

## **Searching by Educational Standards in DLESE:**

### **What does it mean and what do users want?**

Authors: Holly Devaul and Karon Kelly, DLESE Program Center, UCAR, Boulder, CO

Digital Library for Earth System Education [www.dlese.org](http://www.dlese.org)

### **The challenge**

A new functionality, searching for resources by educational standards, was recently unveiled in the Digital Library for Earth System Education (DLESE). Library users can now select National Science Education Content Standards (NSES) and/or National Geography Standards (NGS) along with other search criteria.

To implement this functionality, educational materials must be reviewed and appropriate metadata assigned at cataloging time. DLESE resources are contributed and cataloged by a wide range of community members, from teachers submitting their favorite classroom activities to funded, focused collection builders with trained catalogers. Consistency in cataloging is supported by “best practices” guidelines on the use of vocabularies and metadata fields.

Implementing this functionality is made more complex by the variability in data structure (granularity) of the various sets of standards being considered. We set out to explore guidelines for assigning standards that would be appropriate in a community-contributed environment, to develop an understandable interface, and offer context for the user when searching.

### **Look for guidance: What are others doing?**

A review of existing collections of educational resources revealed a wide range of approaches to associating and presenting standards information, but no one path for DLESE to follow.

Ohio Resource Center <http://www.ohiorc.org>

Offers resources correlated with and browsable by National and Ohio State standards. Content specialists and review board staff select resources and assign standards.

The Learning Matrix <http://thelearningmatrix.enc.org>

Resources are selected and reviewed by staff; collection policy gives high priority for resources aligned with national standards. No search by standards offered.

McREL <http://www.mcrel.org>

Offers in-house resources developed by McREL staff in direct connection with the McREL Standards Database, as well as external resources linked to standards from the Database. No search by standards offered.

### **User-centered design: What do users want?**

In keeping with the DLESE philosophy of user-centered design, a series of four focus groups with 33 participants were conducted. Our goals were to:

- Ascertain user expectations of and needs for a search-by-standards functionality
- Use that feedback to craft appropriate best practices for cataloging
- Explore ways to articulate the association of a standard or learning goal to a resource, once implemented

## **Community focus groups**

Participants included in-service K-12 educators, university science and education faculty, K-12 district supervisors and pre-service science education students. Focus groups were held in Fort Collins, Boulder and Greeley, CO in January, March and April of 2003.

On-line learning materials that reflect a variety of resource types, grade levels and standards were selected for the participants to review. These resources were used as the basis for discussion regarding the process of assigning standards as a cataloger; searching for resources as a user; and the terminology best characterizing the association between resource content and National Science Education Standards.

Educational standards vary widely in complexity. NSES is hierarchical, with 4 levels of depth (grade level; broad topic designated by a letter; abilities; and concepts and objectives. The NGES are the simplest, being a flat list of 18 items without grade level or other hierarchical divisions. At the time of the focus groups (and currently), DLESE tools allow for cataloging at the ability level (3<sup>rd</sup> tier) for NSES. Discussion evolved to include user needs in searching for resources by state standards and the appropriateness of our current approach to granularity.

### **Feedback:**

I like the terms “support” and “address” because no one activity can completely “meet” a standard. – *College faculty*

It is important to make sure the source is reliable. – *Pre-service 4-5 grade teacher*

I can assess usefulness, relevance and alignment with standards just by thoroughly checking out the activity. ...I make my own determinations about appropriateness. The assignments (of the standards in the library) would only be a guide for me. – *6<sup>th</sup> grade science teacher*

...it means that using that resource will at least partially meet that standard. I don't believe that a single resource can address the types of standards that are found in the NSES.... The best I could hope for is that a resource will help me make measurable progress towards meeting a standard. - *Informal education specialist.*

### **Results**

As a result of the focus group discussions the phrase "supports the student learning and attainment of" a specific ability or concept was adopted as the articulation of the association of educational standards and resources within DLESE. This phrase guides the cataloging of resources as part of a “best practices” document that provides detailed instructions on all data fields. Given the current level of granularity available for cataloging the NSES, this phrase best describes an understandable connection for library users and catalogers.

Library users can search for resources by standards in the interface shown here, selecting individual or multiple standards along with other search criteria.

The screenshot shows the DLESE Find a Resource search results page in Microsoft Internet Explorer. The browser window title is "DLESE Find a Resource: Search results - Microsoft Internet Explorer". The address bar shows the URL: <http://www.dlese.org/dds/query.do?q=water&cs=0&s=0&setVocabState=re&setVocabState=gr&setVocabState=ky&setVocabState=...>

The page features a navigation menu with buttons for "Educational Resources", "For Educators", "News & Opportunities", "People & Groups", "For Developers", and "About DLESE". There are also links for "Home", "Register", and "New to DLESE?".

The search interface includes a search box with the text "water" and a "Search" button. Below the search box are filters for "Grade Level", "Resource Type", "Collections", and "Standards". The "Standards" filter is currently expanded, showing a list of National Science Education Standards (NSES) with checkboxes for selection.

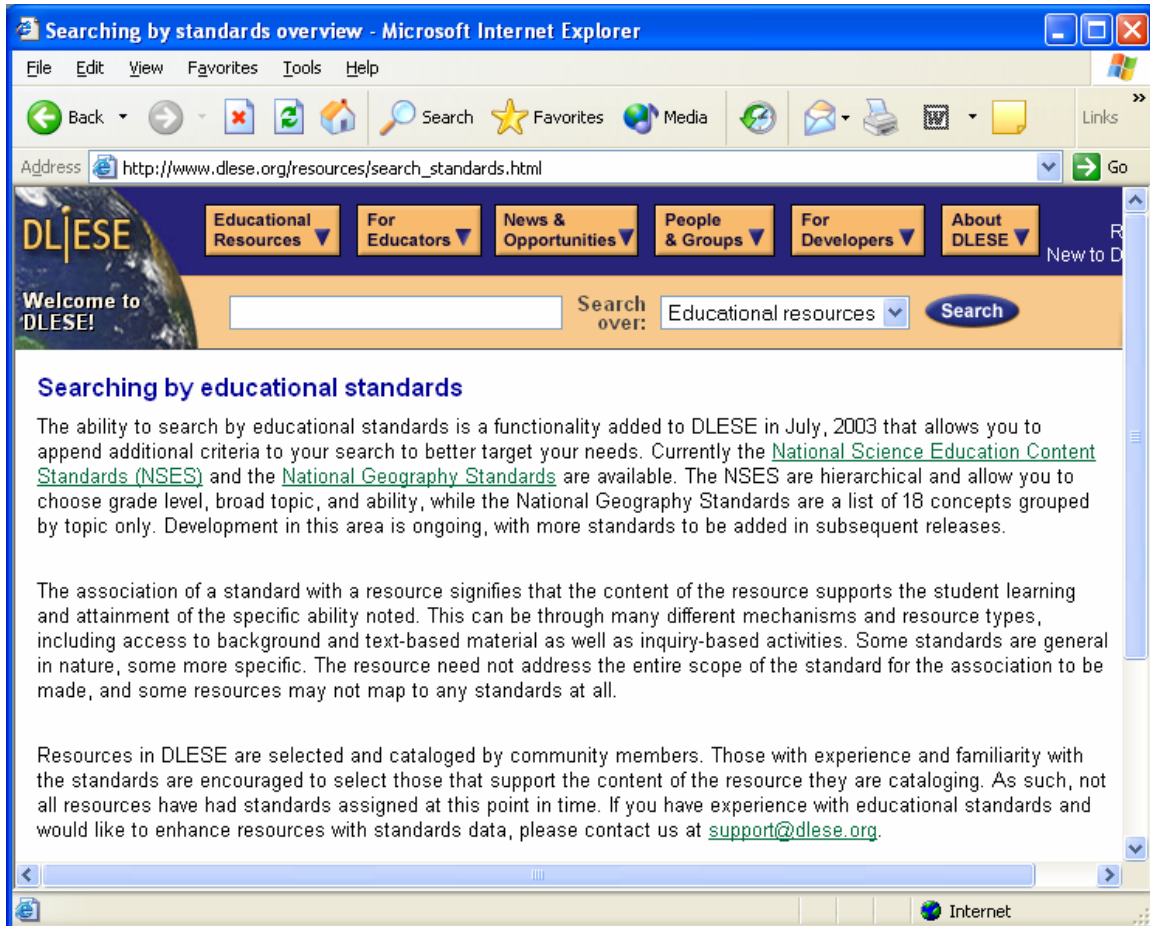
The search results section shows "Results 1-10 of 12 for 'water'". The first result is "Types of Clouds" with a URL <http://www.urbanext.uiuc.edu/weather/2.html>. The description states: "This is a basic lesson on clouds. Very nice photos of cumulus and cumulo nimbus clouds, and a description of all major cloud types and their associated weather. Two activities are included: one involves creating a collage of cloud images along with a description of cloud type... [Full description](#). See [reviews](#), [teaching tips](#), [related resources](#)".

The second result is "The Cloud Case" with a URL <http://weathereve.kgan.com/cadet/cloudless/teachers.html>. The description states: "The Cloud Case is an interactive online lesson about how clouds form through the interaction of air pressure and air temperature. Students learn how air pressure and air temperature affect the formation of clouds. The lesson and tries to solve the 'The Cloud Case'!... [Full description](#). See [reviews](#), [teaching tips](#), [related resources](#)".

The sidebar for selecting standards shows the following options:

- Select all
- National Science Education Standards (NSES)
  - ▼ K-4
  - ▲ 5-8
    - Unifying concepts and processes
      - Change, constancy, and measurement
      - Evidence, models, and explanation
      - Evolution and equilibrium
      - Form and function
      - Systems, order, and organization
    - A - Science as inquiry
      - Abilities necessary to do scientific inquiry
      - Understanding about scientific inquiry
    - B - Physical science
      - Motion and forces
      - Properties and changes of properties in matter
      - Transfer of energy
    - C - Life science
      - Diversity and adaptations of organisms
      - Population and ecosystems
      - Regulation and behavior
      - Reproduction and heredity
      - Structure and function in living systems

Information on how standards are assigned in DLESE is available via a link from the front page, as well as in the For Educators area.



## Reflections and Implications for DLESE and NSDL

### Who is the most likely beneficiary of a search-by-standards feature?

Participants indicated that teachers new to the classroom are the most likely users of this feature. They are potentially more familiar with national standards via their recent university training, and are also more in need of guidance in developing lesson plans and curricula for their students.

Experienced teachers are less likely to search by standards but thought the presence of the standards data in the resource descriptions was helpful in assessing the value and usefulness of a resource.

Pre-service teachers were concerned about the integrity of the process of associating standards. This supports the notion that this group looks for guidance in resource selection more than experienced teachers who rely predominantly on their own knowledge to assess the standards related to a resource.

#### Which standards and at what level of detail?

Participants overwhelmingly indicated that the current convention of cataloging National Science Education Standards at the ability level of granularity was not wholly sufficient for their needs. Educators more often must document that they are meeting state and local standards, not national standards.

Cataloging at a finer, more specific level of granularity (concepts and objectives) offers an easier on-the-fly mapping to one's state standards, if state standards were not offered.

**K-4 Content Standard D**  
**Earth and space science**  
**Properties of earth materials**

**Current level of granularity**

**Proposed level**

- **Earth materials are solid rocks and soils, water, and the gases of the atmosphere. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials, as sources of fuel, or for growing the plants we use as food. Earth materials provide many of the resources that humans use.**
- **Soils have properties of color and texture, capacity to retain water, and ability to support the growth of many kinds of plants, including those in our food supply.**
- **Fossils provide evidence about the plants and animals that lived long ago and the nature of the environment at that time.**

#### Articulation of process and credentials.

Pre-service teachers expressed the most concern about how and who assigns standards to resources; however other participants also indicated that they assumed that resources with standards assigned had undergone more rigorous scrutiny by an experienced individual.

In DLESE, best practices for cataloging helps guide catalogers in consistent application of standards and encourages them to know the bounds of their expertise. Additionally, quality assurance staff reviews all data.

## **Future work**

DLESE will continue to explore users needs for and possible implementation of standards at state and local levels, as well as at the concepts and objectives level (4<sup>th</sup> tier) for NSES. Interoperability with associated projects such as the Strand Map Service's use of AAAS benchmarks, and SRI's Performance Assessment Links in Science library (<http://pals.sri.com>) will be considered in the development strategy.

DLESE already provides a means to annotate resources through the Community Review System (<http://crs.dlese.org>) and is planning mechanisms for user comments on resources such as teaching tips. We will explore cataloging standards as annotations separate from the resource record. These annotation records could provide more explicit information on who assigned the standard and why it was chosen.