Title

Scientific Inquiry and Field Work: Discovering with Technology for Grades 6-8

Target Audience

This course is designed for in-service and pre-service teachers of grades 6-8.

Facilitator

See facilitator guide

Credit

To be decided by college or university

Description

Current technology can help students to improve their problem solving skills by giving them more opportunities for inquiry. In this course, learners will explore the many tools available to them and their students, such as Web sites that have technological equipment available for students to collect and analyze "real time, real world" data in the field. This course is designed to give learners a variety of technological strategies to allow students to record and communicate on-site data collection, analyses, and investigative results. Learners will examine ways to acquire mobile technology for their classrooms. As a final task, learners will design a unit plan for an ecosystem field trip that incorporates current technologies for gathering, analyzing, and sharing data.

Standards

This course will help teachers to meet NETS standards 1, 2, 3, and 5.
This course will help your students to meet NETS foundation standards 3, 5, and 6.

Learning Outcomes

After completion of this course, learners will be able to:

- Find Web sites with examples of environmental activities that use mobile technology.
- Identify a variety of technological strategies for students to record and communicate on-site data collection, analyses, and investigative results.
- Articulate the differences between traditional and current technological methods for collecting and analyzing data in the field for specific ecosystems.
- Create a unit plan that uses inquiry and current technology to support learning in the field.
- Identify which types of current technology are available to your classroom.
- Develop a variety of strategies to acquire mobile technology for your classroom.

Process

This course consists of six activities and a final project. Learners will work through each activity in order.

Activity 1: Examine Existing Web Sites for Technological Devices used for Collecting and Analyzing Data in the Field

In this activity, you will use the Internet to investigate examples of technology being used to study data in the field. You will list different technologies, their uses, and their strengths and weaknesses.

View and reflect upon a video

Explore the following resources

- LEARNWEB at the Harvard Graduate School of Education
  A good source demonstrating the use of new and traditional technology is found in a Water Quality Project at Boston Latin Academy, Boston, Massachusetts, USA
- Digital Exploration Society, DEX , directed by Robert Lindstrom
  This organization seeks to bring new technology to teachers and students for the purpose of enabling them to gather and analyze information while in the field. DEX launches, supports, and equips Internet-enabled outdoor learning adventures for students and teachers. Their DEXpeditions are dedicated to encouraging kids to discover new ways to see, to hear, to learn, and to share—away from the concrete and glass.
- Vernier
  A software company that develops technology for educational activities. Several issues of their publication, "The Caliper," are included on this Web site. Selections from their CD's and manuals include lesson plans and activities available for educators.
- Education with New Technologies (ENT)
  This networked community is designed to help educators develop powerful learning experiences for students through the effective integration of new technologies.
  This particular site contains several choices for how water-quality study can be initiated in the classroom: inquiry for students, activities, and the use of mobile computers for gathering data.
- Indiana Department of Natural Resources
  Links to environmental resources.
- O2 GREEN: Global Rivers Environmental Education Network (Australia) Incorporated.

Submit your list of at least five current types of technology that are being used in the field to gather and analyze data. For each type of technology, provide an example of how it is used and what the strengths and/or limitations are when using it in an outdoor environment.

Post a question or idea of interest that emerged as you viewed the resource Web sites. For example, you may want to ask about others' use of technological devices with their own classroom, such as the Palm Pilot, and in what setting these devices were used. Respond to two other postings.

Activity 2: Choose an Ecosystem to Investigate

In this activity, you will select an appropriate ecosystem to investigate. You will base your decision on its location and transportation, financial, and time considerations as well as curriculum and student interests.

View and reflect upon a video

Explore the following Web sites

- US Fish and Wildlife
  This includes excellent definitions for terms you and your students will be using as you study your ecosystem, such as *watershed*.
- Division of Soil Conservation
  Contacts for soil studies, including: management, administrative and technical support, district capacity, agriculture conservation specialists, resource and storm water specialists, conservation partnerships, soil and water conservation districts, state directory, and related Web sites.

- Softweb Resource Center
  Offers a variety of subtopics dealing with technology and environmental issues.
- US Fish and Wildlife Environmental Quality Homepage
  You will learn about some issues and methods of studying migratory birds, amphibian declines and deformities, pesticides, endocrine (hormone) disrupters, water quality concerns and testing, pollinators, habitat restoration, oil spills, and invasive species and the problems they can cause.
- US Fish and Wildlife
  The U.S. Fish and Wildlife Service works with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. They are the only agency of the U.S. Government with that primary mission.
- The Indiana Department of Natural Resources' Division of Forestry
  Contains directory for park services and contacts.
- National Park Services
  Visit the National Park Service and follow the index for the directory that lists a contact nearest to you.

Write a detailed description of the specific ecosystem that your class will investigate as well as a list of the types of data you wish for them to collect and analyze. Give your reasoning for choosing this ecosystem (location, to meet curriculum objectives or standards, students' interest, etc.).

Share a contact list of local and/or state conservation officers and others who helped you learn about your surrounding ecosystems. Ask for any other contacts or ideas as to how you might learn of other ecosystems to study for comparison of data.

Activity 3: Select and Prepare Student Activities for Collecting and Analyzing Data in the Field

In this activity, you will develop three activities for your ecosystem. You can modify activities you found in Internet resources or you can create your own activity. You will also describe a plan for pre- and post-field discussions.

View and reflect upon two videos

Explore the following Web resources

- Timeline Resource: Week One (of Four)
  Jo Gilbertson's timeline: “New Technology Use in Ecosystem Investigation”
  Introduction to unit, “Brainstorming in the Classroom.”
- Concord Consortiums SmartProbe Webpage
  Contains curriculum ideas and handheld computer activity suggestions.
- Palm Education Pioneer Grants
  Palm has awarded schools that have incorporated the use of handheld devices into their curriculum. In particular, look at those for science as well as cross-curricular designs. Use your imagination and creativity to think of other means of integrating the probes, sensors, cameras and so on into a diverse field of study, not just science.
- The Water Quality Project, Boston Latin Academy, Boston Mass, USA
  Check out the Overview, the Framework, the implementation of National Standards, how the unit worked and, most importantly for you, "what new technology adds."
- The Project WILD program
  Helps teachers and students meet state course requirements by using the environment as a means to apply science, social studies, and other disciplines to real-world situations. This curriculum guides students in the investigation of wildlife concerns and encourages them to contribute their findings to responsive action projects that benefit wildlife, people, and the environment.

- ImagiWorks
  A software company that has the dock, probes, and sensors that attach to the Palm for data gathering and graphing onsite. Check out the environmental activities described.
- Supporting Flexibly Adaptive Design of Innovative Science Curricula
  Excellent summaries of how the new computer technology can be used for environmental curriculum as well as strategies. From presentations for the Annual Meeting of the American Education Researcher Association (AERA), New Orleans, April 24-28, 2000.
- DEX, Digital Exploration Society
  This organization seeks to bring new technology to teachers and students for the purpose of enabling them to gather and analyze information while in the field. DEX launches, supports, and equips Internet-enabled outdoor learning adventures for students and teachers. Their DEXpeditions are dedicated to encouraging kids to discover new ways to see, to hear, to learn and to share—away from concrete and glass. Go to this Web site and click on the Lake Erie DEXpedition; note the technology used.
- Star-Bulletin News
  Read the article, “School Expands Hawaii's Reach over World,” which states that Windward college training in the use of satellite data offers opportunities for business and the environment. A Kailua group and WCC are studying area streams. A Windward Community College professor demonstrates how advanced computer technology can be used for economic, environmental, and other benefits. The college added remote sensing and geographic information and global positioning systems to its earth, marine, and space science program.

List three activities that require the use of technology for data collection and analysis at an outdoor site similar to the ecosystem you chose in Activity 2. Give a detailed description of each activity including your plan for pre- and post-field trip discussions and presentations. Also, describe the type of technology that will be used in each activity and how it will engage the student in the learning process.

While looking at different activities that could occur “in the field,” go to the discussion board and share at least one activity where technology was used to engage the learner. Then, give feedback to one other person, using the guidelines below. Respond to someone who does not already have feedback, so that everyone will receive input.

- In this activity, do data gathering and analyzing activities occur while in the field? If so, what is collected and how is it analyzed?
- What type of technology is used in their activity? How is it used? What was the outcome of using it onsite?
- Share ideas of other technologies they might be able to use or improvements they could make to their current method for using technology.

Activity 4: Investigate Sources for the Most Current Technology Needed for the Field Project

In this activity, you will find out where you can obtain the current technology to accomplish the activities you developed for your chosen ecosystem. A variety of suggestions are provided for locating this equipment.

Explore the following Web resources

- ImagiWorks
  ImagiWorks has several products built on top of a core technology called the ImagiProbe™ system. The ImagiProbe system combines hardware and software that enables users to connect sensors to Palm OS-based computers and collect, display, and analyze data in real time. The primary strengths of the ImagiProbe offering include low price point, ease-of-use, extreme portability, and access to general-purpose computing capability.

- ImagiWorks: ImagiProbe
  See how the set of probes and sensors that attach to a Palm allow the student to move from the classroom to the environment.
- Vernier
  A software company that develops technology for educational activities. Included on this Web site are several articles from their publication, "The Caliper," on the use of the sensors and probes by individuals. Selections from their CD's and manuals include lesson plans and activities available for educators.
- The Caliper
  A publication for users of Vernier products discusses the use of the latest technology developed by Vernier.

For each technological device you need for your class ecosystem activities, submit the information you need for obtaining them. If your school, or other local source has any of the devices you need, include the names, e-mails, and phone numbers of the person you need to contact to get the equipment and the availability of the equipment. For each technological device that your school or other local sources do not have, include the following information: the cost, availability, name of vendor, vendor's address or e-mail.

Share with your colleagues the information you have found in this activity about locating equipment. Ask your colleagues if they are aware of any other sources for getting the equipment you need or other mobile technology that can be used for the same purposes.

Activity 5: Develop a Timeline for Your Field Project

You have chosen the ecosystem, developed some data collection activities, and identified where to obtain the current technological equipment needed to accomplish these activities. Now is the time to bring this event to life! In this activity, you will develop a timeline for your field experience.

Examine a sample timeline

- New Technology Use In Ecosystem Investigation

Submit the timeline for accomplishing the pre-field, field, and post-field activities for your selected ecosystem.

Post your timeline and ask others to provide feedback.

Activity 6: Develop an Action Plan for Acquiring the Current Technology Needed for the Ecosystem Field Project

In this activity, you will develop an action plan for acquiring the technological equipment for your students' field experience. After completing this activity, you will be ready to present the need for current mobile equipment to local or regional organizations, such as school board, PTO/PTA, your corporation grant writer/curriculum director, National Fish and Wildlife Service, local or state museums, environmental organizations and/or local government/political council meetings.

Explore the following Web resource

- Supporting Flexibly Adaptive Design of Innovative Science Curricula

Submit a detailed action plan for requesting the funds and technology that your students need for their field experience. If you will be doing a presentation as a part of your plan, include a brief description of this presentation, the audience that you intend to address, and the format you will use.

Describe the methods you intend to use to get technological equipment that is not already available to your classroom. Ask for other ideas for requesting information and other people you could request funding and equipment from.

Final Project

Review the work you have already done in order to complete your final project. You should make sure you are meeting each of the final project criteria. Review each section to ensure that all are complete and have been edited for content and grammar. You may want to submit your project draft to a peer or colleague to assist with editing. When you are ready to submit your final project, compile the following sections:

- A list of current technology used in environmental data collection and analyses, including their uses and their strengths and limitations.
- An appropriate ecosystem to investigate based on its location, distance from school, transportation and financial considerations, as well as curriculum and student interests.
- Collaborative student activities for your chosen ecosystem that use appropriate new or current technological devices for collecting and analyzing data.
- The technology necessary for gathering, analyzing, and sharing information while at the selected ecosystem.
- Where to locate current technology within your school and community or what suppliers to get the equipment from if not already available to your classroom.
- A timeline to make your field trip a reality.
- A strategy to acquire the necessary new/current technological equipment that is not available to your classroom through the school or community.

Schedule

This course is scheduled to take approximately 30 hours to complete readings, activities, video, assignments, reflections and a final project.

Requirements

Learners are expected to:

- Complete all assignments
- Maintain an online journal
- Participate and actively engage in discussions with fellow learners while contributing to the social construction of knowledge
- Be self-directed and self-motivated
- Ask for assistance when they need it

Evaluation

Pass/fail upon satisfactory completion of assignments and discussion board participation

Materials

Technical Requirements

- Word processor
- Internet service provider

- E-mail

Academic Dishonesty Policy

To be inserted by university institution only