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ABSTRACT

Pre-service elementary education teachers who were enrolled in an educational technology course participated in a semester-long collaboration with technology. The course provided them with the opportunity to apply previously learned theory and to assess, design, develop, and implement solutions to educational problems. The course culminated in student identification of an educational problem or situation that could be addressed by using electronic presentation software. Students were required to identify the problem, conduct a needs analysis, and present an informal presentation describing the problem and the proposed product. Students were then given approximately 6 weeks to design and develop hypermedia software to enable a learner to work with the technology to arrive at a potential solution. Students completed a survey indicating their feelings about the course. Findings indicated that students recognized the value of collaborative leaning in the development of a multimedia project, gained more from a studio-based class than through formal presentations, and were able to share a variety of ways that electronic presentation software can be used to enhance classroom instruction. (MES)

# Hypermediated Learning Environments:

# Students Collaborating with Technology

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**Abstract:**

Pre-service elementary education teachers enrolled in an educational technology course participated in a semester-long collaboration with technology. The course provided them with the opportunity to apply previously learned theory, assess, design, develop, and implement solutions to educational problems. The course culminates in the student identification of an educational problem: the design and development of a piece of hypermedia software to enable a learner to work with the technology to arrive at a potential solution.

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Introduction:

There are three basic ways technology may be used in a classroom: (1) as an instructional resource, (2) as a learning tool, and (3) as a storage device (Perkins, 1992). The proposed course is designed to provide the students with the opportunity design, develop and implement a piece of instructional technology that enables them to see how each interacts with others resulting in a solution to an educational problem incorporating technology.

The philosophical foundation for re-design of Educational Technology in the Elementary School, is constructivism. Constructivists believe learners to be active seekers and constructors of knowledge and they come to the classroom with an innate curiosity and goals (Brooks & Brooks, 1993; Fosnot, 1989). A course having constructivism as its philosophical base is a problem-solving course featuring the use of authentic tasks, complex real-life problems, and the integration of knowledge and skills from a variety of resources in the search for the problem's solution.

The primary feature of the course is the use of authentic learning contexts. This was be accomplished through a combination of anchored instruction and generative learning activities and to accomplish this a form of Grabinger's (1996) *Rich Environments for Active Learning* (REAL) were used. REALs are comprehensive learning systems that are characterized by the following:

- They are based on constructivist learning theory and philosophy;
- They promote study and investigation within authentic, that is, realistic, relevant, complex, and information-rich environments;
- They encourage students to assume responsibility for their learning, develop initiative, foster decision-making, and promote intentional learning;
- They cultivate an atmosphere of cooperative learning;
- They utilize dynamic, generative learning activities that promote high-level thinking processes (i.e. analysis, synthesis, problem-solving, experimentation, creativity, and the examination of a topic from a variety of perspectives);
- They permit the assessment of student progress within context of realistic tasks and performances.

(Grabinger, 1996, p. 668).

The use of REALs in an instructional technology course encourages integration and comprehensiveness. Integration (Hannafin, 1992) is the process of linking new knowledge to old, modifying and enriching existing knowledge, and enhancing depth of knowledge about a topic. Goldman observes

- These environments are designed to invite the kinds of thinking that help students develop *general* skills and attitudes that contribute to effective problem solving, plus acquire *specific* concepts and principles that allow them to think effectively about particular domains

(Goldman, et al, 1992, p. 1).

Comprehensiveness refers to the importance of linking learning to realistic contexts rather than decontextualizing and compartmentalizing it. The use of REALs guides the learner, mediates the individual's learning, and supports the learner's decision-making. The content of the REALs is organized such that the focus is upon projects that promote problem-solving and linking of concepts and knowledge toward a solution within a environment.

Anchored instruction was used to provide the student with an opportunity to develop instruction that is responsive to the identified learning issues. This approach has certain advantages over the decontextualized approach currently in use. First, it develops project management skills such as creating a time-line, interpersonal skills needed to function as a member of a team, and learning how to allocate resources. Second, it facilitates the development of research skills including the ability to determine the nature of a problem, asking questions that elicit pertinent information, searching for new information, developing new information, and analyzing and interpreting information. Third, it assists in the development of organizational and representation skills including the selection of and structure of information, developing representations of information (text, audio, graphic, etc.) in a way that facilitates its understanding, arranging the structure and sequencing of the information, and responding to equipment, time, and budgetary constraints. Fourth, it provides the student with an opportunity to develop and practice presentation skills. Finally, it presents the student with an opportunity to think reflectively about what instruction is being developed, how it does or does not meet the goals and objectives, and how it can be modified to better accomplish the learning outcomes (Carver, Lehere, Connell, Erickson, 1992).

However much a student enrolled in Educational Technology in the Elementary School may learn about the principles of instructional design or the effects of instructional technology on the learning process in the classroom it is not until that knowledge can be applied in an instructional situation that the student is able to recognize how each contributes to the didactic process. Central to this is the weekly two-hour *reflective practicum*. The reflective practicum is not a directed laboratory session attached to the course ; rather, it is an integrated *studio session* where students "design" developmentally appropriate instruction using various types of instructional technology under the directions of an instructional design professional.

The design curriculum proposed by Schön in his three works on reflective teaching and design (1993, 1987, 1991) suggests first to introduce the student to "...classroom theory, then a practicum in its application (Schön, 1987, p. 158). Students learning to use instructional technology "must practice in order to learn to design" (Schön, 1987, p. 158) and any "designlike practice is learnable but not teachable by classroom methods. And when students are helped to learn to design, the interventions most useful to them are more like coaching than teaching-as in a reflective practicum" (Schön, 1987, p. 157).

Instructional design is a creative activity and the " reflective conversation" a student has with the materials may lead to new insights, meanings, and variant applications of technology. For several reasons it is almost impossible to convey to students what it means to design and implement developmentally appropriate instructional in a classroom setting:

- The gap between a description of designing and the knowing-in-action that corresponds to it must be filled by reflection-in-action.
- Designing must be grasped as a whole, by experiencing it in action.
- Designing depends on the recognition of design qualities, which must be learned by doing
- Description of designing are likely to be perceived initially as confusing, vague, ambiguous, or incomplete; their clarification depends on a dialogue in which understandings and misunderstandings are revealed through action.
- Because designing is a creative process in which a designer comes to see and do things in new ways, no prior description of it can take the place of learning by doing.

(Schön, 1987, p. 162)

This instructional model has been shown to be effective in helping students "become more thoughtful and cognitively flexible so that they can perform better in realistic problem-solving situations" (Grabinger, 1996, p. 679). Stiober (1991) found that this approach was more effective in developing reflective teachers than conventional instruction. Stoiber looked at 67 students in a teacher education program with no experience in classroom management or teaching. She divided the students into three groups organized around an instructional model: technical, reflective, and control. The technical condition was based upon the acquisition of concepts, principles and techniques and is comparable to the instructional model currently being used in Educational Technology in the Elementary School. The reflective condition stressed the construction of concepts and principles based on existing knowledge structures. Using case-based learning the students focused on various aspects of the teaching process and is comparable to the instructional methods proposed for this revised course. In the third condition, control, participants were instructed in educational practices not related to classroom management.

Stoiber examined pedagogical reasoning and problem-solving performance in each of the three conditions. In both areas, students in the reflective condition showed skills more like that of experienced teachers than either the technical or control conditions. Their pedagogical reasoning condition reported significantly more concern about student attitudes. They assumed more responsibility for developing positive learning environments and expressed more concern about student attitudes than either of the two other groups. In addition, the reflective condition group was more sophisticated in its problem-solving skills. The participants of the reflective condition group exhibited more metacognitive practices and more frequently reported perceptions of themselves as solving problems in a positive and constructive manner than the other two groups.

The instructional design for this course rested upon constructivist principles and was supported by qualitative and quantitative research. Combining anchored instruction with REALs and reflective practicums provided the student with the opportunity to examine instructional situations where technology can be integrated in classroom instruction. It also affords the student the opportunity to assess, analyze, design, evaluate, and implement an instructional design within the context of a realistic instructional problem--a decided improvement over the decontextualized approach currently being used.

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Methodology:

Students enrolled in Educational Technology in the Elementary Schools (N=118) were required to identify an educational problem or situation that could be addressed by using electronic presentation software. The students were required to identify the problem, conduct a needs analysis, and present an informal presentation to the instructor describing the problem and the proposed product. Following the presentation the students were given approximately six weeks to implement their design.

During the six weeks no formal instruction occurred; however the instructor and graduate teaching assistant were available to provide assistance and guidance. The classroom, a teaching lab consisting of 24 networked pentium-class computers, a teacher's workstation, three networked printers, two scanners, and four large-screen monitors took on the semblance of an artist's studio with student's working on projects individually or in groups, wandering in and out, seeking assistance from each other, and the teaching staff providing direction when requested or as needed.

At the end of the six weeks the projects were submitted and evaluated. For the purposes of this study five of the projects were selected and submitted with five comparable projects from a pervious semester to five instructors of educational technology at universities in different regions of the United States. The judges were requested to rank the projects on the basis on instructional design, effective use of technology, and the project's accomplishment of the stated instructional goals and objectives. In addition, the judges were encouraged to make comments about the projects.

Finally, the students were requested to complete a survey indicating their feelings about the course, its design, and implementation as well as any comments they wished to make about the course.

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Results:

The judges ranking of the projects did not reveal any significant difference in design quality or implementation quality between the control and experimental group. There were more positive comments regarding the creativity of the experimental group's projects. It seemed that while the products were not substantially different in content, the subtle differences in design and implementation were noted by at least two of the judges.

The student comments were consistently high in the areas of interaction, both peer and instructor. They recognized that they course was a collaborative learning experience and collaboration was required to successfully complete the project. They also recognized the reflective components of the course and the contributions they made.

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Discussion:

While the judges' rankings did not result in a significant difference between the control group (projects from a prior semester) and the experimental group (the projects from the reflective practicum semester) the student comments and rankings did provide some positive indicators. First, the students recognized the value of collaborative learning in the development of a multimedia project. Second, the students seemed to gain more from a studio-based class than through formal presentations and instructor-designed activities. Finally, they were able to share amongst themselves a variety of ways electronic presentation software can be used to enhance classroom instruction.

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