Habitat Tracker: Learning about Scientific Inquiry through Digital Journaling in Wildlife Centers

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ABSTRACT
This poster presents preliminary results from an ongoing research project designed to help elementary school students learn about scientific inquiry. Florida State University, in partnership with the Tallahassee Museum (a wildlife center in Tallahassee, FL), has developed a digital journaling system that uses online and mobile technologies to help students better understand the nature of science. The project's goal is to encourage students to become active participants in the scientific inquiry process by collecting and analyzing data about natural habitats, before, during, and after visits to a wildlife center. Preliminary results show that a mobile learning application specifically designed for elementary school students can support the scientific inquiry process at wildlife centers and in the classroom, and help students master the scientific inquiry and nature of science benchmarks advocated by science education reform efforts.

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Scientific inquiry, collaboration, education, field trips, curriculum

1. INTRODUCTION
School field trips to museums, zoos, and wildlife centers are common throughout the education system, and are generally seen as enhancing learning in a variety of subject areas as well as providing a rewarding experience for students [7]. While field trips are considered particularly valuable in science education, research suggests their potential value may be undermined by a lack of integration between visits and the school curriculum [3, 4]. Studies of school field trips to science museums have found that although teachers may express a goal of connecting the trip to classroom curricula, in practice it is difficult for them to do so, and such connections are not generally cited as indicators of trip success [11]. There is frequently little preparation for the trip, time spent at the museum is connected to the exhibits rather than the curriculum, and follow-up activities are rarely connected to science education standards [6, 10].

This project addresses these problems by assessing the value of using digital journaling in wildlife centers to involve students as active participants in their own science education. Journaling requires goal-based information gathering, and is used in science education to encourage students to explain the inquiry process [8]. Using educational technologies specifically designed for this project, students can research wildlife prior to a museum visit, collaborating with students from other schools to develop research questions online. At the museum, students use an iPad application to record observations in digital journals, which are uploaded to a shared online database available to all participating students. Back

in the classroom, students collaborate with other students to analyze their data and answer their research questions.

2. BACKGROUND

The goal of the Habitat Tracker project (http://tracker.cci.fsu.edu/) is to investigate the effect of combining the proven educational benefits of scientific journaling with interactive technologies that enable students to collect real time data to support classroom inquiries. Inquiry-based instruction is the basis for pedagogical standards promoted by science education reform documents and is considered an effective way to help students understand science content, as well as the meaning of scientific inquiry and methods for conducting inquiries [1, 2, 5]. This project draws upon more than a decade of prior research on mobile computing in museums to design a system that helps students develop scientific inquiries, collect data to address those questions, and make claims from that evidence. Habitat Tracker consists of two technologies:

1. The *Habitat Tracker Digital Journal*, an interactive iPad app through which students can answer their own questions about natural science, record their own personal observations of wildlife activities, and contribute observations that can be shared with other students online; and
2. The *Habitat Tracker Website*, where students can access content about museum wildlife; read, edit, and share their own journal entries; discuss findings with students in other classes and other schools; and analyze a growing database of animal, habitat, and weather observations to answer the questions they developed before, during, and after the field trip. The site serves to extend the museum experience beyond a particular visit and facilitate collaborative learning beyond the bounds of a single class group.

Habitat Tracker takes advantage of the potential for collaborative learning between teachers and students across different schools to facilitate learning before, during, and after field trips to the museum. It is possible that the lack of direct links between field trips and classroom curriculum identified by previous studies may be due in part to a lack of support for designing instructional experiences to integrate the field trip with classroom activities. This project, therefore, explores whether encouraging students to become active participants in gathering and analyzing scientific data — for instance, by researching the wildlife at the Tallahassee Museum before, during, and after their museum visits — helps students better understand the nature and practice of science.

3. METHOD

Following an initial pilot test of the system with four schools during the Spring 2011 semester, twelve (12) schools were recruited for the 2011-12 academic year through professional development workshops held during Summer 2011. These three-day workshops were designed to help teachers learn how to implement Habitat Tracker in their classrooms, demonstrate inquiry-based instruction and activities, familiarize teachers with science education standards and benchmarks, and explain how incorporating the Habitat Tracker into the curriculum can improve student learning and help meet educational standards [14, 15].

The participating schools represent a wide range of school demographics, including neighborhood elementary schools, charter schools, and science and math magnet schools. Over 1000 fourth and fifth grade students will participate in the project during the 2011-12 academic year. Students use the website to access multimedia content about the habitats they will see at the museum, use digital journals to write about what they are learning and to develop research questions, and use discussion boards to collaborate with students in other classrooms and other schools. At the museum, students work in pairs to write journal entries and collect observation data about natural habitats, animals, and weather using an iPad application designed for this project. After the field trip, students use the website's analysis tools to refine and answer their inquiries, updating their journal entries with the results of their data analyses.

Student involvement with the project will be analyzed through a qualitative analysis of the students' journal entries from before, during, and after the field trips, and a quantitative analysis of the observations made during the field trips. Content analysis of the students' journal entries will uncover themes such as the types of research questions that the students have before the field trips and the revised questions that they produce during and after the trips, while an analysis of the observation databases will show the types of inquiry students are able to perform using the system's analysis tools. The impact of the project on student understanding of scientific inquiry and the nature of science will be measured through pre- and post-test learning gains using three instruments: the Scientific Attitude Inventory [13], Understanding the Nature of Science [9], and Views of Scientific Inquiry [12].

4. FINDINGS

The Habitat Tracker project is currently in its second year out of a three-year project. Year One focused on developing the systems, resources and technologies for teachers and students, which have been used by almost 950 fourth and fifth grade students as of December 2011; more than 200 additional students are scheduled to participate in the Habitat Tracker project during the 2011-12 academic year. To date, 536 journal entries and 2,657 observations have been entered into the system, including 1,010 habitat observations, 941 animal observations, and 706 weather observations. These findings demonstrate high levels of student involvement and engagement, and provide evidence that on site experiences at the museum can integrate with classroom curricula.

Preliminary results from pre- and post-test surveys show that the Habitat Tracker project has positive impact on science learning. Students participating in Habitat Tracker learn about the nature of science by asking their own questions about the natural world, recording observations and drawing appropriate inferences from them, conducting peer review by discussing their data with students from other classes, and recognizing that science works in various empirically based ways. Preliminary findings indicate that the more involved students and teachers become with a project such as Habitat Tracker, and the more closely integrated student activities are in the classroom and on field trips to science museums, the greater the students' learning gains.

5. CONCLUSIONS

The success of the Habitat Tracker project so far clearly demonstrates the educational value of helping students become actively involved in their own science education on field trips to museums and wildlife centers. By encouraging students to become active participants in their own science education through digital journaling and mobile computing, students gain a deeper understanding of the nature of science and the scientific inquiry process. By involving students in the process of asking and

answering research questions, and making observations and drawing inferences from them, students gain valuable, hands-on experience planning and conducting scientific inquiries while making museums an integral part of classroom learning.

6. ACKNOWLEDGMENTS

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