Riverlink: A Collaborative Technology-Based Project for Improving Science Teaching and Learning

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Abstract: This article presents the details of a collaborative technology-based science learning project completed through a learning community of students and teachers at four public schools with participation by university faculty. The project involved a study of the impact of the environmental health of the St. Johns River and feeder creeks on residents of Jacksonville, Florida. Through field studies, analysis of data, and the use of educational technology for research and communication, the participants developed new ways to facilitate science teaching and learning.

Project Description

The Riverlink project was a collaborative project among four public schools within the Duval County Public School District in Jacksonville, Florida and the preservice teacher education program at the University of North Florida. The project coupled selected students and teachers in two of the school district's elementary schools with selected students and teachers at two area high schools. The project incorporated several educational technologies to link the four schools so that students of different ages and cultures could work together to find solutions to commonly shared science learning topics.

Background

The purpose of the project was to develop an awareness of the impact that the environmental health of the St. Johns River has on Jacksonville's residents. The project created a four-school educational technology connection to monitor the health of selected feeder creeks and streams that flow into the St. Johns River.

One of the elementary schools (Lone Star) and one of the high schools (Sandalwood) is located in suburban Jacksonville. One of the elementary schools (Carter G. Woodson) and one of the high schools (William M. Raines) is located in urban Jacksonville. Participating teachers at Lone Star and Sandalwood worked together on a similar project for two years prior to beginning the Riverlink project.

Through field studies, analysis of resulting data, and the use of educational technologies for research, communication, documentation, and dissemination, project participants discovered new ways to facilitate science teaching and learning through cooperation and collaboration in a learning community.

Structure

To accomplish goals of the project an eleven-member team of experienced educators was formed. The team consisted of three teachers from Lone Star Elementary School, two teachers from Sandalwood High School, two teachers from William M. Raines High School and three teachers from Carter G. Woodson Elementary School. A teacher educator from the University of North Florida participated in the project's planning, training and evaluation. New delivery strategies were developed and used which impacted the roles of all project participants. Project activities were designed to enable teachers at each school to achieve objectives of their school improvement plans and to integrate new teaching strategies and technology-based learning materials and strategies into their classrooms.

Unique Attributes

As a multi-agency collaborative partnership involving public schools and an urban university teacher education program, the project enhanced the effectiveness and productivity of partner institutions by simultaneously addressing related educational concerns. These included the achievement of educational accountability through standards-based teaching and learning coupled with effective uses of educational technology, including the authentic assessment of the academic achievement of P-12 students through the production of their electronic classroom portfolios. The project used a collaborative interdependent change system thereby initiating a redesign of roles for university and school-based faculty. Exemplary classroom teachers examined the link between theory and best practice. The project also provided assistance to participating educators in achieving institutional improvement goals.

Research-Base for the Project

The work of Reeves (1992) provided a useful foundation for identifying four critical success factors used as benchmarks for the project.

1. Clearly defined goals for the project.

Reeves states that "Technology infusion as well as other restructuring activities should be driven by clear goals" (p. 520). Goals for this project involved "authentic achievement" for students and teachers in the form of teacher training, cooperative education, documentation of project activities through digital photography and video, electronic portfolio production and professional presentations at education conferences. Newman (1991) also supports the approach of the project by suggesting that "Rather than reproducing knowledge, students should be involved in producing knowledge, through discourse, through the creation of things, and through performance" (p. 459).

2. Thorough documentation in all phases of the project, Riverlink provided an understanding of where teachers started, where they were at any one point, and where they were going. Reeves states "Documentation attempts to capture all the changes that occur in the process of reform so that interested participants can understand what is really occurring" (p. 522).

3. Formative experimentation is defined by Newman (1990) as follows: "In a formative experiment, the researcher sets a pedagogical goal and finds out what it takes in terms of materials, organization or changes in the technology to reach the goal" (p. 10). The Riverlink project adapted and restructured the project to incorporate new knowledge and improved methods for meeting project goals.

4. Impact evaluation is defined by Reeves as "attempts to assess the effects of innovative instructional practices on factors such as organization, climate, teacher and student self-perceptions, parental and community aspirations, and numerous other difficult-to-measure factors" (p. 524). The Riverlink project used traditional and non-traditional methods of assessment to measure progress toward goals.

The three critical success factors that follow are based on research by Rogers (1983) in which adoption of interactive communication innovations differ from similar processes with other kinds of new ideas or new tools.

Critical Mass of Adopters

The Riverlink project began with four very interested teachers as a core group to influence and persuade school district personnel to get involved with innovations in curriculum, instruction and assessment using educational technology. Rogers found that the usefulness of a new communication system increases for all adopters with each additional adopter. Over 150 elementary and high school students and 11 educators successfully participated in the Riverlink project.

Degree of Use

Continued, supported use of educational technology throughout the Riverlink project was critical to its eventual classroom infusion and diffusion to other users. Rogers also found that the degree of use of a communications innovation rather than the decision to adopt it to be the most important factor indicating the success of the diffusion effort.

Re-invention of Innovations

Rogers defines re-invention of the innovations as the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation. Infusion of technology into school classrooms in the Riverlink project took place as teachers were able to successfully design and implement instructional activities using the educational technologies that met their own specific classroom needs and those of their students.

Seven Project Goals and Their Outcomes

Goal 1: Elementary and secondary students will use technology to collaborate between classrooms and between schools in solving age-appropriate aspects of real-life problems as they develop mastery of related Sunshine State Standards.

Student portfolios created in HyperStudio were produced by elementary and high school students that displayed their new understanding of science and the applications of newly acquired knowledge and skill in using educational technology.

During the year, selected Lone Star Elementary School 1st, 4th, and 5th students traveled to Sandalwood High School where they paired up with high school students to work on computer-based electronic portfolios dealing with science learning outcomes resulting from their study of Gunsmoke Creek, Pottsburg Creek and the St. Johns River. Carter G. Woodson Elementary School teachers and students traveled to the Lone Star site to view Gunsmoke Creek and learn more about Lone Star's science learning activities, materials, experiments and projects.

Throughout the school year, teachers and students at William M. Raines High School and Carter G. Woodson Elementary School worked together to establish a computer laboratory, a Riverlink project laboratory, and establish learning sites at the Pumpkin Hill Preserve. The teachers developed skill in using the educational presentation tool, HyperStudio and the Internet. They also created a distance-learning laboratory to help facilitate communication between the two schools.

Goal 2: A cadre of preservice teachers and veteran teachers will become skilled in the use of high-end technology for classroom instruction.

Partner institutions modified the original goal for the project as project activities were implemented. To guide their students in the display the learning outcomes of their study of the creeks and rivers, all participating teachers received training in the use of Hyperstudio and in procedures for facilitating the development of student electronic portfolios. Participating teachers at Lone Star received additional educational technology training in web page development at New Horizons Learning Center. Web sites were developed for Lone Star and Carter G. Woodson elementary schools. Refinements were made to web sites at Sandalwood and William M. Raines high schools.

Goal 3: The district's professional development model will be expanded to include an experimental learning approach based on the National Writing Project philosophy involving teachers in the same processes and activities required of their students.

Throughout the school year project teachers developed written science lessons, documented science learning outcomes, and created new approaches to science teaching and learning that incorporated language arts learning outcomes.

Goal 4: Students will develop self-initiated learning habits in which they become active questioners and gatherers of information to solve problems.

Students at each project school were actively engaged in science observations, recording data and drawing conclusions to solve scientific problems. The outcomes of the student learning were reflected in their Hyperstudio portfolios and work prepared for posting on the web sites.

Goal 5: The role of the teacher will evolve from a dispenser of information to a facilitator who asks analytical questions, presents challenges, stimulates discussion, and models the learning process.

Students at project schools conducted research, compiled data, and presented it to their peers and students at each other's project schools. The teachers participating in the Riverlink project facilitated the learning and supervised the documentation of science learning outcomes.

Goal 6: The learning environment will change to one in which information technologies are readily accessible to all constituents and one in which questions, discussions, and investigations are at the heart of teaching and learning.

The work with Internet sites provided considerable information to stimulate the students' imaginations. The educational technology provided tools for accessing and effecting scientific communication among students and teachers participating in the project.

Goal 7: Students will understand that science, technology, and society are interwoven.

The artifacts and descriptions provided throughout the project provided considerable evidence that participating students were actively engaged on their own learning. The Hyperstudio portfolios displayed considerable knowledge and skill in the use of technology and the learning of science.

Outcomes and Future Plans

The following dissemination techniques were designed to ensure that other educators had an opportunity to benefit from the outcomes of the Riverlink project.

1. The electronic portfolios produced by each participating student were used in presentations to educators on an invitational basis. Depending on the audience, the presentations were made by either students or teachers.
2. The creation and maintenance of a central website would allow regular student publication of data, articles, and fliers that promote environmental education throughout the community.
3. Students will produce a periodic newsletter that chronicles their investigations.
4. Participating schools will participate in the city's Earth Day celebration by developing and monitoring a public display that describes their involvement in the Riverlink project.

5. Participating teachers developed independent, multi-grade lesson plans and assessments that addressed Florida's Sunshine State Standards in science.
6. Participating teachers developed and presented the outcomes of the project at professional conferences.
7. Participating teachers began the development of their personal professional portfolios.
8. Preservice teachers from the university used the school websites and related Riverlink materials during their clinical experiences in the schools.

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Software Sources

International Business Machines Corporation, New Orchard Road, Armonk, NY 10504. Available online [http://www.ibm.com]

Microsoft Corporation, One Microsoft Way, Redmond, WA 98052-6399. Available online [http://www.microsoft.com]

Roger Wagner Publishing Company, 1050 Pioneer Way, Suite P., El Cajon, CA 92020. Available online [http://www.hyperstudio.com]

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