts at a higher level of detail and subsequent coding rounds organize the data under broader, more abstract headings. In an iterative process focused on narrowing patterns related to issues identified in the literature on scaling, adoption of innovations, and reform/change, three essential (but interrelated) categories for coding were agreed upon (these three themes and pattern-types were identified by all coders in their independent readings of the data). Table 7 provides details of initial codes and how they were subsumed under broader coding categories.

Table 7: Sub-codes and Descriptions

Code/Sub-code Names	Code Description
1. Fluid Process	
<ul style="list-style-type: none"> a. Approaches b. Teacher-student interactions c. Student-student interactions d. Physical layout of classroom e. Typical practices in classrooms f. Assignments g. Integration and threads 	The range of approaches to literacy; integration of technology with teaching literacy; typical tools, classroom formats, and assignments; student and teacher needs (as indicated by behavior); teacher-student and student-teacher interactions

2. Teacher attitudes	
<ul style="list-style-type: none"> a. As expressed to observers b. Teacher-student interactions with the project materials c. Teacher behavior and interaction with project materials 	Informal interviews where teachers talk to observers about their experiences (instigated by teachers); how teachers interact with students; ways teachers integrate and interact with project materials
3. Student attitudes	
<ul style="list-style-type: none"> a. Student behaviors with the project materials b. Student-teacher interactions c. As expressed to observers 	Informal interviews with students about their experiences and thoughts about the project materials (instigated by students); ways that students interact with teachers in regards to project materials; ways that students interact with project materials – behaviors, talk, interactions

Third, the total data-set was again coded for fluid process, teacher attitudes and student attitudes with two to three separate coders assigned to each individual data-set. The qualitative data analysis program NVivo was used to indicate nodes and trees that represent patterns within the total set. A fourth category was added to the set based on the interest of the technical “arm” of the IERI research group. This category organizes information about Usability and Technical Issues. Table 8 describes the final codes.

Table 8: Main Codes and Descriptions

Code Name	Code Description
Fluid Process	Strategies and practices used to support literacy instruction and learning both in control and treatment classrooms.
Teacher attitudes	Teacher attitudes about Reading Project, including software usability, observer roles, reasons for using/not using software, technology in general.
Student attitudes	Student attitudes about Reading Project, including software usability, observer roles, reasons for using/not using software, technology in general.
Usability and Technical Issues	Technical problems students and teachers experience while using the tutoring software. How students and teachers deal with technical problems experienced while using the tutoring software.

3 Findings

Data sets were examined according to type of classroom, grade level, and by node and tree classifications. The data reported here represents the range of teaching and learning settings that the project materials are intended for, including special education classrooms, a range of k-2 classrooms, students primarily at the proficient range according to 3rd grade school CSAP scores, etc. Our results describe a broad range of teaching settings and practices as well as needs (student and teacher). While there are many examples of each topic area discussed (recurring patterns and themes tend to be present in 75% or more of the observations),⁶ we select representative excerpts from field notes to make the categories being described more vivid.

3.1 Fluid Process

While there are many approaches to teaching literacy in grades k-2 for students of all abilities (such as whole language approaches), there are also a number of features that characterize classroom environments in these grades that, if taken into consideration by design, teacher training, and implementation strategies, can enhance the likelihood of successful and wide-spread adoption of materials being developed and introduced by the Colorado Literacy Group.

For teachers and scholars of literacy, a discussion of typical strategies tends to focus on approaches (e.g., whole language). Our focus is on the fluid process that teachers use to help students bridge their understanding of the spoken word and their understanding of the written word. Our observations indicate that the means teachers draw upon in order to make this bridge are often employed regardless of the skills, progression, and content focused on in the lessons. Literacy instruction in this sense (no matter which grade or skill level) is a very fluid process that involves connecting things that students read and write about with their everyday lives and experiences. These are the strategies that teachers use to provide context (often with different content) for learning and improving reading and writing skills. It can be a literacy activity that involves having a small ESL class make cookies for Valentines Day, where students have to read the recipe and then execute it. It might be having students talk or write about how a story they read relates to something that happened to them. This sort of approach was seen in all classrooms where observations occurred with the exception of one of the Special Education

⁶ When coding open-ended data where an unlimited number of possibilities exist, 75% is considered very high.

classrooms (we suspect that this was largely do to the students' particular special needs rather than a choice not to employ this strategy on the part of the teachers).

For example, in discussing a writing assignment that students were researching about animals, the literacy specialist working with the students had them share with the class what they had written so far and follows up with questioning that not only helped these students develop their writing and researching skills, it also helped them talk through (making spoken and written word connections) the process of informing others about something they are researching (early critical thinking skills).

Ms. Smith helps them reason them [out] “how does an iguana relate to a dessert . . . so what is something that would relate to an ocean.” Ms. Smith: “What else could the answer have been? A shark? A swordfish? So do you see what the relationship was? You talked about it lives in the south, you talked about that it lives in a burrow . . . you know what a burrow is, but what about someone else. Do you need to describe what a burrow is?” [The students continue to discuss how this paper might get organized and expanded on.]

Literacy instruction is also characterized by other types of fluidity. Students often spend time (even in the same one-hour period) working alone, in pairs, in small groups, and with the class as a whole on their literacy assignments. Writing assignments are often done alone (although large group discussions of writing assignments as discussed in the example above are also common). Reading tends to be done in pairs (for higher readers), in small groups, and in large classroom groups. Even when a teacher reads aloud to the whole class (often sitting on the floor together in a circle), s/he often stops to check in with the students by asking for predictions, connections to other stories or their own lives, similar experiences, and perspective-taking.

Examples of such questions include:

“What do you think will happen next?”

“Has anything like that every happened to you?”

“If you were Susie, what would you do?”

“Do you think walruses really do things like that?”

Strategies that involve prediction, connecting to their own lives, etc. once again bring literacy into other realms (moving from written to spoken words this time as well as connecting

what happens in books with the students). They also teach students underlying reading strategies that contribute to them becoming more fluent readers and make them better, more fluent writers as well.

Additional fluidity in the literacy classroom environment is evidenced by the connection between students learning to write on their own and students learning to read books and stories. Observations reveal that there is a constant tension in grades k-2 instruction between the need for students to learn to identify and recognize letters (seen in kindergarten instruction), to learn to handwrite those letters for themselves and/or be able to reproduce them from a keyboard, and for them to learn to recognize whole words. In addition to these skills, students in these grades are learning how to communicate their own thoughts in writing so that others can understand what they want to say (grammar, spelling, and punctuation as well as form and organization). In both control classrooms and in treatment classrooms we observed many instances of students moving from learning to read something to also learning to write and/or type it. In some classrooms, when a lesson on words that also includes spelling is given (the notion of opposites – “can’t” vs. “can”), the students all sit together and follow what the teacher is saying and doing, but they also use their own personal whiteboards to write down the words they are learning about and discussing. This type of example takes place in the youngest grades, but extensions of the same practice (just more sophisticated lessons) are seen in all of the older grades studied as well.

Observers expected to see fluidity and integration between the uses of technology for literacy and other types of literacy instruction. In some ways, we did find this among students in the older grades. Students would conduct research on the Internet for reports they were writing. This research also got discussed with their fellow classmates and their teacher during discussions such as that describing Ms. Smith and her classroom interactions. In addition, students in those grades often worked on stories and writing assignments on the computer and then either turned them in for their grade or would discuss them prior to having them graded in small work groups, one-on-one with the teacher, or in a large group. In that sense, integration did take place. However, those technologies were not designed to facilitate literacy and are instead tools in much the same way that a pencil and paper are tools or an encyclopedia is a tool for students. What we had anticipated, but did not see in any of the classrooms, regardless of the literacy technology being used (whether from materials developed for this project, or commercial materials available for purchase) was the application of the various characteristics discussed in

this section earlier as a means of connecting books “read” on the computer or lessons completed on the computer with anything else happening in the classroom. Teachers were making no real efforts to integrate teaching technologies designed to enhance literacy with any other aspect of regular classroom practice. No bridge was made between lessons conducted on computers with lessons conducted in other parts of the classroom environment. While this was true for all literacy teaching technologies, it must be noted that in both treatment and control classrooms, we were unable to observe very many such technologies being used. Our observational data from this past year provided us with demonstrations of the use of only one other type of literacy technology (besides the tutors and books investigated for this project) and that was Living Books. As a finding, this is consistent with the survey our group conducted at the beginning of this project – teachers in the district do not employ technology in their classrooms for the purposes of improving literacy very often – usually only in the form of word processing and internet research. This does not appear to have changed very much during the past 1.5 years.

Unlike most classroom activities, working with project materials on the computer tended to be an isolated and individualized activity. However, even while students indicated a lack of interest (a result of any number of things happening that will be discussed below), they attempted to “bridge” this isolation in several ways. While we did not observe any teachers integrating teaching technologies with other forms of classroom work or other parts of the regular literacy classroom environment, we did observe students make this sort of effort. When working side by side, the students at the computers tend to pay attention to what the other is doing, sometimes trying to give each other answers; sometimes actually trying to work together. For example:

72: The girl at the computer nudged the boy at the computer and asked him for the answer to her question on the tutor she was working on. She pointed at the letter she should click on and he shook his head -- then she pointed and another letter and he said yes so she clicked it.

109: The girls on the computer are making sure that they do the same things at the same time. This is the first time that I've seen this happen. They got to the end of the story and one said, "lets do this" while pointing at a tutor and they both went to it and did it.

Students working with project materials on the computer often tried to connect what they were doing with whatever other students in the classroom were working on by letting everyone know what “gifts” they ‘scored’ on the tutors:

174: Jack continues to yell out in delight when he gets things correct.

4: The girl doing the more difficult games wanted to “trade computers” with the other girl. She explained that she wanted the other girls presents!

30: David gets King Tut as his prize and yells it out that he got it.

7: The kids really seem to love the presents at the end of each tutor. They announce their gifts to the rest of the class, they call the teacher over to show her, other kids come over to the computer to see what gifts the student using the tutor gets, they yell “yes!” The gifts seem to be an excellent addition to the tutors!

168: when asked what they liked most, they all said the presents/prizes

Finally, when we examined all records of classrooms where the software under consideration for this project was being used, we realized that it was not being implemented fully in any class this year (there were examples of more complete integration and implementation during year 1 at Sanchez elementary than in any classroom in year 2). Implementation of an innovation means that a teacher has decided to use that innovation for the class as a whole or for all students within the class that they feel will benefit from it. In other words, implementation is teacher-driven. The teacher makes the choices about which children will work with it and how it will get used. While we understood that the software was being introduced in some classrooms (but not in others) and that the students who would use it had to have permission slips signed, it was not until observations this fall that we understood the limitations this placed on the ATLAS portion of the project (as well as on the findings about learning as a result of using the materials) in terms of understanding the software, its use/usability, its appeal, and its integration into classrooms. Note that last year’s implementation were in a very small number of classrooms and for a very short period of time. This year’s introduction into classrooms was characterized as an implementation, so at a minimum, we expected teachers to be selecting students for whom the materials were appropriate from among the students who returned permission slips. Instead, we found that teachers were putting all students with signed forms on the materials. In special education classrooms, there were usually set times for the use of the software and some students were scheduled to work on it every day. In other classrooms, there were set times and an ordered

list of students who would work with the materials, but these were often not followed for a variety of reasons. In many cases (more than half of the treatment classrooms observed), we found that teachers assigned students to work on the software because someone from the project was present (rather than because it was something they normally did). For example:

82: William is telling Gary to get on the computer and says "Kate [observer] needs you to" and I said he doesn't have to, I don't need to.... in other words, the kid was going to be required to use the computer even though there are other more interesting and probably more valuable learning activities going on.

This sort of behavior (again, seen in more than half the treatment classrooms) on the part of teachers influences not only observation results, but also student attitudes toward the materials – often negatively. Teacher behavior and the lack of integration of the materials into their regular teaching practices limited the ability of the observations to focus on usability, design, and technical issues. One result of this is a breadth of observations rather than depth. In other words, observations covered as many types of classrooms involved in this study as possible rather than selecting a few that could be followed over a several week period.

3.2 Teacher Attitudes

Teacher attitudes toward any type of teaching innovation are critical to any level of successful adoption. It would be easy to discount a section focused on teacher attitudes toward the existing software and its implementation in their classrooms or toward any teaching technology as having little to offer in terms of understanding and designing for scalability. That would be shortsighted in this case. We can examine and cite specific behaviors that teachers engaged in that both indicate and verify the specific attitudes they express in the discussion below (e.g., the fact that teachers do not see any need for integrating or even recognize that they could integrate teaching technologies designed to support their other classroom literacy approaches is an indication of their fundamental beliefs and assumptions about teaching and the place technology can hold in the teaching process – they see it as an extension of books and pencils rather than as meaningful assignments and interactions). The purpose of the discussion here is to highlight those teacher behaviors and needs as a means of better understanding how features of the software developed for this project can be designed and packaged in ways that make its usefulness and integration in the classroom clear to teachers.

Many of the teachers were very frustrated by the technical problems and glitches they had to deal with on a regular basis:

153: Ms. Burkhart: "I think this could be a really useful program, and I was really excited to get it but with all of the errors and stuff...I have to leave what I'm doing and go over and help them and it's just not ideal."

21: Often the students will call the teacher over when they experience problems with the computers/ software. The little girl using the writing center is having problems opening her file and she calls Ms. Burkhart over to help. An error report comes up on the computer where the girl is working (an internet explorer error). She calls Ms. Burkhart over. The computer goes to the gray screen. It freezes, and she calls Ms. Burkhart over to help her.

6: They also said that when the computers crash they have to stop what they're doing and go help and "It's a pain" but that they have patience with it now because they know it's in a pilot phase.

81: She stated several times that she did not have any time to try to fix the computers when something went wrong, she didn't have time to see how the students were doing on the tutors, and if given the option, would not have time to send an email re: problems or suggestions.

Many of the teachers are frustrated by the classroom management issues involved with having the tutors in the classroom:

24: "It's so hard because I'm trying to handle guided reading while trying to manage the tutors. It's just so hard," says Ms. Burkhart.

50: Teacher also tells me she is a control classroom and that, frankly, she is glad. She believes that having the computers takes too much time away from the rest of the students who aren't working on the computers. She classifies it as a management problem. Moreover, teacher believes that she spends a lot of time on small group instruction and that this is how her students best learn how to read and write. She believes the tutors interfere with this type of instruction. She also suggested that, for some teachers, the computers get them off the hook by allowing them to "pawn off" some of the students to a digital instructor.

42: One teacher commented that it's a bit of a problem that the first kid on the computer misses the first part of the story when they are all reading together.

85: she is trying to integrate the tutors in to literacy class but simply does not have the time available when kids are not doing other literacy activities.

153: " I have to leave what I'm doing and go over and help them and it's just not ideal."

These sorts of issues could help explain why teachers often forgot to have their students work on the project software. They also shed light on why it is that the majority of the treatment teachers did not integrate the materials into their regular literacy practices. As discussed previously, classrooms are very fluid places and a great deal of a teacher's time and energy goes into finding the most effective ways of helping students and simultaneously managing the classroom environment. In the lower grades in particular, discipline or teaching students how to function and behave in a classroom environment are issues that permeate all facets of classroom experiences.

Some of the teachers thought observers were there either purely as tech support or as evaluators:

3: Teacher tells class that today some of you will be using computers and you may be asked questions about what you like, dislike and such by Mr. Titus ...(pointing to me).

7: He wanders around the room. Teacher asks him if computer is working. He says no. Teacher points to me and says, "Maybe Mr. Titus can help. He is the computer guy."

110: Ms. Burkhart seems really occupied with what I'm writing down concerning the rest of the class. I told her I'm just taking down what I see -- reading in pairs, teacher works with kid individually, etc.

This is an important perception in several ways since it impacts how they received and treated the ATLAS team of observers. In many cases, the labels of "tech" people and/or "evaluators" restricted our ability to conduct research. It prevented teachers from behaving as they ordinarily would in a number of cases. This limited our ability of observe how teachers actually use the materials in their classrooms.

Some of the teachers expressed that the software doesn't meet their teaching/ literacy needs on a daily basis:

106: Ms. Burkhart says that he's very basic and this is way too hard to him; he's not getting enough practice in the skills he needs.

128: She has 4 kids who really need phonemic awareness stuff and she was really hoping to get this with the tutors -- a couple still haven't had permission forms turned in. I asked her if she wanted them to work in groups on the computers (The way she was talking about it kind of seemed like that). She said no -- she wants them to do it individually, but she really wants them to get the every day practice. She said this would be especially useful for the second language learner kids.

132: There is a list of words for second graders that they need to be able to identify and spell. L says: "I think that is part of the tutor somewhere, regardless I think that's a really useful thing for the kids to do on the tutors" -- learn their required list of spelling words -- for the 2nd grade they are words like a, about, all, an, and, are, as, at, be, but, by, not, what, etc.

9: Ms. Cart says she would use reading software if it used reading strategies ("think of a word that would make sense") She thinks phonics is good, but not exclusively. The best is a combination of whole language and phonics. They use a video program called "Story Lords" that she likes a lot because it uses reading strategies. She wants the kids to think more and sound out less. She would love a comprehension program.

33: Other teacher suggests that they practice writing before reading the book on the main whiteboard (on easel) in front of room. Book is entitled, "I Can't Sleep". Teachers lead students in writing can't on their whiteboards. They explain the difference between can't and can by covering and uncovering their ears and saying they can and can't hear the students. They also point out the role of the apostrophe in shortening longer words (i.e., cannot). Teacher asks students to show her their writing.

129: I asked what it would take to get them to adopt it regularly (they think its great for the phonics aspect of it because they don't spend much time with it) but it needs to be more challenging and they need to have 2 computers so they can use the tutors for "centers." They put the kids in pairs to do centers. What they do is they rotate through all of the centers in 15-minute intervals in

pairs, reading to each other, writing in their journals, reading with the teacher etc. They think that the tutors would be a great center.

There are a number of reports of teachers really loving the software:

38: The teachers agree that the tutors “have been great and haven’t disturbed class much at all.”

98: She said that she loves having two computers because she can move more kids through and they can work together if necessary. She said they still really love the gifts and to keep that going.

5: The teacher also stated that when the software works, it is wonderful because she can work with groups of kids, while other kids practice skills on tutor.

17: Yesterday Ms. Wally told me that the computer is really helpful for these kids.

75: Teacher comments: 1) Ms. Packer told me at the end of class that she really enjoys using the software and that her ESL students find the software especially useful.

34: I talked with the helper about the tutors. He told me that the kids are, for the most part, excited to do the tutors, but there are a handful who are not. He thinks its because the tutors are too easy for them.

35: He said that he doesn’t really think that it takes them away from the rest of the class too much because if they don't want to do the computer they can just say that they want to pass up their turn and continue with what the rest of the class is doing.

36: He thinks they're a good addition.

Many teachers commented that the tutors would be especially useful for ESL or Spanish-speaking students

90: She told me that over half of her kids are ESL and could really use time on the literacy software. Teacher feels that using the software would give many of her ESL students a chance to use computers for the first time.

53: Ms. Kaw also mentioned that the ESL classroom only has one computer, and could really use two.

75: Teacher comments: 1) Ms. Packer told me at the end of class that she really enjoys using the software and that her ESL students find the software especially useful.

These comments and others like them demonstrate that some teachers do see a role for the materials in their classrooms. This means that other teachers can be persuaded in ways that will change their attitudes from negative to positive too.

All of these teacher perceptions are critical because they shed light on what can be featured about the software so that it can appeal to more teachers. Negative attitudes can often be addressed by featuring the things that lead to positive attitudes. They provide a foundation to work and build on and determining ways to highlight features of the software that address the concerns and negative attitudes of teachers (the features already exist – often in the MLE area of the system – but teachers are not “seeing” these features). Teacher attitudes as discussed here provide strong indicators of what the “available means of persuasion” are in this particular case (Aristotle, translation: Kennedy, 1991). Many of the fundamentals are already in place in the software and teachers are simply not featuring them in their thoughts as they use it in their classrooms.

3.3 Student Attitudes

The students often showed signs of boredom, including fidgeting, playing with everything in the software except for the tutor itself, playing with things on the table next to them, trying to end early, being very concerned with what is going on with the rest of the class, etc. These behaviors suggest that the materials are often too easy for them.

180: Jack plays with the mouse pad as he plays. He also turns the speakers on and off at various times. He also starts to play with the things on the wall next to him -- losing interest it seems.

32: David logs out of the tutor and then logs back on. He points and clicks pretty much everywhere except where he's supposed to in the game

58: Tim's 15 minutes are up. Prior to the 15 minutes showing on the screen he stops playing and watches the last 30 seconds or so of the tutor and waits for the countdown to finish. The second the 15 minutes hits he bolts off the computer and then goes back and logs off.

24: *The boy at the tutor is now not really using it properly (or so it seems). He is simply clicking on all of the sounds to make Gurney say things over and over and it seems like in some sort of pattern.*

91: *Now he takes the headphones off and moves the mouth piece over his mouth and says "Hello Hello"*

92: *He's back to playing with Gurney*

93: *Student on computer to girl sitting near by: "Hey, watch what I can do." and he moves Gurney around some more. The girl doesn't watch or comment.*

94: *He yawns and stretches and covers his eyes.*

95: *He looks up Gurney's dress again.*

59: *I only saw one student react negatively. After she finished one tutor she logged out and went back to her seat. She still had 7 minutes left. Her teacher told her that she didn't have to stop until she was told to. The little girl said that she was "tired of dealing with Ms. Gurney."*

71: *I noticed two students in particular showing definite signs of boredom (playing with their shoes, playing with their fingernails, drawing on their hands and legs). Despite this lack of attention to the tutors, they both still managed to get through 3 full tutors.*

1: *I talked to a little boy and asked him if he liked the tutors. He said kinda but not really because she keeps asking the same things over and over. He also doesn't like it because he has to keep spelling the same words over and over, and it's not so fun.*

54: *The girl at the computer says "I don't want to do it anymore"*

8: *"Ms. Jill I don't really want to do the computer" says the girl at the computer*

78: *I go over and ask her why she doesn't want to do the computer. Without hesitation she says "because she asks too easy ones." Interesting. I wonder if this is why they are all so much less enthusiastic about it.*

70: *Comments from students: --After using the tutors for about 15 minutes one little girl asked me if she had to use the computer (Polly was out of the room): I said no, but asked her why she didn't want to use it. She said because it was boring. I then asked her if it was too easy for her and she said, "No, just boring." I asked*

another little girl and a little boy if they liked using the tutors. Both of them said that they did like playing with Ms Gurney, but that it was too easy.

166: The feedback from most of the kids was that the tutors were boring. A few said that they enjoyed using them at first, but now they are too easy and boring. They said the tutors never progressed them to higher levels.

In a number of instances, the rest of the class worked on something “fun” (e.g., watching a movie, making cookies, making an art project, etc.) and the students working with project materials on the computer were excluded from these activities. Again, this is an indication of the failure to integrate the software into normal classroom routines. There are many other activities going on in the classroom as well while the students are working on the tutors (e.g., small group reading work). It is not surprising that they tend to get distracted by them while they are supposed to be working with project software:

60: She continues to do well with the tutors but looks back at the class a lot to see what they're doing in their circles.

62: She looks back after just about every one she answers on the tutor.

92: Evan (at the computer) has stopped doing the tutor and watches the class read for about 2 minutes.

110: On the tutor he's gotten them all right and keeps getting distracted, looking back at the class (every minute or so)

Some of the students really enjoy the software in general:

164: He says, "I love this game with the matching part."

178: He seems to really enjoy it (just said Ooh yeah" as he played for no real reason.

3: The kids seemed to enjoy their time on the tutor and enjoyed getting their prize at the end of each session.

These student behaviors not only indicate that it is essential for the software to be integrated in the regular classroom experience, they also point to some design issues. For example, why are students working at levels on the tutors and the books that are not appropriate for them? Some of the students clearly found the material to be too easy for them while others (usually students in

resource rooms) found it to be too hard. Is part of the problem that half or more of the students in these schools score at the proficient level on the CSAP so they do not need remediation in this form? Or is it that teachers are failing to use the MLE to set harder levels for the students? Does the current software move students along (even skipping levels) based on how they do on the first exercise or book? If this is occurring and the students are working at appropriate levels for their reading skills, then it appears that the design of the tutors needs to be more interactive and engaging. Many of these questions can be addressed by the results of the learning assessment team for the project. Observations indicate that there is something that is not quite working correctly in terms of students interacting with the software. This is especially important because observations of control classrooms as well as of treatment classroom activities for students not using the tutors indicate that students are not experiencing problems with interaction and engagement in those learning environments. These student behaviors occurred with students on project materials only (students don't always pay attention in any class, but the problem of engagement and attention among students working on the project materials was extreme).

4 Implications

Our findings are organized according to the key elements identified both in the project and literature related to the adoption of innovations, scalability, etc. Due to the revised nature of the project as a whole, we are unable to comment on and discuss factors that led to successful scale-up of the project materials and approach. Rather, we focus on the categories that typically influence scalability of a teaching innovation in terms of how what was learned through observations can be used to in future implementations of the materials. Implications for design, implementation, and strategies for adoption and are discussed below. Most critical are the indications that an understanding of typical teaching practices and classroom interaction as well as teacher needs and expectations are opportunities to ensure successful implementation and widespread adoption.

4.1 Usability/Infrastructure

When considered in terms of successfully scaling a teaching innovation, usability and infrastructure generally refer to the ease of use and interface with the software as well as the other support infrastructures (e.g., adequate computers for running the software; knowledgeable

users and support providers; fast internet lines; etc.). In all treatment classrooms, computers for running the software were provided by the project (a practice that is cost-prohibitive in terms of scalability). There are many reasons the computers already in the schools were not adequate for project software. Some reasons were technical considerations (i.e., school computers tend to be old and slow). Other reasons were a result of where, how, and how many computers are available in individual classrooms. The end result of the lack of infrastructure and support available in schools to run project software strongly indicates that it is currently unlikely that project software is scaleable. Despite this, a great deal was learned in the observations about how existing features of the software package could be more effectively communicated to teachers so that if they had access to better computers, the approach and software could be scaled.

We found other evidence that the software is not easily used and adopted by teachers who participated in treatment classrooms. Teachers' primary experiences with the software often focused on overcoming problems with it while simultaneously trying to manage their classroom environment. Their understanding of their role and that of their students was characterized by the idea of "troubleshooting". Based on their focus, questions and interaction with observers, and the feedback they provided, teachers felt their purpose was to tell project team members what did not work well with the software. This assumption directed their focus to technical rather than content and implementation difficulties (although a few teachers did provide feedback on the content and approach that underlay the software). While technical progress was made during the past 1.5 years of the project (i.e., the Spring 2003 implementation was riddled with many more technical problems than seen in the Spring 2004 implementation), the software was interpreted by users and project personnel alike as something that was in a "pilot" phase.

For example, one teacher volunteered the following:

6: They also said that when the computers crash they have to stop what they're doing and go help and "It's a pain" but that they have patience with it now because they know it's in a pilot phase.

Labeling the software as a pilot certainly helped teachers account for the problems and frustration they and their students experienced, but at the same time, calling it a pilot also allowed them to keep use of the software as something apart from the rest of the classroom literacy experience. In this way, it created a situation in which teachers never even needed to

think about actually integrating and adopting the software. The label of “pilot” functions as a terministic screen (Burke, 1966) that directs and narrows teachers’ attention away from other ways of interacting with and characterizing the software. Labeling the software in this way leads to teacher perceptions of the software characterized by an underlying belief that these materials are something “apart” and that because it is a pilot, there is no reason to integrate them into regular classroom work. With pilot functioning as an interpretive screen or filter in this way, teachers are most likely to not even or ever consider that they could integrate the materials in their regular teaching practices. A terministic screen like “pilot project” can (and probably did) actually function to prevent *adoption* of a new teaching innovation. As a result, use of the materials becomes limited and no information about how they can be seamlessly integrated into normal/existing practices is available. Allowing teachers to think about the project in these terms limits even the ability to study usability. Re-characterizing teacher and student participation in the project is a simple and critical way to enable them to account for difficulties and yet encourage integration. Another label such as “implementation” or even “phase 1 implementation” would function in this way and alter the focus teachers have on technical problems to one on how to implement this software in their classrooms. This approach also engages the teachers at a different level such that the software is not something they have no influence over, but is rather part of a larger set of issues that asks them to share their experiences as they implement this teaching innovation in their classrooms. Re-characterizing what is taking place in their classroom vis-à-vis the software is an opportunity to make teachers more equal partners with the research and development team.

At the same time, it is important to consider what teachers normally do during literacy times as a way of demonstrating how easily and readily the software can be integrated into their normal teaching practices. There are features within the software that are consistent with their normal literacy practices and classroom needs, but which were not emphasized in practice. Teachers noted their frustration with the technical problems most often within the context of issues of classroom and learning management. The comments discussed in the section on teacher attitudes suggest that while teachers often see value in the teaching approach and literacy skills covered by the software, these benefits are over-shadowed by the sheer difficulty of being able to conduct business as usual during literacy time when the software is used. Teachers get called over to assist with technical problems at least once a session – usually more often. To do

this, they have to take time away from their other students to focus on something that doesn't have anything to do with literacy and learning and instead has everything to do with technology. This prevents teachers and students both from recognizing and capitalizing on the value of the software and keeps it something that does not easily or readily integrate into their normal classroom literacy experiences.

Thus, a user-interface that is not transparent to students when problems arise (they are unable to resolve problems on their own) overshadows the cognitive as well as classroom management benefits of the software. The primary strength of this software is that it allows students to work independently (with the aide of the animated agent) on skills that they need help with. Ideally, they should be able to do this on their own, without supervision because that means that the student gets the necessary one-on-one time to strengthen a particular skill or set of skills related to literacy and reading fluency, while the teacher is free to work with other students and groups that do not need help with that skill. Instead, what we see in classrooms is a computer program that requires almost constant attention on the part of the teacher and doesn't free up any time. Nor does it seem to function effectively as a skill enhancer that moves students along to the appropriate levels (see examples from student attitudes – boredom and the frequent problem with the level of the activities and readings being too low). Observations did not reveal any indication that teachers were making use of the MLE features of the software. In spite of their having received training about how to use this feature, it failed to get adopted in the treatment classrooms and led to undesirable results such as student boredom, or at least a lack of engagement. Moreover, teachers believed that using the software poses a classroom management problem.

Some ideas for addressing this came from observations (including teacher comments):

212: She would like to have a manual to help refresh her memory on how to do some things.

8: Ms. Burkhardt doesn't understand how the kids progress through the tutors

23: It is very apparent that there needs to be more teacher involvement with the tutors. The kids enjoy them but it seems that there is a lot of time wasted on activities that are either too easy or too difficult for the students. She really needs to be more educated on the MLE.

Certainly the design and implementation of the teacher training sessions need to be reconsidered in ways that can help address the lack of use and understanding of the MLE. One suggestion is to focus the purpose of the training sessions on helping teachers integrate what is possible, the mechanics of how to use it, and how these features fit with their normal classroom practices.

A further limitation imposed on the study of software usability took place through the role project personnel repeatedly assigned ATLAS team researchers involved in the project. In k-2 classrooms, “evaluation” and “evaluators” are seen as people who will pass judgment on teachers and their abilities. In communication between the project member assigned to act as a liaison between teachers (and the district) and all other project personnel, the ATLAS team was repeatedly referred to as “evaluators” rather than indicating their true capacity in the project – that of “researchers”. The deeply-held perception that teachers have about evaluators and what the purpose of evaluation is (based on their own experiences) colored their interactions with observers – often in negative ways. The ATLAS team was able to overcome these attitudes with time, but this required considerable effort in relationship negotiation and management. With more experienced teachers, we were often not completely successful in renegotiating our purpose and role – they remained skeptical and suspicious of us. Being hampered in this way created a research situation in which researchers were often unable to adequately follow up on both the positive and negative aspects of software usability.

4.2 Implementation

Implementation is a process by which schools, programs, and/or teachers use a teaching innovation in classrooms. On at least some level, this process is controlled and influenced by the classroom teachers themselves. They decide to implement an innovation and in doing so, they determine how and in what format the innovation will be used, who will be using it and how the innovation fits with other activities and assignments in their class (e.g., they determine how to assess individual students’ progress and use of the materials contained in the innovation). As discussed before, no true implementation was observed in any of the treatment classrooms. However, lessons learned from both control classrooms and treatment classrooms about their normal needs and practices with regards to literacy instruction does suggest a number of

opportunities for software design, introduction and training to increase the likelihood of successful adoption.

The fluid nature of literacy instruction described above indicates that teachers need activities and assignments that can be used to bridge their students' understanding of the spoken word into the realm of the written word. They do this in many ways including having students talk about things that they have read with one another, with the teacher, and with the class. Activities designed to accompany the books and tutors that move them from an interaction solely with the computer to one that fits in with typical classroom interactions are one way to achieve something that is visible to the teachers – something that they can easily and readily see fits in with how they usually work with the students. In addition, the comprehension questions included with the books could use more of the types of questions that extend the reading beyond comprehension into the realm of making connections with students' everyday lives as well as their ability to make predictions (the questions typically used to do this that were discussed previously). Essentially, the suggestion (based on observation data of the types of activities and assignments made during literacy lessons in both control and treatment classrooms) is to not only have comprehension questions to test students' ability to read and understand what they have read, but to also help them make connections between things that they read and their own thoughts, feelings, predictions, questions, etc. It is true that there are no “wrong” answers to questions asking students what they think will happen to the characters or in the story next or to questions that ask them if they ever had an experience like that or felt that way, but having them engage in the more active nature of reading (it is not just something you get through, it's something you think about even as you are reading) would make the experience of working with the books more like the experiences they have with physical books used in their literacy classroom settings. In addition to these types of questions, other assignments like getting the class engaged in finding out more about a subject (research), making something connected to what they read, etc. would also assist teachers and students in integrating and thus fully implementing the books as part of their normal literacy practice. The same types of extensions can be made for activities in the tutors. Even something as simple as having those students who work on the tutors share with the class what they did, what their strategies were for doing it, what they learned, and how well they did (their prizes) would make it easier and more clear to teachers that all project software and materials fit in well with the practices they already use.

4.3 Adoption

Adoption of a new teaching innovation involves a complex system of interactions, needs, persuasion, and exposure. Usability and implementation are both areas that contribute either positively or negatively to a final outcome that leads to adoption, but we were unable to observe, trace, or track this level of commitment during the course of this project either (due primarily to issues described in the usability and implementation sections). Unfortunately, our research for the project cannot provide a great deal of insight into what can happen with the project software to lead to this outcome. By its very nature, usability/infrastructure and an understanding of implementation are essential precursors to adoption. However, one critical piece of information/insight gleaned from the research conducted by the ATLAS team during this project will be very valuable once true software implementations occur. In both the early survey conducted for this project and in the observational data, it was clear that teachers in this range of k-2 classrooms most often treat technology as a tool that is simply an extension of pencils and papers and of encyclopedias (they rarely even provide students in these early grades with strategies for conducting research on the internet, but require it anyway – a practice that was/is also typical of the lack of attention to the process of conducting research found in early grades with regards to physical books as well). In this way, teacher behavior suggests an attitude toward technology that restricts its use and fails to highlight ways that activities conducted on the computer that relate to literacy can be integrated into regular classroom practices and activities. Until this barrier is overcome (and this software has the potential to do so), it will not become widely adopted.

5 Summary

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Appendices

Appendix A: Observation Protocols

2003 Observation Protocol

IERI VOCAB Classroom Observations

Observer:

Date:

School:

Grade:

Time:

Teacher:

Note

Observation Guidelines for IERI VOCAB Classrooms

Guiding Questions

1. If teachers could dream up a literacy solution, what would it look like?
 2. What factors influence the widespread adoption of literacy tools and approaches, particularly software in the primary grades?
 3. What are teachers' and students' needs and desires surrounding literacy?
 - What needs do teachers and students express with respect to literacy? Please note that this question is not about technology, but general literacy needs that could be solved using any number of strategies.
 - What aspects of teachers' and students' everyday and periodic needs could be fulfilled either by the tutoring software itself or through the managed learning environment?
-

General Information

Observer:

Total time spent observing:

Date:

School:

Grade:

Teacher:

Control / Treatment:

Students:

males:

females:

What is currently being done in the classroom? More specifically:

1. Is literacy something that occurs during a set time frame on a daily basis or is it something that is integrated into many activities throughout the day (*please select one*)?

- a. Occurs during set time frame on daily basis:
- b. Integrated into many activities throughout day:
- c. Other:

Please describe your selection below:

2. What tools and systems are being used to support literacy instruction (*please check all that apply*)?

- a. Books:
- b. Software:
- c. Activities:
- d. Other:

Please describe *each* selection below:

3. Why do teachers use the tutoring software (for those that are using it)?

4. Do teachers who use the tutoring software also use the Managed Learning Environment (MLE)?

- a. Yes:
- b. No:

Please describe your selection below (i.e., how they use it and whether it is a novel or recommended use):

How is it being done? More specifically:

1. The *majority* of literacy-related interactions are focused on (*please select one*):

- c. One activity at a time:
- d. Several different activities at a time:
- e. Movement of small groups of students among room's activity centers:
- f. Other:

Please describe your selection below:

2. The *majority* of literacy-related interactions take place between (*please select one*):

- g. Teachers and individual students:
- h. Teachers and small groups (including pairs) of students:
- i. Teachers and entire class:
- j. Teachers and entire class, but teachers express desire to work with smaller groups of students:
- k. Other:

Please describe your selection below:

3. In what ways are teacher-individual interactions different than teacher-group interactions? In what ways are they similar?

4. Do teachers *tend to* (please select one):

- a. Adapt their literacy instruction to the demands of their students:
- b. Stick to a set schedule of literacy activities regardless of student engagement:
- c. Other:

Please describe your selection below:

5. For teachers that tend to adapt, what is the context of these adaptations?

6. For teachers using software to support literacy instruction, how does it get used (*please select one*)?

- l. Teacher spends *majority* of time with individual students on computers:
- m. Teacher spends *majority* of time with pairs of students on computers:
- n. Teacher spends *majority* of time with small groups of students on computers:
- o. Teacher spends *majority* of time with whole class on computers:
- p. Teachers do not use software with students, but express a desire to do so:
- q. Other:

Please describe your selection below:

7. For students using software to support literacy learning, how does it get used (*please select one*)?

- r. Students work alone on computers:
- s. Students work in pairs on computers:
- t. Students work in small groups on computers:
- u. All students work on computers at the same time:
- v. Students do not use software, but express a desire to do so:
- w. Other:

Please describe your selection below:

8. For students using software to support literacy learning, do they work in their own classroom, or do they go to a different room?

- x. Students stay in own classroom to work on computers:
- y. Students go to different room to work on computers:

Please describe your selection below:

Does the tutoring software work without problems? Is there infrastructure in place that permits teachers to use it?

1. Did the classroom start with the infrastructure (e.g., computers, Internet connectivity, space) necessary to support the use of the tutoring software (*please select one*)?

- a. Yes:
- b. No:
- c. Other:

Please describe your selection below:

2. Do teachers and students experience technical difficulties while using the tutoring software (*please select one*)?

- a. Yes:
- b. No:
- c. Other:

Please describe your selection below:

3. How do teachers react to technical difficulties experienced with the tutoring software?

4. How do students react to technical difficulties experienced with the tutoring software?

General Notes

Appendix B: Summaries of Technical Problems and Solutions

Technical Problems

Freezing - The computers froze on many occasions because the program was left idle in either the Ms. Gurney screen or the log in screen for short durations; other times it would happen for no discernable reason. When this happened, the computer would display either a dos screen or a blank gray screen.

Flicker – On several occasions, Ms. Gurney would flicker between a large and small image. On one occasion, Ms. Gurney flickered a few times before the program froze.

Slow Runtime - The program had a delayed response time from user commands. After logging in, it sometimes took over 45 seconds for Ms. Gurney to appear. When this occurred, Ms. Gurney looked like she was in slow motion.

Logging In - Students had trouble logging in for a variety of reasons. Sometimes it was a user error and other times it was a program error. Teachers could not change their students' login names, so requests often had to be processed by the technical support team.

Sound - The sound on the computers often failed. Sometimes Ms. Gurney mispronounced words and sometimes the sound would be completely inaudible. Other time she would read the same word over and over again, even when students clicked on new ones. Sometimes, the headphones themselves failed and had to be switched with another pair.

Complete Computer Failure – One of the two computers would completely fail. This happened on multiple occasions. The computer would not turn on or load the program.

User Errors - Multiple times, the problem originated not with the program but with the teacher's or student's own unfamiliarity with computers. Sometimes students could not figure out what to click on, some were unclear about their login names, and others had trouble using the keyboards for logging in. Students often opened windows that were not pertinent to the program. Teachers would often become frustrated when they could not fix errors.

Technical Solutions

Training – A few teachers recommended that, to reduce technical problems, both students and teachers should be trained to troubleshoot common issues. Teaching assistants were often unable to help with technical problems due to their own lack of familiarity with computers. When problems arose, having assistance from either a professional or a peer often allowed students to progress through uncertain areas that otherwise inhibit their use of the program.

Adjusting Computer Settings - Especially in cases where the sound was too quiet, a teacher or assistant would go into the computer's settings and raise the computer's master volume. This appeared to work quite effectively in every instance except one in which the sound problems originated in a faulty output plug.

Pressing "Next" - Students were often able to progress through errors or glitches by pressing "next" or "again".

Rebooting Computer - Turning off and restarting the computer was a primary solution to errors, especially to fatal Internet Explorer errors. When the computer would restart, the students or supervisor would restart the program and the error would have been fixed.

Restarting Program - Closing and restarting the program solved a number of problems, including slow runtime or login problems.

Adjusting Plugs - Adjusting and inspecting the sound output plugs often redressed sound problems with headphones. In some cases, a request to have the hardware fixed or replaced was processed.

Moving Computers/Equipment Switch - More often than not, the main solution to recurring problems was to switch computers. An effective solution to sound problems was to switch headphones with the other computer.

Appendix C: Raw Survey Data

What exactly do we want to put here?