Reflecting on Virtual Globes and Teaching Methods

Thinking of the structure of a teaching lesson, various pedagogical methods, and what you've learned about virtual globes, write a short essay reflecting on where you think the greatest potential exists for applying virtual globes in environmental education.

Lesson Plan Outline
(Rosanne Fortner)

- Title
- Author
- Grade Level/discipline
- Rationale (why do this?)
- Materials
- Objectives
- Procedure
- Assessment
- Resources Used
- Standards (state and ocean/Great Lakes literacy)
- Teacher notes (as needed)
Teaching Methods

http://serc.carleton.edu/sp/library/pedagogies.html
(Science Education Resource Center, Carleton College)

- Assessment provides educators with a better understanding of what students are learning and engages students more deeply in the process of learning content.
- Authentic Writing for STEM (science, technology, engineering, & mathematics) will promote writing within the context of a profession, such as engineering or engineering technology. This type of writing requires a style that is more analytical, devoid of emotion, and with a separation of author from the written product.
- Calibrated Peer Review™ (CPR) is a web-based management tool that enables discipline-based writing with peer review in classes of any size.
- Campus-Based Learning uses the campus environment itself as a teaching tool.
- Classroom Response Systems use technology that promotes and implements active and cooperative learning.
- Coached Problem Solving is a class format in which professors provide a structured, guided context for students working collaboratively to solve problems.
- ConcepTests are conceptual multiple-choice questions that focus on one key concept of an instructor's learning goals for a lesson. When coupled with student interaction through peer instruction, ConcepTests represent a rapid method of formative assessment of student understanding.
- Context Rich Problems are short realistic scenarios giving the students a plausible motivation for solving the problem.
- Cooperative Learning involves students working in groups to accomplish learning goals.
- Engaging Students with Visual Rhetoric
- Experience-Based Environmental Projects get students involved in their own learning.
- The First Day of Class is your opportunity to stimulate excitement about the course, establish a positive classroom climate, and engage students with course content - right from the start.
- Gallery Walk activities get students out of their chairs to actively work together.
- Game-Based Learning was written to assist geoscience faculty who want to start using games to help them teach.
- Guided Discovery Problems: Through intriguing puzzles to solve, structured hands-on activities, carefully worded leading questions, crucial hints, and just-in-time presentations of information, guided discovery problems escort students step-by-step through the process of scientific discovery.
- Interactive Lectures provide short activities that can break up a lecture.
- Interactive Lecture Demonstrations engage students in activities that confront their prior understanding of a core concept. The activity can be a classroom experiment, a survey, a simulation or an analysis of secondary data.
- Inventing and Testing Models This approach uses Model-Eliciting Activities, which are posed as open-ended problems that are designed to challenge students to build models in order to solve complex, real-world problems.
• **Investigative Case-Based Learning** involves students in addressing real world problems.
• **Jigsaws**: When you have several related data sets you would like students to explore, a jigsaw may be an option. In a jigsaw, each student develops some expertise with one data set, then teaches a few classmates about it (and learns about related data sets from those classmates).
• **Just-in-Time Teaching** gets students to read assigned material outside of class, respond to short questions online, and then participate in discussion and collaborative exercises in the following class period.
• **Lecture Tutorials** are short worksheets that students complete in class to make lecture more interactive. They are designed specifically to address misconceptions and other topics with which students have difficulties.
• **Making and Testing Conjectures** is an effective way of engaging students in learning and helping them to develop their reasoning abilities.
• **Measurement and Uncertainty** provides science educators with clearly written, effective material to teach introductory level students the fundamentals of effective measurement, and describes how to integrate these ideas into science teaching. This increases scientific literacy, helps students use data to understand science concepts during inquiry-based labs and activities, and prepares students for future science education.
• **Peer-Led Team Learning** engages teams of six to eight students in learning sciences, mathematics and other undergraduate disciplines guided by a peer leader. Peer leaders are drawn from the pool of students who have done well in the course previously.
• **Peer Review** uses interaction around writing to refine students understanding.
• **Place-Based Learning** is intended to promote sustainable lifestyles and economies appropriate for the ecological and cultural attributes of places and regions, rather than global standardization or narrowly-focused career training.
• **Problem Solving Strategies** are specific methods and templates for teaching students to solve problems in mathematics, physics and chemistry. The ultimate goal of these strategies is to guide students in their progression from novice to expert problem solvers by providing them with a framework for a systematic approach to new problems.
• **Process-Oriented Guided Inquiry Learning (POGIL)** is a research based learning environment where students are actively engaged in mastering course content and in developing essential skills by working in self-managed teams on guided inquiry activities.
• **Professional Communication Projects** ask students to effectively communicate scientific information in a genre that professional scientists are expected to master, such as with scientific posters, conference proposals or oral presentations.
• **Quantitative Writing** engages students with numbers by asking them to analyze and use quantitative data in written reports and arguments.
• **Role-Playing** immerses students in debate around Earth science issues.
• **SCALE-UP** is a Student-Centered Active Learning Environment for Undergraduate Programs. Carefully designed studio classrooms facilitate student teamwork and instructor movement between groups.
• **Service Learning in the Geosciences** offers the opportunity to link academic learning with community service.
• **Socratic Questioning** turns a lecture into a guided discussion.
• **Spreadsheets Across the Curriculum** helps students build spreadsheets and apply elementary mathematics to solve problems in context.
• **Structured Academic Controversy** is a type of cooperative learning strategy in which small teams of students learn about a controversial issue from multiple perspectives.
• **Student Research** engages student interest and provides opportunities for them to participate in active learning.
• **Studio Teaching** can provide a quintessential active and cooperative learning environment.
• **Teaching Large Classes** will help you bring active pedagogies into large lecture halls.
• **Teaching the Process of Science** helps you integrate the process of science into your teaching at all levels, using a variety of different techniques.
• **Teaching Quantitative Reasoning with the News** describes how one can use media articles as the main content for a course focused on honing students' ability to critically think about and analyze quantitative information.
• **Teaching Urban Students**: Urban students bring a rich set of experiences to the classroom that may be significantly different than those of students in small-town settings. Effective teaching of urban students requires instructors to tap into these rich experiences, cultural customs, and practical skills sets.
• **Teaching with the Case Method** combines two elements: the case itself and the discussion of that case. Teaching cases provide information, but neither analysis nor conclusions. The analytical work of explaining the relationships among events in the case, identifying options, evaluating choices and predicting the effects of actions is the work done by students during the classroom discussion.
• **Teaching with Data** helps faculty find and integrate real data sets into their classes.
• **Teaching with Data Simulations** allows students to visualize probability distributions, which in turn can make the processes associated with probability more concrete.
• **Teaching with GIS in the Geosciences** shows how this powerful new tool can be used to help teach geoscience.
• **Teaching with Google Earth** provides detailed instructions for bringing rich imagery and interactive information into the classroom.
• **Teaching with Models** helps students understand the relationships between data and Earth processes.
  • Conceptual Models are qualitative models that help highlight important connections in real world systems and processes.
  • Mathematical and Statistical Models involve solving relevant equation(s) of a system or characterizing a system based upon its statistical parameters.
• **Teaching with Simulations**: Instructional simulations use a model of behavior to gain a better understanding of that behavior.
• **Teaching with Visuality** intentionally harnesses the power of the visual to provide powerful learning experiences for all students.
• **Teaching with Visualizations** helps students see how systems work.
• **Undergraduate Research** In an undergraduate research experience, students collaborate with faculty on actual research projects, learning about both a particular topic in a field and the research process in general.

• **Using an Earth History Approach** helps students understand how human impact on the Earth's systems has increased exponentially over time.

• **Using an Earth System Approach** introduces concepts and resources centered on space, air, water, land, life, and human dimensions.

• **Using Field Labs** introduces students to complex natural systems, breaks down barriers among academic fields, encourages multiple observations, and introduces students to the area near their campus.

• **Using Indoor Labs** provides students with opportunities for structured investigations and experiments of materials, models, and other equipment.

• **Using Issues to Teach Science**.

**Virtual Globes**

http://en.wikipedia.org/wiki/Virtual_globe
(Wikipedia)

“A virtual globe is a 3D software model or representation of the Earth or another world. A virtual globe provides the user with the ability to freely move around in the virtual environment by changing the viewing angle and position. Compared to a conventional globe, virtual globes have the additional capability of representing many different views on the surface of the Earth. These views may be of geographical features, man-made features such as roads and buildings, or abstract representations of demographic quantities such as population.”

Google Earth
http://en.wikipedia.org/wiki/Google_earth

NASA WorldWind

ArcGIS Explorer
http://en.wikipedia.org/wiki/ArcGIS_Explorer