

# Starting Point: Linking Pedagogy, Resources and Community Interaction to Support Entry-Level Undergraduate Geoscience Education

Cathryn A. Manduca, Sean Fox, Ellen Iverson, Science Education Resource Center, Carleton College  
Dorothy Merritts, Geoscience Department, Franklin & Marshall College  
Mary Savina, Geology Department, Carleton College



serc.carleton.edu

NSF 0226243

**The Starting Point project is exploring the ability of on-line resources to catalyze improvements in undergraduate teaching. Our goal is to develop a resource that intimately integrates pedagogy with teaching resources and fully supports a virtual community of educators.**

## Technology Supporting Development

- Exploits DLESE Cataloging System and OAI protocols for resource management and sharing
- Enables tracking and cross-referencing of resource links
- Enables distributed portal authoring and community contribution

**Starting Point Teaching Entry Level Geoscience**

**Get Started**  
Learn about instructional methods that work with entry-level students. Each section of this site provides information describing a teaching method, why/when it is useful, how it can be implemented, and a set of examples spanning the Earth system that can be used in your class.

**Teaching with Models**  
Conceptual, physical, mathematical, statistical and visualization models that can be used to help students understand geoscience concepts.

**Using Socratic Questioning**  
Strategies for developing and managing questioning that guides students through exploration of a topic.

**How to Use Mathematical Models**  
In addition to the general pedagogical discussion related to the effective use of models in the geoscience classroom, there are also technical considerations related to using models for introductory geoscience instruction. Technical considerations related to using different modeling environments are outlined in each link below. These include tutorials on using the software, hardware considerations, and links to specific geoscience examples that use the software.

**Solid Earth Socratic Questions**  
Created by Robert Walter and Dorothy Merritts, Franklin & Marshall College (robert.walter@fandm.edu, dorothy.merritts@fandm.edu)

**Description**  
Questions regarding the solid Earth are arranged in sequence for a session of Socratic questioning.

**Learning Goals**  
To be aware of scientific hypotheses regarding the nature of plate tectonics, earthquakes, and volcanoes. To recognize the types of evidence used to evaluate hypotheses regarding plate tectonics and mountain building. To understand fundamental aspects of the materials that compose the Earth, including minerals and rocks.

**Context for Use**  
This example is suitable for in-class use during a lecture period. No equipment is required unless the instructor wishes to use supplemental images. In that case, the images can be shown either with an overhead or computer projector. Images of rocks, minerals, and tectonic plates are available at numerous web sites, and add significant impact to this topic during class discussions. Some examples are given below in References and Resources.

**Teaching Notes and Tips**  
Tips: As in all Socratic questioning, give students time to reflect before answering questions, and make an effort to call on different students throughout the class period. Let students know at the beginning of class whether or not you will call on students randomly, or ask for hands to be raised, or both. To explore questions on the Solid Earth fully, allow at least an entire class period of 50 to 90 minutes.

**Teaching Materials**

## Teaching Entry-Level Geoscience Site Launched, July 2003

•The Starting Point site provides concrete pedagogic advice for faculty teaching entry-level geoscience courses that can be discovered by teaching method or geoscience topic.

•Teaching methods are outlined from a Geoscience perspective with a discussion of how and why to use. Topics include: Socratic Questioning, Teaching with Models, and Investigative Cases.

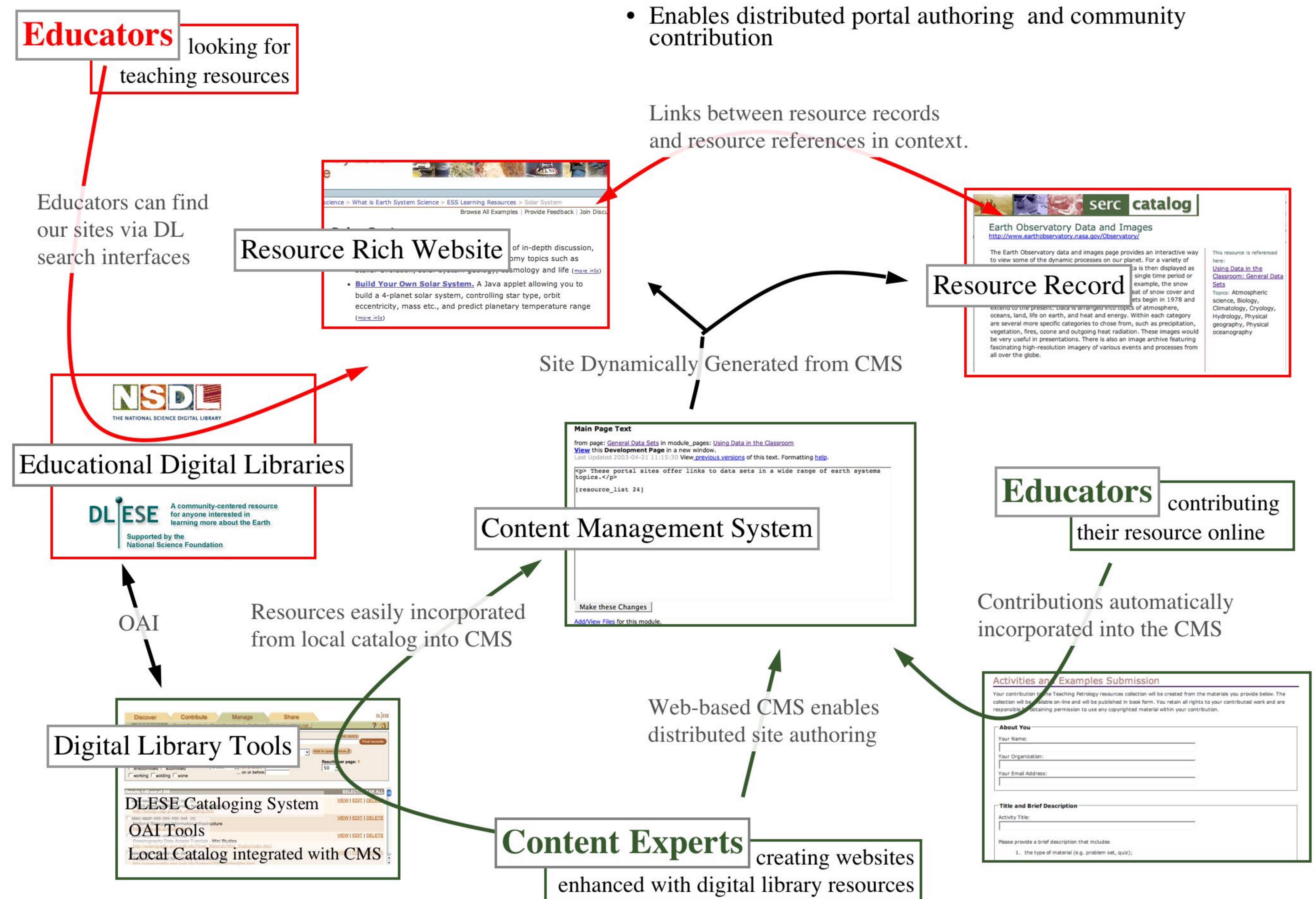
•Thirty-five classroom ready examples demonstrate the use of methods for teaching the full spectrum of entry-level geoscience topics.

## Initiating Evaluation Studies

- Over 3600 visitors since launch with average session of 2.5 page views
- Site walkthroughs indicate faculty are engaged by geoscience examples and excited by site; all reviewers bookmarked site.
- Faculty interviews indicate strong use of Google for finding information and images on the web.

## Lessons Learned for NSDL

- Specialized portals can provide solutions for specific user groups
- DL technology enables meta-data sharing that supports rapid development of specialized portals.
- Collaboration on evaluation studies will help our project.



<http://serc.carleton.edu/introgeo/>