INTRODUCTION

We propose a five-year, interdisciplinary effort to create a research-based, large-scale project designed to have a positive impact on young children's reading achievement. This project brings together an interdisciplinary team of experts in areas including pre-service teacher education, early childhood literacy development, instructional technology, cognitive psychology, survey research, quantitative and qualitative methodologies, computer-related early literacy instruction, and web design. The project seeks to improve children's reading achievement by enhancing pre-service teachers' knowledge and thus their implementation of proven best practices for teaching reading. It also seeks to establish as yet unavailable guidelines for the use of technology related to best practices in the K-3 literacy curriculum. Technology will be utilized as a "value added" delivery vehicle for the project, including a location on the Internet for case-based, anchored instruction, ongoing support, data collection and dissemination. We intend to leverage the resources and mission of The Southeast Literacy Consortium (SELC) in enhancing the scalability of the materials we will create. The SELC exists currently in 11 states and has 85 members, mostly faculty of universities and colleges who are engaged in teacher education, research, and who have close contacts with the school districts in their regions. We will use this network of members to establish and train a cadre of 30 SELC educators who, in turn, will teach over 3,000 pre-service teachers during the implementation phases of the project. They will engage in field trials and participate in a research and development program that uses both quantitative and qualitative methodologies. Reading achievement scores for approximately 2,000 students will be collected in the two final years of the project to document the effects of this project's approach on children's reading achievement.

At the conclusion of the five years, we will have answered the following core research questions:

1. Can multimedia, anchored, case-based instruction, delivered via CD/DVD and/or over the Internet, enhance pre-service teachers' knowledge of best practices for teaching reading and, if so, does this knowledge result in the implementation of these practices in K-3 classrooms?
2. Does teacher preparation that includes multimedia, anchored, case-based instruction, delivered via CD/DVD and/or over the Internet, result in teachers who teach in ways that affect K-3 children's reading achievement in statistically significant, positive ways?
3. Will the provision and implementation of guidelines that integrate technology meaningfully into existing best practices for reading instruction result in positive effects on K-3 children's reading achievement?

In this proposal, we provide the rationale for our argument that changing pre-service literacy education and integrating technology into the K-3 curriculum has great potential to enhance children's reading achievement. Following the theoretical rationale, we detail a synergistic set of development and research efforts that span five years and will result in meeting our project's goals.

RATIONALE

A recent report by The National Research Council's Committee on the Prevention of Reading Difficulties in Young Children (Snow, Burns, & Griffin, 1998) synthesizes relevant research. It suggests that young children of diverse abilities, ethnicities, and socioeconomic levels learn best in classrooms where teachers are expert decision makers who are able to make the best use of available curriculum materials and resources to design productive instructional activities that meet the literacy needs of their students. According to this report, teacher education faces a critical challenge: Even though pre-service early childhood teacher education courses aim to prepare educators to implement exemplary literacy instructional practices, developing the ability to engage in complex problem solving is extremely difficult to realize. This view is also supported by the National Academy of Sciences report, *How People Learn* (Bransford, Brown & Cocking, 1999), which provides clear indicators of how technology can be used to enhance learning environments, teacher education, and children's learning in schools.

The following beliefs are the basis for our proposal:

- We note that textbooks and reports from pre-service literacy instructors have, for the past two decades, contained most if not all of the best practices advocated by the National Panel reports described in detail later. That is, decoding skills, including phonemic awareness and fluency, comprehension strategies, vocabulary strategies, and so on, have all been a part of the pre-service education curriculum and in mainstream college textbooks for some time.
- We feel the issue is <u>not</u> that little is known about best practices for teaching reading, but that teacher education programs should and can do better at training our teachers to understand and implement these practices.

- We feel that traditional methods, largely consisting of lecture and transmission models of teaching, are not doing the necessary job in training our future teachers--if they were, implementations of best practices would be more prevalent that they now are.
- We feel that moving toward an integration of traditional methods with case-based methods now common in law, medical and business schools provides opportunities that will enhance pre-service teachers' knowledge and skills.
- We feel that better teachers--teachers who know well the best practices for teaching reading and know how and when to use them--will result in reading achievement gains for children
- We feel that technology affords unique opportunities to enhance both pre-service, case-based instruction, as well as teaching and learning in K-3 classrooms, in ways that will result in children's reading achievement gains.

However, complicating the issue of how to better go about preparing early childhood educators to implement best practices is the fact that "Few teacher education programs currently provide preparation in technology use, and many that do provide it as an isolated course, seldom within reading or literacy methods courses." (Leu & Kinzer, 2000, p. 123). While computers have recently become permanent fixtures in society in general and in elementary and early childhood classrooms in particular (Technology Counts, 1999), their use as an effective resource either for teacher training or as an instructional classroom resource for children's literacy acquisition and development remains largely untapped and under-researched. A recent national survey indicates that only 1 of 5 public school teachers believe that their professional development training has adequately prepared them to use computers for instruction (U.S. Department of Education, 1999).

Educators of young children are unsure about what constitutes best computer-related practices and frequently end up using computers for low level tasks that could be just as easily accomplished with paper and pencil (Becker, 1991; Labbo & Reinking, 1999). Educators of the 2000s are faced with the enormous task of preparing students to be literate in a future that is unclear and for a level of computer-related literacy that many educators themselves have not yet grasped (Leu & Kinzer, 2000). Therefore it comes as little surprise that teachers across the nation do not routinely integrate available computer-related technologies into their everyday literacy curriculum (U.S. Congress, 1995).

In spite of a growing research base that consists of snapshots of best practices (Labbo, 2000), teachers and teacher educators lack a clear vision of a bigger picture for effective literacy-related classroom computer usage. Teachers want to know how to analyze features of software that meets a wide range of literacy needs of individual students (e.g., high, middle, and low literacy abilities); how to align various types of software (e.g., multimedia composing, word processing, games, simulations, skill practice, etc.) with interrelated literacy curricular objectives (e.g., phonemic awareness, phonics, vocabulary, sight word recognition, concepts about print, informational text familiarity, fluency, comprehension). It is critical that teacher educators find affordable, effective, and adaptable ways to create opportunities for pre-service teachers to learn how computers can be used to support young children's literacy development within the complex and varied worlds of early childhood classrooms that exist in a variety of locations and contexts.

Today, children need to be prepared for much more than book literacies. Increasingly, scholars argue it is essential to expand traditional definitions of literacies to include the best practices in the literacies of our children's future (Leu, 2000; Leu & Kinzer, 2000). In 1999, for example, 63% of K-12 classrooms in the U.S. had at least one Internet computer and it is expected that nearly 100% of U. S. classrooms will have this new tool in 2002. The rapid appearance in many of our classrooms of networked information and communication technologies (ICT), such as the Internet, requires us to fundamentally redefine our understanding of the literacy curriculum. By studying best practices of Internet use and computer software in the primary grades, we will contribute important information to a critical area. This information will be used to extend our cases of best practices to include best practices within technology use.

Thus, our project has several components that we expect will lead to increases in K-3 children's reading achievement: enhancing pre-service teacher education through case-based instruction targeting known best practices; establishing as yet unavailable best practices for effective technology uses in K-3 classrooms; and incorporating these into our cases for pre-service literacy classes. We will document how these components affect pre-service teachers' knowledge and skill at using best practices in reading instruction, and will rigorously test and document the reading achievement of children in these teachers' classrooms, comparing their achievement to the achievement of children in classrooms of teachers who have been trained in traditional pre-service programs. In doing so, we will have met four appropriate benchmarks as defined in the RFP:

1. Addressing appropriate uses and implementation of technology. As will become clear, we implement technology in both our pre-service and our K-3 classroom locations in ways that will enhance children's' reading achievement.
2. Scalability. Our design uses a step-wise method that ensures testing of our products in ways that move from the four individual Co-PI's sites, to across Co-PI sites, to 20 participating Southeast Literacy Consortium universities, to a web site accessible by pre-service and in-service teachers nationally. By moving from small to large-scale implementation and testing across states, we ensure that our project maximizes its national potential. The inclusion of the Center for the Improvement of Early Literacy (CIERA) and the International Reading Association's publication division as dissemination partners for our project ensures national visibility for our work. (See letters of support.)
3. Methodological rigor. Our research design uses a step-wise, synergistic, recursive methodology that uses the answers to research questions in one year to inform and thus appropriately modify our work and testing in the following year. Similarly, we have structured our research questions so that they answer needed questions that ultimately, at the conclusion of year 5, will be able to answer the overarching and important issue addressed by this project: Will technology-enhanced, case-based instruction of pre-service teachers, which includes currently-known best practices for teaching reading as well as to-be-identified, technology-based best practices for teaching reading, positively affect children's reading achievement? As detailed later, both quantitative and qualitative procedures will be used to test and document outcomes on a large scale. Appropriate design and measures are assured by the expertise of the research team as well as by clear responsibilities assigned to experts in assessment who serve on the interdisciplinary team.
4. Interdisciplinary and appropriate team membership. Each of the four Co-PIs brings a needed but different area of expertise to the project. Labbo (University of Georgia) is an expert in the use of technology, software and sign systems/semiotics, especially as occurring in kindergarten classrooms with young children. Kinzer (Vanderbilt University) is an expert in case-based, technology enhanced pre-service education and anchored instruction uses of technology. Leu (University of Connecticut) is an expert on technology use and the integration of Internet strategies in classrooms. Teale (University of Illinois, Chicago Circle) is an expert in early literacy development and developmental/emergent aspects of literacy. In addition, this proposal makes use of consultants in specifically-designated ways that requires their participation (as reflected in the budget) in long-term and meaningful tasks. Fuchs adds expertise in special needs learners and skill development in reading instruction, specifically in the area of phonemic awareness. Cordray adds expertise in measurement, design and evaluation as well as psychological aspects of assessment. Verhoeven adds expertise in linguistics, cognition and second language learners. Reinking adds expertise in formative teaching experiments as an assessment procedure and technology. Thus, the above-named and other team members, from areas of educational technology, early literacy, psychology and assessment, linguistics/cognition/second-language learning, pre-service education/case-based learning, and so on, ensure interdisciplinary perspectives on the issue we address.

RESEARCH QUESTIONS

The proposed research project is an ambitious effort to develop effective teacher education materials that are adaptable to a variety of training situations and educational contexts. As described below, these research questions emerged from efforts to enhance educational practice and student literacy development within digital anchor cases, in light of a broader effort to understand a practical, scalable model of teacher learning that is consistent with socio-cognitive and constructivist learning theories. The questions begin with initial research to identify best practices as we develop cases based on this research. They move to formative assessment of the effectiveness of our pre-service instructional cases and then to summative assessment of our cases in a large-scale implementation. This large scale implementation includes the assessment of pre-service teachers' knowledge of best practices, pre-service teachers' use of best practices in their classrooms as compared to the classrooms of other teachers not trained through our methods, and children's reading achievement within these teachers' classrooms as compared to the reading achievement of children in comparable settings but with teachers who have not participated in our training. These synergistic and step-wise development efforts and concomitant research questions, implemented across the years of the project, will ensure modification of implementations on a year-by-year basis and will lead to more effective teacher preparation methods. This design will allow us to answer this important question at the end of the project: Will technology-enhanced, case-based instruction of pre-service teachers, which includes currently-known best practices for teaching reading as well as to-be-identified, technology-based best practices for teaching reading, positively affect children's reading achievement?

Figure 1: Research questions and Sets of Studies Proposed by Year of the Project

Year	Research Questions	Sets of Studies Proposed

1	• What are the best practices of classroom technology use for early literacy instruction as defined by K-3 teachers exemplary at using technology in their classrooms.
	• To what extent does a national survey of K-3 classroom teachers indicate that
	  • they engage in best practices of early literacy instruction, including the use of technology?
	  • they are familiar with best practices in early literacy instruction, including the use of technology?
	  • they would seek more information about best practices in early literacy instruction including the use of technology?
		• Survey of primary grade teachers, identified by others as exemplary at using technology in support of the best practices in early literacy instruction, to determine guidelines and best practices of technology use in phonemic awareness, word analysis/phonics, fluency, and comprehension, especially within content areas such as science and math.
		• National survey of K-3 classroom teachers to evaluate their use, familiarity, and interest in understanding more about the best practices of early literacy instruction, including the use of technology.
		• Reviews of the best practice research literature on reading instruction and recent national reports.

2	• How might the design of CD/DVD and/or Internet technology for pre-service teacher education using case-based, anchored instruction in the use of best practices of early literacy be optimized? • How might case-based, anchored instruction for pre-service, primary grade teacher education with CD/DVD and/or Internet technology best be used? • To what extent are the measures developed for the year 3 studies valid and reliable?	• Conduct formative experiments on the most effective use of case-based instruction using CD/DVD and/or Internet cases of best practices and pre-service classes at four sites: University of Georgia, University of Illinois, University of Connecticut, Vanderbilt University. • Conduct validity and reliability assessment of measures used in year three.

3	• Do case-based, materials for pre-service, primary grade teachers , designed with CD/DVD and/or Internet technologies
	  • significantly increase student knowledge of best practices in early literacy?
	  • significantly increase their knowledge of technology use for delivering best practice in early reading?
	• Does providing communication opportunities through a listserv
	  • significantly increase pre-service students' knowledge of best practices in early reading?
	  • significantly increase their knowledge of technology use for delivering best practice in early reading?
	• To what extent are the measures developed for the year 4 and 5 studies valid and reliable?
		• Conduct experimental and qualitative studies of year three pre-service teachers.
		• Conduct validity and reliability assessment of measures used in years four and five.

4	• (Same questions for year 4 cohort of pre-service teachers as for year 3 cohort above.)
	• Do teachers who received case-based instruction with CD/DVD and/or Internet technologies
	  • use best practices significantly more often in their primary grade classrooms than pre-service teachers who did not receive this preparation?
	  • use technology significantly more often for delivering best practice in early reading?
	• Do primary grade children achieve at significantly higher levels of reading and writing when they have teachers who received case-based instruction with digital technologies during pre-service education?
		• Conduct experimental study of year four pre-service teachers as per year three teachers above.
		• Complete quantitative and qualitative classroom observational study of teacher implementation in classrooms of teachers from year three cohort..
		• Complete quantitative analysis of student achievement in classrooms of teachers from year three cohort.

5	• (Same classroom questions as per year 4 above.) • Do significant differences in the frequency of best practice use, frequency of technology use, and student achievement in reading due to the use of case-based instruction sustain themselves over a two-year period?	• Complete second year of the classroom study of teacher use and student achievement in classrooms of teachers from year three cohort. • Complete the classroom study of teacher use and student achievement in classrooms of teachers from year four cohort.

THEORETICAL BACKGROUND

The proposed project is based on a convergence of relevant theoretical underpinnings that are complex enough to address the various multifaceted components of the study. The first set of theories informs the development and study of digital anchor cases designed to impact educators use of effective literacy and computer-related literacy practices that promotes children's literacy acquisition. The second set of theories involves understanding the role of computers in addressing effective early childhood literacy instruction and children's literacy development. Both sets of theories are undergirded by a cognitive apprenticeship framework which acknowledges that learners, whether they are children in a kindergarten classroom or an adult in a professional development course, benefit from active instruction and goal-oriented interactions with more knowledgeable others (e.g., teachers, mentors, experts, more experienced peers) (Brown et al., 1989).

Convergent theories that undergird what we know about how teachers develop professionally.

Teacher education traditionally involves a transmission delivery system using a craft and competency-based model (Alvermann, 1990; Bransford, Brown & Cocking, 1999). As such, traditional models rely on lectures, textbook readings, supplementary readings, a series of overheads, a field experience, and attempts to provide simulations of instructional situations through role-playing or viewing of video tapes of instructional practices (Kinzer & Risko, 1998). Students do not usually see the identified practices (usually described in pristine conditions) actually used in context-rich or complex situations. As a result, this commonly-adapted perspective on teacher education denies students opportunities to engage in the sort of analysis, reflection, or decision-making that enables them to begin to think like an expert or to modify the learned procedures in ways that meet differing instructional needs in the real world they encounter in elementary classrooms.

Case-based instruction (Merseth, 1991; Shulman, 1995; Silverman & Welty, 1995), occurring in various professional fields (e.g., law, medicine, social work), focuses on a narrator's presentation of situations, facts, problems, and solutions; however, the notion behind case-based instruction is typically one of learning how to think

like an expert with the support of experts' opinions as expressed either in the written narratives or in the comments and corrective feedback of instructors. Through social interactions, reflective thinking, and corrective feedback, novices learn to think like their more expert professional guides. Experts differ from novices in that experts have a richer base of knowledge, are able to recognize and analyze patterns, and are fluent in applying knowledge and solving problems in practical situations (Alvermann, 1990). As Reinking, Mealey, and Ridgeway (1993) note, developing conditional knowledge (ability to analyze effectively and creatively) should be the focus of professional development, with procedural knowledge (ability to carry out a strategy) and declarative knowledge (ability to define a strategy) in supportive roles. Thus, knowledge that teachers receive during training should go beyond a mere regurgitation of descriptions or definitions of steps involved in an effective practice to organized occasions for accessing a knowledge base that informs effective instructional decisions. During training and professional development, teachers need to have opportunities to move into expert realms of decision-making when they engage in case-based educational experiences (e.g., readings, problem solving, and discussions) and when they receive feedback from an expert on their proposed solutions.

A cognitive apprenticeship model aligns and undergirds digital anchor cases because teachers and students share visual images, sustained and malleable video clips of practice, related readings, and a social context that provides for exploration of in-depth, effective decision making and classroom interventions. This theoretical insight is at the center of our research efforts.

Convergent theories that undergird what we know about how children become literate in conventional and digital environments.

Wright (1987) suggests that adequate theories may need to wait until more is known about the optimal formats for displaying electronic and printed texts; however, instead of seeking one overarching theory, it is possible that computer-related literacy development is so complex that it will require a convergence of multiple theoretical underpinnings. Therefore, we base this part of our work on both *socio-cognitive learning theory* and *semiotics*. *Socio-cognitive learning theory*, the framework most frequently adopted by literacy researchers, literacy curriculum writers, and early childhood classroom teachers in the early 2000s, is based on instructionally utilizing a child's "zone of proximal development ... " the distance between the actual developmental level as determined by [the child's] independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). The language and thinking displayed by the teacher or more capable peer during a shared instructional activity will be internalized, reconstructed, and appropriated by the child over time. Thus, what the child is able to do with help today, s/he will be able to do independently tomorrow. As Leu and Kinzer (2000) observe, social learning strategies are crucial to children's literacy development within Internet technologies because social collaborations, such as group learning among peers or Internet project participants, help prepare them for future workplace organizational/decision-making frameworks.

Another theoretical perspective, *semiotics*, sheds light on digital literacy learning processes and instruction because it combines cognitive psychological and socio-cultural learning theory (Lemke, 1998). The cognitive psychology component is grounded in the idea that comprehension is mediated by students' abilities to interpret signs and sign systems. From a digital perspective, children construct meaning by interpreting an array of multimedia signs (ie., words, icons, music, video) they encounter on a computer screen. From a semiotic perspective, the social and cultural contexts surrounding the signs play a role in meaning making. Thus, the purposes for meaning making, the culturally agreed upon interpretations of the symbols, and the interactions with significant others in the environment all combine to effect meaning (Rowe, 1994).

A productive developmental reading perspective, *balanced instruction*, informs effective literacy practices and recognizes a convergence of the theoretical underpinnings of socio-cognitivism and semiotics necessary to understand children's computer-related literacy development. *A balanced approach* to literacy instruction in elementary school (McIntyre & Pressley, 1996; Freppon & Dahl, 1998) can be interpreted in many ways, as in a balance between instructional approaches, philosophies, home/school cultures, school/community literacy goals, etc. Usually, however, it refers to the notion that literacy instructional time should be allocated among various materials, methods, language systems, and literacy skills that include, but are not limited to, those that focus on the word-level (i.e., word recognition, word analysis, phonics), passage-level (i.e., fluency, comprehension), strategic level (i.e., monitoring comprehension, fix-up strategies, text structure), and aesthetic level (i.e., personal response, literary appreciation, grand conversations about literature) (Stahl, 1998). When socio-cognitive and constructivist theories are applied to a balanced approach, there will be a range of types of instructional activities offered to children so they become literate, each used at appropriate times and in appropriate ways. Some approaches are more relevant at certain stages of learners' literacy development, though none can be ignored.. From this perspective, literate people

are able to use various registers or forms of oral and written language to participate in their various daily discourse communities including those that are public (i.e., work-related, government-related, commerce-related) and those that are personal (i.e., social, entertaining, spiritual) (Beach, 1995; Venezsky,1990). This includes the use of computer and Internet resources for information and communication.

PRIOR RESEARCH INCLUDING RECENT NATIONAL REPORTS

Findings from prior research inform the current proposed study and provide a framework for best computer-related practices that will be included in the digital anchor cases. In the past five years, a number of syntheses of research related to early literacy have appeared (e.g., Bus, van IJzendorn, & Pellegrini 1995; Snow, Burns & Griffith, 1998). Also, the National Reading Panel (NRP, 2000) recently published what is arguably the most methodologically rigorous metaanalysis of research on instructional reading methods that "show the most promise" and are "ready for application in the classroom." A number of aspects of the NRP report related specifically to best practices for early literacy instruction.

On the issue of Phonemic Awareness (PA) instruction, the Panel found the following:

- teaching children how to manipulate the sounds in language improves their reading both in the short term and in the long term;
- children of various abilities benefit from PA instruction; and
- PA training is most effective when children to are taught to manipulate phonemes in conjunction with attention to letters.

Phonics Instruction was another area of great importance to this research. The Panel found that phonics instruction:

- produced significant reading achievement benefits for students in preschool through 3rd grade and for children having difficulty learning to read;
- improved the ability to spell phonetically and conventionally across K-3; and
- had substantial effects in K and grade 1, indicating that systematic phonics programs should be implemented at these levels.

The Panel also noted concerns about phonics instruction that bear on the issue of best practices as they will be implemented in the cases developed for this research project. On one hand, they noted that scripted phonics programs may dull teacher interest and motivation. Also, they indicated that because there is no clear definition for "intensive" phonics, no research support could be found for the implementation of intensive phonics programs at the primary grade levels.

The final area the NRP studied that is relevant to this research project is reading fluency. The conclusions were that:

- For both good readers and those experiencing reading difficulties, guided repeated reading procedures had a clear and positive impact on word recognition, fluency and comprehension across K-3.

Accordingly, these research-based findings will provide the foundation for producing the digital cases that demonstrate best literacy instruction practices and the use of technology in K-3 classroom.

Alignment of features of technology with effective literacy development and instruction.

Another issue is how best to align the use of technology with best practices in traditional reading instruction. A National Association for the Education of Young Children position statement indicates that there is now enough research to suggest the positive effects of computers on young children's literacy development (Clements, 1994). Computers are most effective when they are used to supplement not supplant literacy instruction. Researchers, combining theory with pedagogical advantages of computers, have developed applications that support many goals of literacy instruction (Reitsma, 1988; Roth & Beck, 1987) as children progress through various stages in their literacy development(Chall, 1983). Effective teachers know why features of software contribute to children literacy development, how to utilize features of software to meet individual children's literacy needs and to align with the curriculum, and how to assess children's computer-related literacy development and achievement (Labbo & Sprague, in press). Our research suggests that teacher's roles for effective computer-related use across grade levels involve modeling, mentoring, and managing (Labbo & Ash, 1998; Labbo, 2000; Labbo & Sprague, in press). As insightful as prior research in this area has been, however, additional research is needed to clarify the role of computers, software, and Internet applications in effective early childhood literacy instruction.

When considering phonemic awareness and phonics instruction, for example, the type of software selected will depend upon children's literacy needs. Children in kindergarten, generally in an emergent literacy (Teale & Sulzby, 1986) or awareness stage (Stahl, 1998), form a conceptual foundation for reading. Those most likely to experience academic success later in school understand the functions, forms, and conventions of print and develop phonemic awareness. Features of software can lend themselves to instructional activities that focus on phonemic awareness (Lundberg, Frost & Peterson, 1988), letter recognition, alphabetic principle/phonics, comprehension, vocabulary development (Anderson & Freebody, 1981), listening, speaking, and writing (Labbo & Teale, 1996; Stahl, 1998). Teachers need guidelines for how to select software for various instructional purposes and groupings.

Children in first grade are typically in an initial stage of conventional literacy development at the beginning of formal reading instruction. Instructional approaches require systematic, direction instruction, related practice in instructional level reading materials (Adams, 1990), engagement in authentic literature (Trachtenburg, 1990), engagement with information texts (Duke, 2000). The general focus is on providing various opportunities for children to construct knowledge about how to accurately decode words, recognize basic sound/symbol correspondences, gain more control over phonics skills, develop vocabulary concepts, and read connected informational text for meaning (Adams, 1990). Instruction should help children attend to orthographic features in words, develop complex networks of knowledge about letter patterns and sound patterns (Adams, 1990), and become more fluent in writing and reading connected text. Researchers, have explored how on-demand pronunciations of words in talking books offer first grade children occasions for acquiring sight words, improving their attitudes toward reading, and fostering decoding skills (Lewin, 1995; McKenna, 1998). The interactive features of CD-ROM Talking books provide opportunities for young children's development of concepts about print, vocabulary, comprehension of story, engagement with story, and higher level thinking skills (Labbo & Kuhn, in press; Labbo, 2000).

Anchor cases

Anchor cases (Cognition and Technology Group, 1990; Lundeberg, 1999), involve the sustained, repeated explorations of classroom instructional scenarios that allow pre-service teachers to understand the kinds of problems teachers encounter and the knowledge experts use in their decision making. That is, video cases become a common anchor for instructors and students to construct knowledge through discussions of theory, research, and practice. The random access capabilities of CD/DVD/and Internet technologies allow teachers and students to call-up particular clips of diagnostic interactions for extended study. The cases contain videos of classroom lessons and related materials that serve as a springboard for discussion, a model, and a practice tool. Additionally, the capability of revisiting scenes from real-world settings allows for a re-viewing that is not available in the real world and is difficult and unwieldy to accomplish when attempting to use video tapes. Through the interactive viewing of video from classrooms, these technologies offer malleable interaction and tailored presentation of developmentally appropriate and research-based literacy instruction and the developmentally appropriate use of computer technologies. In addition, they can provide students with (1) extensions of Internet assignments as well as class and course readings, (2) an interactive on-line discussion forum, (3) a link to other relevant sites (e.g., experts in the field), (4) access to guidelines for studying cases, and (5) access to supplemental information (e.g., hard copies of testing instruments, lesson plans, summaries of information about students, etc.). Our preliminary findings from previous research on digital anchor cases (Kinzer & Risko, 1998; Labbo & Field, 1996; Labbo & Field, 1997; Risko, 1995) indicate that undergraduate students engage in high levels of problem solving, gain expertise, confidence, and the ability to implement literacy instructional strategies in the field. Sustained, repeated explorations of classroom instructional scenarios and best computer-related practices appears to enable pre-service teachers to understand the levels of complex decision making involved in real life situations.

PROJECT DESIGN

One of the primary purposes of the research project is to provide powerful case study examples of how traditional as well as new computer-based approaches to literacy instruction can dramatically enhance educational practice - regardless of the educational setting or literacy curriculum materials. In practice, small differences in teachers' decision making and the implementation of best practices, may result in big differences in achievement for students. Therefore, qualitative measures that result in insights about the processes of implementation of computer-related interventions are just as crucial as those findings that come from empirically determined student literacy achievement results. Evaluation will include both quantitative and qualitative measures as well as formative and summative components. Additional assessment of the project's impact on participant knowledge, skills, beliefs, and actions will be aligned with the project goals. Figure 1 identifies yearly focus, project tasks, and primary responsibilities. Multiple, complementary methods and a range of approaches will be conducted, including survey

research, observations of implementation in individual curriculum design activities and classrooms, as well as assessment of participant's knowledge of procedures. Interviews, problem-solving questions, transcripts of learning activities, and paper and pencil measures of factual and conceptual understanding will be collected. Various ethnographic techniques (Glaser & Straus, 1967; Lincoln & Guba, 1985) including observations by Co-PIs, school district administrators, SELC instructors, pre-service teacher self-report data, and interviews will be used to evaluate implementation of the project and to provide insights not available exclusively through quantitative measures. Objective evidence of the effectiveness and impact of the project will be enhanced with interpretative narratives to help others understand implementation of best practices and computer-related practices in various educational contexts. Triangulation with multiple methods will yield a more realistic and complete view of the effectiveness of the anchor cases (Glaser & Straus, 1967; Lincoln & Guba, 1985). The succession of ongoing formative evaluations will be guided and carried out continuously by project staff. Process evaluations will audit development and field testing of the cases (i.e., Did we do what we said we were going to do? Are we on schedule? What changes are needed?). Pedagogical and content experts on the team and an advisory council of K-3 teachers will offer formative feedback on the content and use of the cases. This structured formative evaluation will provide the basis for revision to improve the implementation of the cases. Cordray, an expert in quantitative methodologies will provide guidance and feedback on overall design, quality, and educational impact of the effort and will guide the summative evaluation.

THE ROLE OF CONSULTANTS

We have made a special effort to consider carefully the role and the selection of each consultant in this project. Each brings special skills to complement the interdisciplinary effort in a project as complex as this one. The specific roles are listed in Figure 2 (above). Their backgrounds and special skills that complement ours are described later in our proposal. We also want to note that Hillinger brings a special blend of Internet and multimedia design, training, programming skills along with impressive research training in Cognitive Psychology. He will be do much of the programming and design work, a critical component of this project, with Kinzer and Leu.

EQUAL ACCESS TO UNDER-REPRESENTED GROUPS

We intend to make every effort to concentrate our work, wherever possible, in schools with substantial numbers of underrepresented groups. All four of the main project sites, as well as all member SELC universities who will participate in the large-scale implementation, have active affirmative action policies that will be followed in hiring personnel for this project. In addition, every effort will be made to contact qualified minorities and women who might be interested in positions as research assistants, teachers, data collectors and general project staff. This will be done through local publications and by contacting the respective academic Departments at the university sites, where listings of qualified graduate students needing funding are maintained. Additionally, this project specifically addresses the need of handicapped and low achieving children, and many of these children will participate in and benefit from the project. The research will be specifically designed to ensure that students included in the studies represent minorities as they occur in the participating school systems. Our cases will take place in a variety of school classrooms, including those that have a significant proportion of under-represented groups as defined by race, culture, handicapping conditions, or second-language characteristics.

ADEQUACY OF RESOURCES

Each of the four institutions that serve as central sites for this project is known for a long tradition of leadership in research in education and other areas. Each is a Research I institution. In addition, each also has extensive resources and a significant record at successfully completing major research grants. Peabody College of Vanderbilt University has many additional resources available to this project including: The Department of Special Education, The Learning Technology Center, the John F. Kennedy Center for Research on Education and Human Development, The Program Evaluation Laboratory, the Education and Central University Libraries, Vanderbilt University Computer Services, and the Policy and Evaluation Center. Each of these resources is among the top in the nation. The University of Georgia is one of the leading centers for research on reading in this country. Among many other facilities, it has available the Survey Research Center, located within the Institute for Behavioral Research, featuring a highly qualified professional staff with extensive experience in conducting large scale survey research projects and managing large data sets. The University of Illinois at Chicago is the largest university in the Chicago area. Its library has over 1,800,000 volumes and 1.5 million publications in the Documents Department. It has access to numerous urban public schools for case development in the Chicago area. The University of Connecticut is the only Ph.D. granting public university in Connecticut and one of only two Research I public universities in New England. The University of Connecticut libraries contain more than 2,800,000 volumes and currently make

over 100 electronic databases available to faculty and students, offering individual assistance in the use of them. The Neag School of Education at the University of Connecticut has the largest endowment (more than $25,000,000) of any School of Education in the country. It has Professional Development Schools in Hartford, a major urban center, and other nearby districts. At each institution, the office staff is well trained and able to provide secretarial and administrative assistance. All offices are equipped with networked computers with direct access to e-mail, Internet services, library resources. Office meeting space, routine office support, and access to classrooms equipped with computer work stations, media stations, projection equipment, and DVD capabilities will be provided. The School of Education at each institution attracts many of the brightest graduate students in the nation, and maintains a large pool of graduate students who are capable of serving as research assistants.

IMPACT OF THE PROPOSED PROJECT

We expect the proposed project to have significant, positive impact on the pre-service teachers and their instructors who directly participate in the project. More importantly, we also expect this work to have a national impact on the reading achievement of children and the education of pre-service teachers through the development of our web site. Direct participants are expected to number approximately 20 faculty and their classes from the SELC, with each faculty member teaching a class of 30 students during each of two semesters in years three through four, approximating 2,400 pre-service teachers. In addition, the children taught by these pre-service teachers are expected to benefit in terms of their reading achievement. In addition, we expect many more teacher educators, pre-service teachers, and classroom teachers will gain from using the cases located at our web site.

Perhaps the most important impact, however, is the development of a research-based demonstration to the nation of the potential improvements in pre-service teachers' learning when new, innovative approaches to teaching and learning are implemented. We expect the products and outcomes to influence professionals and thereby impact professional practice. In part, this will occur through an ambitious dissemination plan for sharing information about the interventions and the multimedia case instructional packages with other professionals.

DISSEMINATION

Six types of dissemination activities are planned. We will: (1) make our cases available and share information about the project via the world wide web; (2) submit manuscripts describing project results for publication in appropriate journals in the fields of literacy, curriculum, teacher education, and public policy; (3) deliver conference presentations at national, regional, and local levels, including meetings for researchers, professor of education, university education school administrators, and public policy personnel; (4) submit versions of all written products as technical reports to pertinent ERIC locations, a demonstrably effective diffusion network, (5) submit technical reports for inclusion in the publication catalogs of the Center for the Improvement of Early Reading Achievement (CIERA; see letter of support and commitment) and the Publication Division of the International Reading Association (see letter of support and commitment); and finally (6) we will seek funding to maintain the web site that will provide on-line case-based training for use by instructors with pre-service teachers. We feel that our dissemination plan ensures the continued impact and life of our project's work well beyond the funding period.