NSDL Science Literacy Maps

http://strandmaps.nsdl.org/

Helping teachers connect concepts, standards, and NSDL resources

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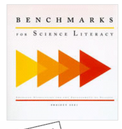
BACKGROUND

Based on the learning goals from the AAAS Benchmarks for Science Literacy and the visualizations from the AAAS Atlas of Science Literacy (AAAS Project 2061), the Strand Maps demonstrate the connectedness of ideas and skills that students should develop over time. The maps illustrate learning goals for different grades, and the relationships between goals, for K-12 students across a range of science, technology, engineering, and mathematics (STEM) disciplines.

Benchmarks: Describe what learners should know, or be able to do, at key stages in their education across the STEM disciplines



Strand Maps: Learning progression diagrams illustrating how student understanding changes over time

Map Browser: Interactive graphical interface that helps K-12 teachers and students understand the relationships between science concepts and enables them to find supporting educational resources.

SIGNIFICANCE

Concept browsing interfaces provide navigational cues based on important science concepts that are typically lacking from traditional keyword or field-based search interfaces. Prior research indicates that these types of visual knowledge map representations are useful cognitive scaffolds, helping users lacking domain expertise – such as learners, new teachers, or educators teaching out of area – to understand the macro-level structure of an information space (Hall et al., 1999; Martin, 1994; O'Donnell et al., 2002).

EVALUATION RESULTS

- Controlled study examined influence of interface on cognitive processes of undergraduates (Butcher et al., 2005)
- Compared visual interface and keyword-based interface
- Students focused on science content twice as much using visual interface, as opposed to query construction and surface features

API Features

The interactive maps are generated through the Strand Map JavaScript API, which lets developers embed the maps in Web sites and display educational resources and other information in the maps.

- Used to render interactive strand maps
- Requires no browser plug-ins
- Maps can be embedded in any webpage
- Provides access to all data in information space (related benchmarks, NSES alignments, keywords, student misconceptions research)
- Ability to enhance maps with your own custom content (educational resources, assessments)
- Customize the map colors, styles and fonts

Documentation

http://strandmaps.nsdl.org/cms1-2/docs/

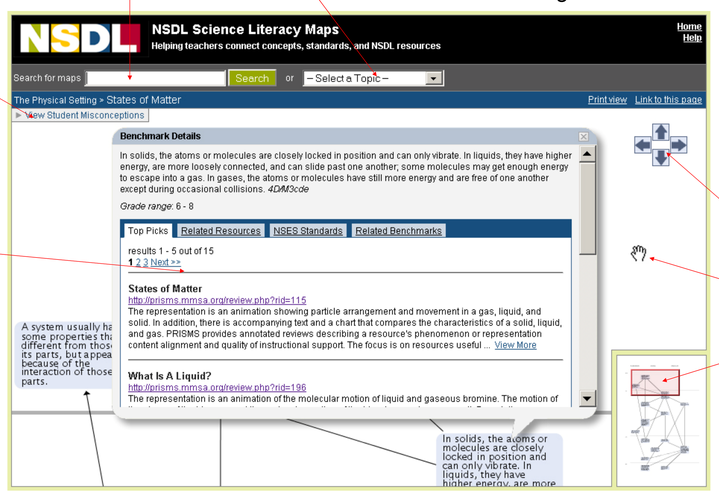
USER INTERFACE

Map Selector
Search for a map by entering a keyword into the search box OR choose a topic from the drop-down menu to browse maps

Student Misconceptions
Read background research on common student misconceptions

Information Bubble
Locate resources supporting specific concepts and learning goals, aligned standards and related benchmarks.

The NSDL Search Service is used to retrieve Top Picks and Related Resources for each Benchmark shown in the Science Literacy Maps.



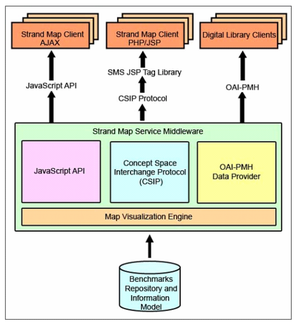
Navigation
•CLICK the arrows buttons
•CLICK and DRAG the map
•CLICK and DRAG the red box in mini-map

BENEFITS

K-12 Educators and Learners
- Discover educational resources that support learning goals
- Browse the interconnected learning goals in the strand maps
- Enhance content knowledge by using the service to explore important background information on benchmarks, such as corresponding National Science Education Standards and related student misconceptions

Digital Library Developers
- Customize a browsing interface with their own resources targeted to their own audiences

ARCHITECTURE



JavaScript API: Lets web developers insert interactive strand maps into web pages using JavaScript and place custom content into the maps.

Concept Space Interchange Protocol (CSIP): Provides benchmark and map information in XML or as dynamically generated visualization.

Strand Map Service Clients: Graphical browsing interfaces presented to the end-user.

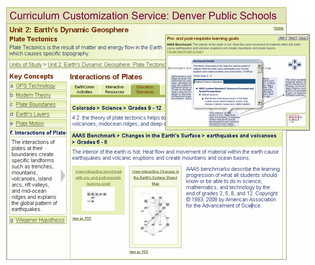
SMS Tag Library: A client-side JSP tag library that provides a markup language for rapidly creating strand map based interfaces.

OAI-PMH Data Provider: Enables third parties to harvest the information in the benchmark repository.

Map Visualization Engine: Visual maps are dynamically generated from the benchmark repository.

Benchmarks Repository: Database housing the benchmark text and relationship information.

OTHER INTERFACES



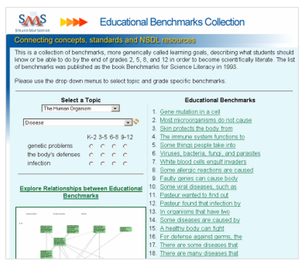
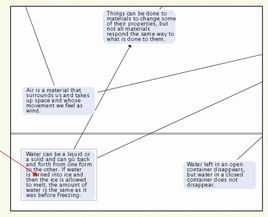


Image map regions make the map interactive



The strand map image is generated by the SMS

Acknowledgments

NSDL Science Literacy Maps were created by the NSDL using the Strand Map Service (SMS). The SMS is produced by researchers from the University of Colorado at Boulder and Digital Learning Sciences at UCAR, and is based on the strand maps developed by Project 2061 at the American Association for the Advancement of Science and published in the Atlas of Science Literacy, Volumes 1 and 2 (2001 and 2007, AAAS Project 2061 and the National Science Teachers Association).

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