External Evaluation Report

Digital Literacy Portfolio Series

Interactive Multimedia Case Studies

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November 2001

Introduction

This document is the External Evaluation Report for the Digital Literacy Portfolio Series, a series of interactive multimedia cases focused on early literacy, that were developed by Dr. Betsy Baker and Dr. Judy Wedman, both Early Literacy faculty in the College of Education at the University of Missouri. Primary funding for this initiative came from the Fund for the Improvement of Postsecondary Education (FIPSE), a funding program of the U.S. Department of Education, with additional funding provided by the University of Missouri. This external evaluation was conducted over a four-year period by Dr. Thomas C. Reeves, an evaluation consultant, from The University of Georgia. The evaluation, which involved several site visits to the University of Missouri, began in the Fall Semester of 1998 and concluded in the Fall Semester of 2001.

Background

Detailed information about the Digital Literacy Portfolio Series (DLPS) can be found at the official project web site located at: http://www.missouri.edu/~dlps/. According to information found on the project web site, this project was inspired in 1997 by then President Clinton's statement of a national educational goal that every child in the United States of America should be able to read independently by third grade. Several of the specific challenges that the project directors, Dr. Betsy Baker and Dr. Judy Wedman, wished to overcome through the development of the DLPS included:

1) many children have insufficient literacy abilities,

2) elementary school educators commonly make instructional decisions based on children's performance with little understanding of children's cognitive strategies, and

3) efforts to adequately prepare teachers to support children's literacy development are severely limited by a lack of materials and methods which promote effective teacher preparation.

To obtain the resources to meet these challenges, Dr. Baker and Dr. Wedman applied to the Fund for the Improvement of Postsecondary Education (FIPSE) for funding to develop a series of interactive multimedia case studies that would be used by undergraduate students enrolled in teacher education programs. These interactive multimedia CD-ROMs have been designed to address the following needs for more effective teacher preparation:

1) the need for anchored instruction (Cognition and Technology Group at Vanderbilt, 1990),

2) the need to reflect on teaching practices by discussing and revisiting the anchor shared with peers and instructors,

3) the need to situate learning in realistic contexts (Brown, Collins, & Duiguid, 1989),

4) the need to experience generative learning (Wittrock, 1974, 1992), and

5) the need to gain experience with the ill-structured nature of teaching.

The resultant interactive learning materials have been primarily designed for use in teacher education programs to give preservice literacy teachers access to observations and diagnostic opportunities similar to what they will have as practicing teachers. Instead of listening to lectures about analyzing children's strategic literacy thought processes, the preservice teachers use the DLPS materials interact with multimedia (e.g., viewing videos of a child reading at various stages of the school year while at the same time viewing facsimiles of the materials the child is reading) to accomplish several high level cognitive tasks. These tasks include identifying problems related to the analysis of children's strategic literacy thought processes, sharing and reflecting on their analysis methods, and developing better ways to make sense of children's cognitive strategies.

In all, six cases have been developed. Each case consists of one child's reading and writing samples over a whole school year in the following content areas: Literature, Social Studies, Science, and Math. The children were videotaped as they read and wrote during whole class instruction, small group interactions, and individual work. The interactive case studies also include scans of the books the children read and the writings they produced.

While there are other examples of interactive multimedia materials developed for literacy instruction (Hughes, Packard, & Pearson, 2000; Kinzer & Risko, 1998), the DLPS materials are unique in several ways. First, rather than focusing on what the teacher does to teach literacy, the DLPS materials focus on the child. Second, these materials provide the data that preservice teachers need to analyze the literacy growth of a child over an entire academic year, rather than a snapshot of their abilities at one point in time. Third, the DLPS multimedia cases are diverse with respect to both culture and ability. Fourth, they have been designed for use in multiple ways ranging from whole class instruction to individual problem-solving.

During the development and implementation of the DLPS, the principal investigators, Dr. Betsy Baker and Dr. Judy Wedman, in collaboration with colleagues and graduate assistants at the University of Missouri, have carried out several educational research studies using the multimedia materials with preservice teacher education students. The results of these studies have been presented at national and international literacy and reading conferences (e.g., Baker & Wedman, 2000; Wedman, Baker, Kingsley-Hawkins, & Rha, 1999) and published in referred education research journals (e.g., Baker, 2000). At the time of this report, additional papers were being submitted to other journals.

Purpose

The external evaluation of DLPS had four primary purposes:

- To identify corrections, improvements, and extensions to the DLPS during design and development;
- To describe the implementation of the DLPS in an undergraduate teacher education program;
- To determine faculty and student reactions to the DLPS as an interactive multimedia learning environment; and
- To judge the feasibility of the DLPS as a model for further development of preservice teacher education materials.

The focus of the evaluation has gradually shifted from one that was primarily formative (intended to improve) in the first few years of the project to one that is now primarily summative (intended to estimate effectiveness and worth) in the last year of the initiative. However, even the last stages of the evaluation have included formative perspectives.

Specific aspects of the DLPS that were examined during the formative stages of the evaluation included:

- Content validity;
- Graphical user interface;
- Pedagogical dimensions;
- Implementation guidelines; and
- Technical requirements.

Specific aspects of the DLPS that were examined during the summative stages of the evaluation included:

- Student reactions;
- Instructor reactions;
- Instructional effectiveness;
- Impact;
- Dissemination; and

- Feasibility of DLPS as a model or template for further development.

Stakeholders

The primary stakeholders (or audiences) for this evaluation are the DLPS Project Directors, Dr. Betsy Baker and Dr. Judy Wedman. They are the clients who have requested this external evaluation from the author of this report, Dr. Thomas C. Reeves, an evaluation consultant and professor of Instructional Technology at The University of Georgia. Dr. Reeves was introduced to the Project Directors by other faculty at the University of Missouri for whom he had conducted previous evaluations.

Additional stakeholders include:

- Project officers at FIPSE, the primary funding agency for this project;
- Administrators of the University of Missouri who also provided funding;
- Faculty and students at the University of Missouri;
- Teachers in the cooperating public schools; and
- The wider teacher education community.

Decisions

This evaluation has not been an end in itself, but a means of providing information to the project participants so that they could engage in better decision-making about the design, implementation, and dissemination of the DLPS materials. To increase the likelihood that the evaluation would have utility (Patton, 1997), it was important to delineate probable decisions in advance. The following decisions were identified as likely to be influenced by the results of this evaluation:

1. Improvements and corrections would be made to the DLPS materials;
2. Guidelines for the implementation of the DLPS materials would be developed;
3. Recommendations for the further dissemination of the DLPS materials would be made; and
4. The feasibility of the DLPS materials as a model or template for the design of additional teacher education multimedia would be determined.

Questions

To inform the decisions identified above and accomplish the overall formative and summative purposes of this evaluation, the following questions were addressed:

1) What recommendations can be made for enhancing the user interface and reliability of the DLPS materials?

2) What are the recommended procedures for implementing the DLPS materials in preservice teacher education literacy courses?

3) What pedagogical dimensions are evident in the design and implementation of the DLPS materials?

4) What are the technical requirements of implementing the DLPS materials in preservice teacher education courses?

5) What are faculty reactions to the DLPS materials as an effective interactive learning environment for preservice teacher education?

6) What are student reactions to the DLPS materials as an effective interactive learning environment for preservice teacher education?

7) What is the immediate instructional effectiveness of the DLPS materials in the context of their use at the University of Missouri?

8) What is the impact of the DLPS materials on the students who graduate from the College of Education at the University of Missouri?

9) What recommendations can be made concerning the dissemination of the DLPS materials?

10) What recommendations can be made concerning the feasibility of the DLPS materials as a model or template for the design of other interactive multimedia resources for teacher education programs?

Methods

This external evaluation incorporated a number of data collection methods to provide multiple inputs in addressing the questions listed above. This multiple methods approach allows for triangulation of the findings (Mark & Shotland, 1987). Specific methods that were used included:

- Firsthand observations carried out by the evaluator on site at the University of Missouri;

- Focus groups with students at the University of Missouri;

- Individual interviews with students at the University of Missouri;
- Individual interviews with faculty at the University of Missouri;
- Usability testing; and
- Expert review.

The different data collection methods yielded data related to different questions. The relationships among the ten questions listed above and the six evaluation methods used are illustrated in Figure 1.

Questions **Methods**	Observation	Focus Groups	Student Interviews	Faculty Interviews	Usability Testing	Expert Review
What recommendations can be made for enhancing the user interface and reliability DLPS materials?		X	X	X	X	X
What are the recommended procedures for implementing the DLPS materials in preservice teacher education literacy courses?	X			X		
What pedagogical dimensions are evident in the design and implementation of the DLPS materials?						X
What are the technical requirements of implementing the DLPS materials in preservice teacher education courses?	X			X		
What are faculty reactions to the DLPS materials as an effective interactive learning environment for preservice teacher education?	X			X		
What are student reactions to the DLPS materials as an effective interactive learning environment for preservice teacher education?	X	X	X			
What is the immediate instructional effectiveness of the DLPS materials in the context of their use at the University of Missouri?		X	X	X		
What is the impact of the DLPS materials on the students who graduate from the College of Education at the University of Missouri?			X			
What recommendations can be made concerning the dissemination of the DLPS materials?			X	X		
What recommendations can be made concerning the feasibility of the DLPS materials as a model or template for the design of other interactive multimedia resources for teacher education programs?				X		X

Figure 1. Evaluation questions and methods matrix.

Participants

Faculty and students in the College of Education at the University of Missouri were the primary participants in the evaluation. In addition, recent graduates of the undergraduate teacher education program at Missouri were interviewed via telephone or a video-conferencing system. Finally, graduate students in the Department of Instructional Technology at The University of Georgia participated in the usability testing and expert review components of the evaluation.

Limitations

The interpretation and generalizability of this evaluation is limited by several factors. First, the data collected for this evaluation represents a series of snapshots of a program that evolved over a four-year period. Given that resources only allowed approximately one visit per year, this evaluation should not be construed as representing all the actual or potential outcomes of this innovative program.

Second, all of the participants in this evaluation volunteered their time and energy. They were not remunerated in any way. Volunteers may over or under-represent certain perspectives concerning the effects and value of the DLPS materials.

Third, the evaluation data is primarily described in reference to the "DLPS materials," as if these materials were in existence from the beginning of this evaluation, but the materials actually went through several iterations during the last four years. Thus, findings are generally descriptive of a set of materials that has changed and evolved, and as such, represents a "moving target."

Logistics

Dr. Thomas C. Reeves, an external evaluation consultant from The University of Georgia, has been responsible for the planning, data collection, analysis, and reporting of this evaluation. Dr. Baker and Dr. Wedman were graciously cooperative and provided ample opportunities to observe classes, hold focus groups, and interview faculty and students during site visits to the University of Missouri. Any errors in reporting or misinterpretations of the data should be attributed to the external evaluator alone.

Results

The results of this evaluation are reported in a series of two-page subsections, each of which addresses one of the ten evaluation questions listed above. The format for each subsection is the same. First, the question is posed and an encapsulated response is given. Second, the data that supports the response is provided. Third, a discussion of the data is provided. Lastly, a specific recommendation related to the finding is presented.

1. What recommendations can be made for enhancing the user interface and reliability the DLPS materials?

After several rounds of formative evaluation, including usability evaluation and expert review, the DLPS materials have reached an acceptable level of user-friendly design and reliable functionality.

Data

The first formative review of the design of the DLPS materials was conducted by faculty and doctoral students from The University of Georgia in the Fall of 1998. Using the initial "Julie" multimedia CD-ROM, this expert review focused on both the instructional design and user interface design aspects of the DLPS materials. Several recommendations were made at that time:

- Develop an online orientation to the CD-ROM that would provide students with a statement of purpose, specific objectives, and guidelines for interacting with the program.

- Clarify the functionality of buttons, especially those used in the video editing components of the program.

- Eliminate the busy wood grain background in favor of colors that would highlight the functional components of the program.

These and other recommendations were acknowledged and acted upon by the development team at the University of Missouri. Other formative reviews were conducted later, and the results of these reviews were subsequently incorporated into the further design of the DLPS materials.

Finally, a heuristic evaluation of the usability of the most recent version of the DLPSL materials was conducted in Fall 2001 using the heuristic evaluation instrument in Appendix A. The results of this heuristic evaluation are summarized in Figure 2.

Discussion

The developers of the DLPS materials confronted a number of technical challenges during the four-year design, development, refinement, and implementation phases of this project. Many of these stemmed from the evolving nature of the hardware and software used to design and deliver the materials, as well as the rapidly changing standards and tools for digitizing video. Anyone engaged in the development of educational courseware during the past twenty years has been faced with similar problems, but these problems have been exacerbated during the past few years when video digitization protocols have evolved so quickly.

	Must be improved	Should be improved	Acceptable	Exemplary	Not applicable
1.Visibility of system status			X		
2. Match between system and the real world			X		
3. Error Recovery and Exiting			X		
4. Consistency and standards			X		
5. Error prevention			X		
6. Navigation support			X		
7. Aesthetics			X		
8. Help and documentation			X		
9. Interactivity				X	
10. Message Design			X		
11. Learning Design				X	
12. Media Integration				X	
13. Instructional Assessment					X
14. Resources			X		
15. Feedback			X		

Figure 2. Summary of results of heuristic evaluation of DLPS Zane CD-ROM.

The developers have resolved most of these problems. The user interface is reasonably user-friendly and the DLPS materials now operate with acceptable reliability. Nonetheless, some reliability problems remain and the CD-ROMs have the potential to freeze or crash on occasion. The source of these errors may stem from incompatibilities between various versions of the Macromedia authoring software and newer versions of Apple QuickTime.

Recommendation

To eliminate any remaining reliability problems, the DLPS materials should be subjected to an additional round of debugging before further dissemination is conducted.

2. What are the recommended procedures for implementing the DLPS materials in preservice teacher education literacy courses?

An outstanding feature of the design of the DLPS materials is that they can be successfully implemented in multiple ways, including through whole class instruction and through small group work.

Data

Observations of whole class and small group use of the DLPS materials were conducted on-site at the University of Missouri. In addition, in-depth interviews with faculty who have used the DLPS materials in undergraduate teacher education courses there were conducted.

The results of these observations and interviews reveal that the DLPS materials are remarkably rich in implementation possibilities. When shown to a whole class using a high resolution computer projector, the materials afford an instructor with authentic cases to illustrates key points during lectures or interactive presentations. Alternatively, portion of the cases can be shown to the whole class to stimulate discussions about the interpretation of a child's behavior or a teacher's interactions with the child.

Alternatively, the DLPS materials can be used effectively with small groups ranging in size from 5 to 7 students down to pairs. The most effective small group implementation appears to be with pairs of students. The discourse that occurs when two students are engaged in accomplishing assignments with these materials can be invaluable as a learning dialogue.

Finally, the materials can be used by individuals for review or extended practice. While this is a feasible implementation, it is not recommended because the interactions among classes, small groups, or pairs of learners adds a great deal to the instructional value of these materials.

Dr. Betsy Baker and Dr. Judy Wedman have described a variety of ways of implementing the materials in their classes. Sometimes, the materials are used to stimulate discussion and other times they are employed to initiate analysis and problem-solving activities.

Discussion

For novice teachers, there is nothing quite as compelling as visiting real classrooms and observing students and teachers in action. However, a major drawback of classroom visitations is that there is no guarantee that students will observe typical or exemplary learner behaviors or teacher performances. A significant advantage of the DLPS materials, although they are not as rich as being there, is that the nature of what is viewed is controlled. Another major advantage is that whereas classroom visitations typically provide only a limited

sample of student behaviors at one time and place, the DLPS materials provides a unique longitudinal perspective of a child's literacy behaviors over the period of an entire academic year.

The primary developers of the DLPS materials have clearly developed a variety of successful implementation protocols and lesson plans. The developers have also developed a set of excellent assignments (referred to as "study guides") and interactive problems for students to solve in large and small groups.

Unfortunately, these protocols, lesson plans, and assignments (study guides) are not provided on the official project web site. In fact, at the time of the conclusion of this evaluation, the "Instructor Resources" section of the DLPS web site (http://www.missouri.edu/~dlps/index.html) is completely blank.

Recommendation

The protocols, lesson plans, and assignments developed for the DLPS materials should be added to the DLPS website as soon as possible.

3. What pedagogical dimensions are evident in the design and implementation of the DLPS materials?

The DLPS materials are based upon the pedagogical dimensions of an effective constructivist interactive multimedia learning environment.

Data

Reeves and Harmon (1994) defined a set of pedagogical dimensions that can be used to analyze multimedia as a form of interactive learning system. Figure 3 includes ten of these dimensions that were used to conduct an expert analysis of the pedagogical dimensions of the DLPS materials.

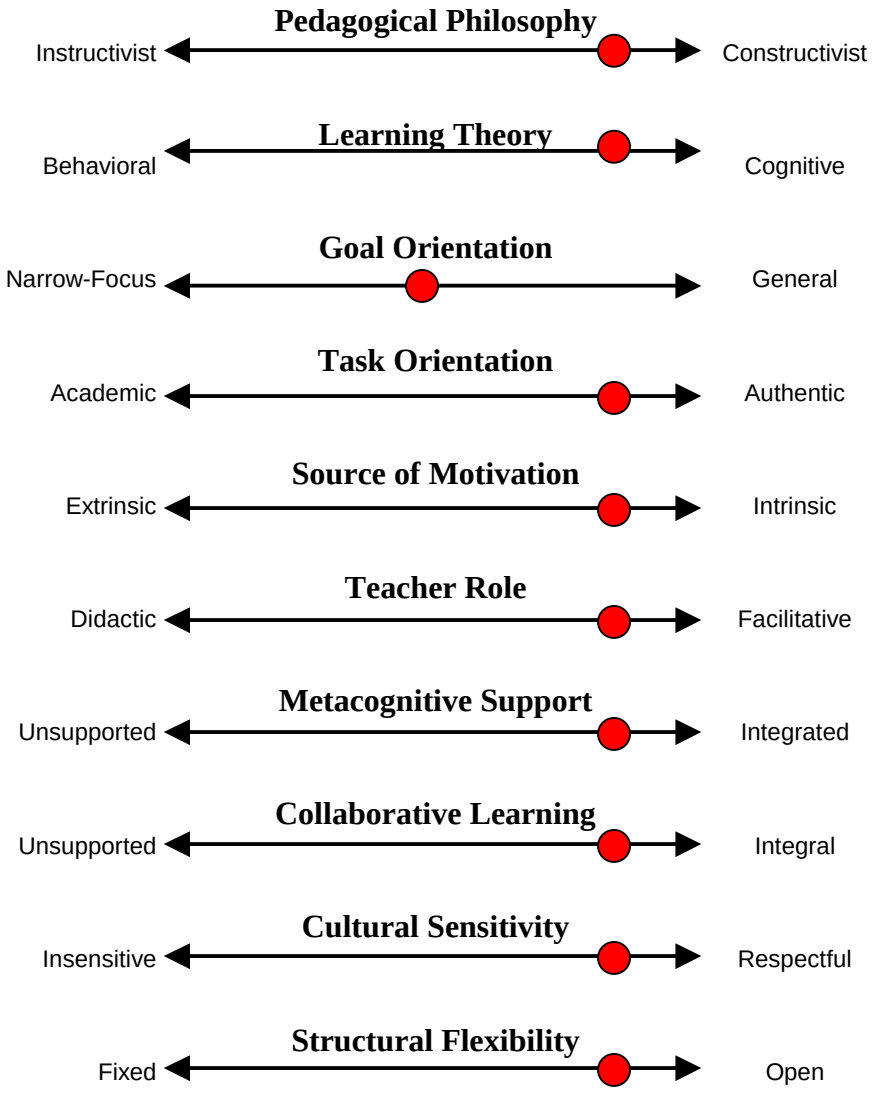

Figure 3. Pedagogical dimensions of the DLPS materials.

Discussion

Each of the ten dimensions in Figure 3 is presented as a two-ended continuum with contrasting values at either end. Of course, the world is rarely dichotomous, and there is more complexity involved in learning than any one of these dimensions represents. However, the individual dimensions themselves are not as important as the array across the ten dimensions that represent the instructional design of an interactive learning system. While a particular array of ratings is not guaranteed to yield an effective interactive learning system, it does provide the basis for an expert analysis of the pedagogical design of interactive multimedia such as the DLPS CD-ROMs.

In my judgment, the array presented by the DLPS materials is that of an exemplary constructivist interactive learning environment (Wilson, 1996). The materials promote a constructivist approach to learning wherein students are expected to construct their own interpretations of the literacy capabilities of the children represented in the video cases. The learning objectives are primarily cognitive in nature, including the development of higher-order problem-solving skills. The materials address a diverse range of specific and wide goals, and the tasks that student undertake are highly authentic, similar to what these students will face when they become practicing teachers. The materials are intrinsically motivating, and the instructor's role is primarily that of a facilitator rather than the primary source of information. Reflection and other forms of metacognition are encouraged by the assignments that have been developed for the program. The materials are designed to be used collaboratively in large and small groups. The video materials have been designed to reflect cultural diversity, and the flexibility of instructional implementation is quite open.

Recommendation

The pedagogical dimensions of the DLPS materials identified by this expert review should be verified in future research studies.

4. What are the technical requirements of implementing the DLPS materials in preservice teacher education courses?

The DLPS materials have been designed to be implemented on both PC and Mac computers with a modest degree of technical expertise required.

Data

Observations and faculty interviews were the main sources of data related to this question. The system requirements for using these materials on a PC include:

- A personal computer with a Pentium Pro 200MHz CPU or better and a six-speed CD-ROM drive or better.
- RAM requirements are at least 64 megabytes.
- A hard disk drive with at least 10 megabytes of free space.
- A monitor set to 640x480 on desktop area and color palette set to 16 million colors or higher.
- A speaker.
- Windows 95 or better as the operating system.
- QuickTime 4 installed.

The system requirements for a Macintosh include:

- An Apple Macintosh 180 MHx Power PC and a six-speed drive or better.
- Ram requirements are at least 64 megabytes.
- A hard disk drive with at least 10 megabytes of fee space.
- A monitor set to 640x480 on desktop area and resolution set to 16 million colors or higher.
- A speaker.
- Operating system 8.1 or better.
- A computer with QuickTime 4 installed.

Discussion

The technical requirements listed above are modest and quite straightforward. Unfortunately, the installation procedures are less clear, and some of the recommendations are likely to cause learners who are not particularly technically adept to experience problems. For example, for the PC installation, renaming the hard drive is given as an option that may optimize performance, but this may cause other technical challenges that extend beyond the use of this particular learning environment.

Recommendation

An effort should be made to streamline and simplify the installation of the DPLS CD-ROMs for both PC and Mac users.

5. What are faculty reactions to the DLPS materials as an effective interactive learning environment for preservice teacher education?

Faculty reactions to the DLPS materials as an effective interactive learning environment are very positive.

Data

Observations and faculty interviews were the main sources of data related to this question. Faculty were observed using the materials in large classes without any significant problems of a technical nature. Faculty self-reported that the materials could be assigned to small groups of students with confidence that students could install and operate the programs with few technical problems.

Faculty expressed a strong belief that the DLPS materials afford students opportunities to learn in ways that they would be unable to accomplish in traditional classroom instruction, through readings, or even through site visits to schools. Some of the strengths of the DLPS materials highlighted during faculty interviews include:

- These materials focus on real children, reading and writing over a whole school year.
- Rather than jumping right into the implementation of a specific teaching strategy, the DLPS materials encourage students to watch children and diagnose their real needs.
- The programs encourage a developmental perspective on literacy development because students can observe “growth” over an extended period of time.
- The programs provide students with opportunities to observe literacy development in diverse cultural backgrounds and various ability levels.
- Another perceived advantage of the DLPS materials is that they provide preservice teacher education students with a common experience that forms the basis for higher level discussions of important literacy issues. This common experience is especially valuable given the widely different experiences that students may have in their field placements.

Discussion

The DLPS materials take unique advantage of the pedagogical affordances of video to present a developmental perspective on literacy that it would be impossible to replicate through traditional field placements. While none of the faculty who were interviewed suggested that field experience be replaced by interactive multimedia simulations, they clearly recognized the advantages and

disadvantages of each approach. Clearly, in the eyes of these faculty, there are teaching and learning opportunities provided by the DLPS materials that could not be done without these types of interactive multimedia resources.

Recommendation

The DLPS materials should be disseminated to other literacy faculty at minimal costs.

6. What are student reactions to the DLPS materials as an effective interactive learning environment for preservice teacher education?

Student reactions to the DLPS materials as an effective interactive learning environment are very positive.

Data

Observations, focus groups, and student interviews were the main sources of data related to this question. Students were observed using the DLPS materials in large classes as well as in small groups and pairs.

When I spoke with students in 1998 and 1998, they were much less enthusiastic about the DLPS materials than the students who were interviewed in August 2001. Typical comments made by students in 2001 included:

> "The literacy CDs were really cool. They gave us a chance to see stuff in action. But it's better than a regular video because you can freeze it and talk about what you saw right then. That is the coolest thing. We used regular videos in some of my other classes such as the "Marilyn Berris" videos in math education, but those videos were just linear. Zane is really interactive because you can look at the book, look at the child, print parts out."
>
> "It was good to be able to see Zane who was from first or second grade. I'm not sure about the grade, but our field experience was in Kindergarten and there wasn't as much literacy there as we would have liked. There was really no comparison between the Kindergarten and Zane's classroom. Our real life experiences in the Kindergarten were much more limited with respect to literacy. Zane allowed us to focus on a real child. We could watch the child, see his written work, watch what the teacher was trying to do. For me, seeing how the teacher worked with the child was the best part. We also had the text of the stories Zane was reading, and we could keep reading and writing records."
>
> "We used Zane a lot in Dr. Baker's course, at least 15 to 20% of the course was Zane. It was a really useful program because it provides good practice before field study. With Zane, we kept everything we did and it was a big part of our grade."
>
> "It was especially valuable to be able to compare Zane's work over time and to see evidence of progress. This helped a lot with our field studies. It gave us experience in what to look for when we were out in the schools, gave us a basis for comparison. We learned that Zane was a little below average, so we knew what that type of child would be like. It's not the same as real experience in

the field. In a real classroom, the interaction is unpredictable. But Zane provided good preparation for what to look for and expect."

Discussion

When this evaluation started in 1998, students enrolled in the College of Education at the University of Missouri were participating in a large scale laptop initiative. All faculty, supervising teachers, and students were required to have Apple Macintosh laptop computers. At that time, there was considerable diversity of opinion among students about the value of this initiative ranging from students who hated having to lug around heavy laptop computers when they perceived that the technology was not well-aligned with the teacher preparation curriculum to students who were quite pleased to have portable computers. However, on balance, the attitudes among students toward the overall technological approach were negative or skeptical. I believe that these negative attitudes dampened the enthusiasm among students for the early versions of the DLPS materials as well. The more positive reactions to the DLPS materials expressed in 2001 were most likely influenced by improvements in the design of the materials during the intervening time as well as the elimination of the laptop initiative.

Recommendation

The DLPS materials should be disseminated to other colleges of education so that students there can experience the positive learning experiences reported by students at the University of Missouri.

7. What is the immediate instructional effectiveness of the DLPS materials in the context of their use at the University of Missouri?

Students learn a range of specific and general skills as well as foundational knowledge related to literacy when using the DLPS materials.

Data

Student and faculty interviews as well as student focus groups provided the data to address this question. Both faculty and students agreed that the materials are effective within their immediate context of use. Sample student comments included:

> "From Zane, we learned a lot about miscue analysis, how to correct a child, the real practices of a teacher working with a child one-on-one."
>
> "We learned to analyze different aspects of the reading process, the affective components, the semantic components, and so forth."
>
> "We developed a lot of knowledge and skill in keeping a running analysis and other kinds of evaluation methods."
>
> "I don't think the CDs can replace field experience, but in a real classroom you never know what you are going to see, and not everyone you see is a good model. On the CDs, you can show really good models. And you can analyze it, discuss it, and really learn from it. It's great."
>
> "We learned a lot with Zane, and I think they should continue to develop programs like these. It's hard work, but worth it."

Faculty also stated that they believed that students gained important knowledge and skills from interacting with the DLPS materials. The consensus among faculty is that the DLPS materials provide students with unprecedented opportunities to examine and understand literacy in real world contexts just as they will eventually do when they are practicing teachers. Faculty claimed that their students learning discrete observational and analytic skills and the knowledge foundations for further development of these skills when they go out for field placements and student teaching.

Discussion

Research on the differences between experts and novices indicates that in many field (e.g., physicians), the expertise of the professional in recognizing and diagnosing problems is based upon the number of cases that the professional has seen. In light of this evidence, the capacity of the DLPS materials to provide

students with exposure to multiple realistic cases may be one of its greatest strengths.

Recommendation

The immediate effectiveness of the DLPS materials should be studied in contexts beyond the University of Missouri where the materials were developed.

8. What is the impact of the DLPS materials on the students who graduate from the College of Education at the University of Missouri?

Recent graduates of the College of Education at the University of Missouri who have used the DLPS materials can point to specific examples of how they have applied (and continue to apply) the knowledge and skills that they learned with these interactive materials.

Data

Via a video-conferencing system and telephone, recent graduates of the University of Missouri College of Education were interviewed concerning the impact of the DLPS materials on their experiences as beginning teachers. Here are some of the typical comments made by these graduates:

> "Most of all, I remember Zane. We spent a lot of time using the CDs in class and on our own. You could go to the Reflector and check one out. Zane really stands out in my experience; we watched the videos of Zane in class and out We spent most of the time on assessment issues. Seeing Zane was not as real as working with real children, with a real child you never know what they are going to say or do. But Zane was great as a practice child, someone you could work with before seeing a real child. There was another child we watched on the CDs, a little girl, but I can't remember her name. Zane was the one we used the most."

> "We used them in class at first, in Dr. Baker's class. We discussed them as a whole group. Then we would go to the Reflector to check them out. Sometimes I worked on the CD with another student in the Reflector, and sometimes I worked with it on my own. We spent a lot of time on specific assignments with Zane. We would watch what the teacher did with Zane to help him, and then discuss it. You could read about this in a book or paper, but seeing it made all the difference. We did specific assignments as well, assessment activities for the most part."

> "We learned a lot of assessment skills, such as miscue analysis. That's why these videos are so great. You have to see the video over and over again to develop these skills. These are really hard things for new teachers to learn. During our field experiences, you might be in classrooms only one hour a week, and there is so much going on that it is hard to see what is really happening. The case study with Zane really allowed me to concentrate on his development. I have four emergent readers right now, in fourth grade, and I learned things from watching Zane that I am using with them. Zane really stuck with me; I mean it was two years ago, and

I still remember it very well. Zane was not as realistic as working with a real child, but it was very valuable."

"I remember using the Zane Project a lot. It was great that we could watch the kids. You can talk about literacy and teaching kids to read all day, but until you're discussing something you can really see, it isn't all that worthwhile. Zane was so realistic. We watched Zane's development over a long time, and we could see progress over a period of months. You can't do this any other way before you actually have your own classroom."

"We started using them in class, the whole class at first, and then in groups. Then you could go watch it in the Reflector. I usually looked at it with a partner, but sometimes I worked with it alone. There is a lot of stuff there, and you have to go over it many times. You can print out Zane's worksheets and analyze them. You can assess what he is doing when reading. Later in the course, we looked at another CD of a girl, Helen. She was at a higher level than Zane."

"I learned a lot about what to do one on one with a kid. This is something that is important. You could also learn a lot about the teacher's style in the classroom. I absorbed the teaching style by seeing what Zane's teacher did. It is really important when you are new to teaching to watch what other teachers do. At least, it was very important for me. You can try to put yourself in that teacher's place and think about what she did and what she didn't do. And what I would do."

Discussion

Interviews with recent graduates indicated that they not only remembered the DLPS materials and what they had learned using them, but they could describe specific examples of how they were applying the knowledge and skills they gained from DLPS in their teaching today. This level of transfer is rarely found in the literature related to instructional technology.

Recommendation

The DLPS materials should be provided to graduates of the College of Education at the University of Missouri so that they can use them for continuing professional development.

9. What recommendations can be made concerning the dissemination of the DLPS materials?

Faculty reactions to the DLPS materials as an effective interactive learning environment are very positive.

Data

Student and faculty interviews provided the primary data used to address this question. Faculty were less enthusiastic than students about disseminating the materials. Typical student comments included:

> "I think they should continue to develop more of them, and not just for literacy. More case studies. Also, the specific assignments that we did with the CDs were really important. We may not have fully appreciated it at the time, but they were very practical. I think there should be more materials like this developed for teacher preparation. The case studies and this course really stand out in my memories of my program at Mizzou."
>
> "Dr. Baker was a great role model for using technology. She used the video projector a lot. Now I feel confident in using it. Frankly, I am way ahead of any of the teachers in my school. My principal wanted to show a PowerPoint presentation at Parent Night, and no one else here knew how to do it, but I did."
>
> "Dr. Baker is also a great teaching model. This is one of the classes that really stands out in my mind. I hope they are still using these materials, and that they'll develop some more cases. These kinds of materials don't substitute for field experience, we still need that, but they are a wonderful supplement. You can do things with these CDs that you can't with other media, like videotapes. And you learn things that you don't learn during field experience."
>
> "They need to develop more of these. When I told my mother about Zane, she thought the idea was great. She went through a teacher education program in the 70s, and they didn't have much field experience in her program. She thinks what we do here is great, and that programs like Zane would be good for in-service."
>
> "Zane is very useful for us in addition to field study. It's good practice. We need both. It is good to work with partners when using Zane because there is lot that is difficult to interpret."

Discussion

Students were very enthusiastic about further dissemination of the DLPS materials, and the further development of similar materials related to literacy as well as other subjects. Faculty were less enthusiastic, perhaps because they perceived the challenges of eliminating all the nagging bugs still left in the programs as well as other production challenges.

Recommendation

The DLPS materials should be prepared for dissemination, a process that will require a thorough debugging of the software.

10. What recommendations can be made concerning the feasibility of the DLPS materials as a model or template for the design of other interactive multimedia resources for teacher education programs?

Given the richness of the pedagogical dimensions, the unique nature of the video resources, and the evidence of successful implementation, the DLPS materials provide a strong model for the development of other interactive multimedia resources for teacher education programs.

Data

Faculty interviews and expert review provided the data for addressing this question. The faculty interviewed at the University of Missouri stated that the DLPS materials were different from other types of multimedia resources for teacher education in several critical ways:

- They provide a longitudinal perspective on the development of early literacy, whereas other materials provide only snippets.
- These materials focus on the children and their behaviors rather than on the teachers and their teaching performances.
- The materials have been designed to reflect both cultural and ability differences, another aspect unique to these materials.
- The study guides developed for the DLPS materials challenge students to collaborate in the solution of complex and realistic problems.
- The materials can be implemented in several effective ways, ranging from whole class instruction to small group work.

As an expert in the design and evaluation of interactive multimedia, I can attest that these materials are truly unique in the history of multimedia materials developed for teacher education for all the reasons stated by the faculty as well as based upon the evidence from students that they have learned a great deal from using these materials.

Discussion

The field of educational technology and the field of teacher education have rarely been successfully blended (Means, 1994). However, the DLPS materials are a successful integration of sound pedagogy with appropriate technological affordances. They represent a substantial advancement in the state of the art of designing and using interactive multimedia to support teaching and learning in teacher education contexts. As such, they should be emulated.

Recommendation

The DLPS materials should be presented to the teacher education community as a valuable model for the development of similar materials in other contexts.

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Appendix A

E-Learning Usability and Instructional Design Heuristics

(Developed by Lisa Benson, Dean Elliott, Michael Grant, Doug Holschuh, Beaumie Kim, Hyeonjin Kim, Erick Lauber, Sebastian Loh, and Tom Reeves from The University of Georgia, Fall 2001)

1. <u>Visibility of system status</u>: The e-learning program keeps the learner informed about what is happening, through appropriate feedback within reasonable time.
Sample questions to ask yourself:
a. When modules and other components of the e-learning (e.g., streaming video) are downloading, is the status of the download communicated clearly?
b. Is the user provided with information that indicates that the e-learning program is operating correctly?

Additional comments:

2. <u>Match between system and the real world</u>: The e-learning program's interface employs words, phrases and concepts familiar to the learner or appropriate to the content, as opposed to system-oriented terms. Wherever possible, the e-learning program utilizes real-world conventions that make information appear in a natural and logical order.
Sample questions to ask yourself:
a. Does the e-learning program's interactive design utilize metaphors that are familiar to the learner or related to the specific content of the program?
b. Is the interface "user friendly," given the content of the program and its target audience?

Additional comments:

3. <u>Error Recovery and Exiting</u>: The e-learning program allows the learner to recover from input mistakes and provides a clearly marked "exit" to leave the program without having to go through an extended dialogue.
Sample questions to ask yourself:
a. Does the e-learning program distinguish between input errors and cognitive errors, allowing easy recovery from the former always, and from the latter when it is pedagogically appropriate
b. Does the e-learning program allow the learner to leave whenever desired, but easily return to the closest logical point in the program?

Additional comments:

4. Consistency and standards: When appropriate to the content and target audience, the e-learning program adheres to general software conventions and is consistent in its use of different words, situations, or actions.
Sample questions to ask yourself:
a. If appropriate to the content and target audience, does the e-learning product adhere to widely recognized standards for software interactions (e.g., going back in a Web browser)?
b. If the e-learning program does not utilize common software conventions for interactions, are the novel interactions appropriate for the content and target audience?
c. Does the program maintain an appropriate level of consistency in its design from one part of the program to another?

Additional comments:

5. Error prevention: The e-learning program is carefully designed to prevent common problems from occurring in the first place.
Sample questions to ask yourself:
a. Is the e-learning program designed so that the learner recognizes when he/she has made a mistake related to input rather than content?
b. Is the e-learning program designed to provide a second chance when unexpected input is received (e.g., "You typed "bat" in response to the question. Did you mean "tab?")?

Additional comments:

6. Navigation support: The e-learning program makes objects, actions, and options visible so that the user does not have to remember information when navigating from one part of the program to another. Instructions for use of the program are always visible or easily retrievable.
Sample questions to ask yourself:
a. Does the interface of the e-learning program speak for itself so that extensive consultation of a manual or other documentation does not interfere with learning?
b. Does the e-learning program provide user-friendly hints and/or clear directions when the learner requests assistance?
c. Does the e-learning program include a map or table of contents that allows you to see what you have seen and not seen?

Additional comments:

7. Aesthetics: Screen displays do not contain information that is irrelevant, and "bells and whistles" are not gratuitously added to the e-learning program.
Sample questions to ask yourself:
a. Are the font choices, colors, and sizes consistent with good screen design recommendations for e-learning programs?
b. Does the e-learning program utilize white space and other screen design conventions appropriately?

Additional comments:

8. Help and documentation: The e-learning program provides help and documentation that is readily accessible to the user when necessary. The help provides specific concrete steps for the user to follow. All documentation is written clearly and succinctly.
Sample questions to ask yourself:
a. Is help provided that is screen or context specific?
b. Is help or documentation available from any logical part of the e-learning program?
c. Is help or documentation written clearly?

Additional comments:

9. Interactivity: The e-learning program provides content-related interactions and tasks that support meaningful learning.
Sample questions to ask yourself:
a. Does the e-learning program provide meaningful interactions for the user, rather than simply presenting long sections of text?
b. Does the e-learning engage the learner in content-specific tasks to complete and problems to solve that take advantage of the state-of-the-art of e-learning capabilities?

Additional comments:

10. Message Design: The e-learning program presents information in accord with sound principles of information-processing theory.
Sample questions to ask yourself:
a. Is the most important information on the screen placed in the areas most likely to attract the learner's attention?
b. Does the e-learning program follow good information presentation guidelines with respect to organization and layout?

Additional comments:

11. Learning Design: The interactions in the e-learning program have been designed in accord with sound principles of learning theory.
Sample questions to ask yourself:
a. Does the e-learning program follow an appropriate learning design to achieve its stated objectives?
b. Does the e-learning program engage learners in tasks that are closely aligned with the learning goals and objectives?

Additional comments:

12. Media Integration: The inclusion of media in the e-learning program serves clear pedagogical and/or motivational purposes.
Sample questions to ask yourself:
a. Is media included that is obviously superfluous, i.e., lacking a strong connection to the objectives and design of the program?
b. Is the most appropriate media selected to match message design guidelines or to support specific instructional design principles?
c. If appropriate to the content, are various forms media included for remediation and/or enrichment?

Additional comments:

13. Instructional Assessment: The e-learning program provides assessment opportunities that are aligned with the program objectives and content.
Sample questions to ask yourself:
a. If appropriate to the content, does the e-learning program provide opportunities for self-assessments that advance learner achievement?
b. If appropriate to the content, do assessments provide sufficient feedback to the learner to provide remedial directions?
c. Wherever appropriate, are higher order assessments (e.g., analysis, synthesis, and evaluation) provided rather than lower order assessments (e.g., recall and recognition)?

Additional comments:

14. Resources: The e-learning program provides access to all the resources necessary to support effective learning.

Sample questions to ask yourself:

a. Does the e-learning program provide access to a range of resources (e.g., examples or real data archives) appropriate to the learning context?

b. If the e-learning program includes links to external World Wide Web or Intranet resources, are the links kept up-to-date?

c. Are resources provided in a manner that replicates as closely as possible their availability and use in the real world?

Additional comments:

15. Feedback: The e-learning program provides feedback that is contextual and relevant to the problem or task in which the learner is engaged.

Sample questions to ask yourself:

a. Is the feedback given at any specific time tailored to the content being studied, problem being solved, or task being completed by the learner?

b. Does feedback provide the learner with information concerning his/her current level of achievement within the program?

c. Does the e-learning program provide learners with opportunities to access extended feedback from instructors, experts, peers, or others through e-mail or other Internet communications?

Additional comments: