HABITAT TRACKER:
Learning About Scientific Inquiry through Digital Journaling in Wildlife Centers

This project proposes to investigate the effect of combining the educational benefits of paper-based journaling with interactive technologies allowing students to collect real time data to support their classroom inquiries. Learning to conduct inquiries, to ask scientific inquiries, to collect data to address those questions, and to make claims from that evidence are all skills fundamental to science education reform efforts. To help students develop these skills, the proposed project draws upon more than a decade of prior research on mobile computing in museums to design and develop a learning system based on the use of digital journals before, during, and after field trips to wildlife centers.

This system will consist of two interrelated technologies:

1. the Habitat Tracker Digital Journal, an interactive application for a handheld computer (such as an iPod Touch) through which students can access multimedia content and expert commentary relevant to a particular museum location, answer their own questions about natural science, record their own personal observations of wildlife activities, and contribute observations that can be shared with others in the museum and online; and

2. the Habitat Tracker Community Website, an interactive forum where students from multiple schools can access multimedia content and expert commentary about museum wildlife, read, edit, share and discuss their own digital journal entries, and contribute to a growing database of information about organisms and habitats observed. The site will serve to extend the museum experience beyond an actual visit and facilitate collaborative learning beyond the bounds of a single class group.

The use of mobile, handheld computers allows students to access expert content and commentary in real time during visits (including audiovisual materials). They can review digital journal entries before, during, and after visits, and teachers can integrate their experiences into educational activities in the classroom. By encouraging students to record wildlife observations that can be shared electronically with others, digital journaling has the potential to extend the benefits of traditional journaling beyond the individual to influence a broader group of learners.

Extending the journal system onto the web takes advantage of the potential for collaborative learning between teacher and students across different schools, before and after museum visits. The web-based nature of the educational visit will be of particular benefit in providing valuable support for teachers prior to and after a visit. It is possible that the lack of direct links to the curriculum identified by the above field trip studies may be partially due to a lack of support, especially since designing instructional experiences around a field trip requires a different approach from a normal lesson, particularly if it is to be integrated with classroom activities.

The following sections, therefore, detail how students and teachers will be prepared for using the intervention prior to the school year, as well as how the intervention will function before, during, and after the student visits to the wildlife center. It is expected that the use of the system will take place over one week, including a day or two of pre-visit activities, one day at the museum, and couple of days of post-visit activities. For more information, including a mock-up of a prototype system, please see: http://tracker.ci.fsu.edu/
Planning for the Intervention: Activities Prior to School Year

The intervention itself is situated within the context of inquiry as a theory of knowledge change. This is because the students themselves will not be passive recipients of knowledge while at the museum. Instead, students will spend time prior to the visit beginning their research and developing their own inquiries situated within the context of the museum’s wildlife habitats. During the museum visit, they will use Habitat Tracker to help them answer their chosen research questions. After the visit, they will use class time to understand the extent to which they were successful in answering their original goals, and to address any new questions that may have emerged out of their inquiry. As a part of the post-visit process, students will share data and thoughts with other students, teachers, and experts, in order to explore common areas of interest.

To help teachers learn how to implement the intervention and its learning goals in the classroom, a three-day professional development workshop will be held in the summer before the second and third years of the project. The goal of the workshop will be to familiarize teachers with the target benchmarks, inquiry-related activities to be associated with pre and post-visit activities, as well as the incorporation of the Habitat Tracker journal and website into their classroom curricula to meet science standards.

The three-day professional development workshop will help teachers become familiar with the Nature of Science concepts, as well as other content standards (e.g. Interdependence) germane to this project; learn how to facilitate student participation prior to the museum visit in order to get students engaged prior to their visit; become familiar with the details of the museum visit, and the operation of the mobile computers that the students will use at the museum; learn how to facilitate post-museum visit student interaction with other students and with scientists/experts; and learn how to contact staff for assistance during any phase of the process.

The Florida State Standards for Science Education (see below) include benchmarks that are specific to the practices of science, the characteristics of scientific knowledge and science content. The workshop for participating teachers will help them address these benchmarks in pedagogically appropriate ways. In particular, the use of inquiry-based teaching strategies will be emphasized as a means to facilitate the development of nature of science content. The system will be specifically designed with activities and content to provide learning opportunities consistent with these standards. Flexibility will be given for teachers to customize activities and content to the specific needs of their classes at the time of a field trip.

Using the Intervention: Educational Activities in the Classroom Prior to the Museum Visit

During the school year, and prior to the museum visit, teachers will be able to visit the Habitat Tracker website (see Figure 1) to access the content and resources that they will need in order to learn about the journaling approach and create journal logins for their students; learn about the technologies in use at the museum and download lesson plans; and learn how to link the museum visit to classroom learning and the science curriculum.

At same time, students in the classroom will be able to use the website in order to access multimedia content about the wildlife exhibits they will see at the museum; learn how to create their own journals and what constitutes a good journal entry; and read select journals entries from students who have already visited the museum and enter their own comments.
As part of this process, teachers will lead students in a discussion of scientific questioning, and as students review the data from the website, small groups will be asked to compose their own sets of questions for investigation at the museum, review the data already available to address those questions, and plan how they will collect their own data while at the museum.

Using the Intervention: Educational Activities at the Museum during the Field Trip

Upon arriving at the Tallahassee Museum, students working in pre-determined small groups will receive a Habitat Tracker digital journal for use during their visit. These digital journals will run on a handheld computer such as an iPod Touch (see Figure 2). These devices are equipped with touch screens, cameras, wireless networking, and a location positioning system (similar to GPS), which allows them to be customized for data collection applications in the field.

Using a handheld computer allows for the creation of a location-aware system that will provide greater usability and a more significant educational impact. A location aware device can provide contextual information to students according to their inquiries and prompt them for inputs based on their location in the museum grounds. The students can remain focused on learning science rather than learning how to navigate the screens and menus of a computer application.

To encourage cooperation and discussion among students, the digital journals will be shared among small groups of students who will take turns entering the data. Introductions to the exhibits will be done through audio (using a built-in speaker), with only short text and video content sequences that require viewing the screen. The interface of the handheld device, including the data entry prompts, will specifically require students to observe closely what the animals are doing and enter these data into the system. Researchers from the project will be available during the trip to guide students in their observations and data collection.

Using the Habitat Tracker Journal at the museum, students working in small groups under teacher supervision will be able to view detailed information and multimedia highlights about the wildlife exhibits, with different content and interactives appearing based on their location in the museum; create journal entries, using the keyboard and camera built into the device; and upload their journal entries to the Habitat Tracker Website.

Project researchers and museum personnel will provide a brief orientation explaining the use of the Journal to the students, who will be asked to complete a short login process. Museum staff and project team members will be available throughout the museum to help answer questions, and an interactive, online help system will be integrated into the Journal.

As they explore the museum’s habitats, students will be able to use their Journals to access an interactive map of the museum, indicating their current location as well as the current status of the wildlife habitats in the museum. At each habitat, they will be able to use their Journals to access multimedia information about the museum’s wildlife, including expert commentary from the museum’s curators as well as the latest observations entered by other museum students (see Figure 3). They will have access to general information about natural science (e.g., videos of Bald Eagles hunting for fish) as well as specific information about the museum’s wildlife (e.g., how to find animals that are not always out in the open).

As they walk the wildlife trail, students will be able to create journal entries in which they can record their own personal observations of wildlife activity linked to their current location (see Figure 4). These entries will allow students to personalize their visits, recording data about
animals meaningful to them and maintaining a history (including digital images using the built-in digital camera) which they can access on a future visit or online.

By using their journals to document events of significance to them, they will learn how to make their personal experiences and scientific inquiries an integral part of the educational learning process, incorporating their journal entries into broader learning activities away from the museum. In this way, students will extend the museum visit beyond the boundaries of the physical museum. As students create journal entries, they will be encouraged to contribute their observation about the wildlife and their habitats to a database accessible to other students.

**Using the Intervention: Educational Activities in the Classroom After the Museum Visit**

Returning to the Habitat Tracker website back in the classroom, students will be able to submit questions to curators and invited experts about their wildlife observations (professional development with teachers will facilitate this usage); communicate with other students for purposes of obtaining data or testing ideas and explanations; join discussions and form animal interest groups with students at other schools; and respond to comments about their journal entries from students, teachers, and others involved with Habitat Tracker.

The central aspect of the post-visit portion of the intervention will involve student-led analysis of data gathered at the museum to determine answers to their scientific inquiries. Peer discussions and consultations with experts will help generate scientific inferences and explanations. Students will be encouraged to construct scientific arguments about the content encountered and communicate how scientific inquiry is done consistent with the Nature of Science benchmarks.

At same time, teachers will be able to read, comment, and provide feedback on student journal entries; suggest peers, experts, and/or links for students to refer to; share ideas with teachers in other schools; and provide feedback for the museum educators about the visit experience.

Figure 5 provides a prototype screenshot showing some of these options at the website. The screenshots provided are illustrative; the final systems will depend on the results of the user-centered iterative design and development activities to be carried out during the project.
The Florida Black Bear is a large omnivorous animal that is very secretive and rarely seen by humans. Black bears are the only bears in North America that are able to climb trees after they reach adulthood. The bears at the Museum are no exception to this special characteristic. They each spend a good bit of time up in trees to the delight of visitors. The large enclosure at the Museum allows visitors the opportunity to observe bear behaviors much as they would be in the wild.
Figure 3: Prototype multimedia content page for digital journals

Figure 4: Prototype journal entry page for digital journals
Date: July 22, 2006  
Time: 9:00 AM  
Subject: Florida Panther Habitat

Today we spent nearly twenty minutes watching the panthers play in their habitat. They have a very large climbing toy, much like the one our cat has at home, only much bigger. Both the panthers can climb on it at once, although only one seemed very interested in playing -- the other was sleeping under a tree.

We were amused to see a large tether ball attached to a tree. Do the panthers play tether ball? We tried to talk them into playing, but they seemed uninterested.

All in all, they seemed less playful than our cat at home. One of the panthers came right up to us, so we took several pictures using the journal's attached digital camera.