SMETE: Technology Provider for Exploratorium Online

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Key Topics

- SMETE and Exploratorium Online
- Background on SMETE
  - NEEDS: Precursor to SMETE
  - Development of SMETE (and NSDL)
- SMETE Technologies
- Demo
SMETE Team @ Berkeley

- **Alice Agogino**, Principal Investigator
- **Brandon Muramatsu**, Project Director
- **Jialong Wu**, Doctoral Candidate
- **Eric Fixler**, Senior Software Architect
- **Andi Niess**, Web Designer
- **Shuang Song**, Doctoral Candidate
- **Jonathan Hey**, Grad Student
Partnership

• Builds on long-standing relationships
• Exploratorium Online’s Strengths
  – Informal education
  – Repository of resources
• Chance to deploy technologies to other collections
SMETE’s Strengths

- Developed educational digital libraries for over 12 years
- Consulted with NSF on development of NSDL program
- Developed Open Federation of Partner Collections, Services and Organizations
- Participated in development of IEEE Learning Object Metadata
  - IMS Metadata, IEEE XML-binding
- Technologies
  - Search, Federated Search
  - Recommender Systems, Metathesaurus
  - Middleware
- Link research to production systems
SMETE’s Activities for Exploratorium Online

• Consulting
  – Metadata
  – NSDL history and organization

• Technology Provider
  – Search for Exploratorium Online
  – Enable metadata harvesting of Exploratorium Online metadata by NSDL
Background

- Developing Educational Digital Libraries since early 1990’s
  - Synthesis Engineering Education Coalition
    - Educational reform in Engineering
  - NEEDS: National Engineering Education Delivery System
    - Develop, Deliver and Share Engineering Courseware
    - Repository of Synthesis Courseware and Search Technologies
  - Expansion of NEEDS leads to development of SMETE
How did we get from NEEDS to SMETE?

• National Science Foundation and National Research Council examine a digital library for undergraduate science education from 1996-1998
  – New funding under Special Emphasis in DLI2 and now NSDL programs
• NEEDS already beginning to expand into physical sciences and mathematics in cataloging
• NEEDS as a technology-base through which we can extend to other disciplines
The SMETE Open Federation

• To build a successful National STEM Education Digital Library envisioned by NSDL Program…
  – SMETE focuses on science, mathematics, engineering and technology at all levels
  – And more important, it focuses on education
• …we needed to develop a collaborative team…
  – To overcome the challenges and build upon work already underway
  – To cover target audiences and disciplines
  – To share in the development efforts
Shared Vision

• The SMETE Open Federation, individually and collectively, is committed to providing services...
  – to support teaching and learning
  – across disciplines in science, mathematics, engineering and technology
  – providing access to high-quality resources
  – in support of education reform and cross-disciplinary learning
  – from K-12 to higher education to professional development
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<tr>
<th>SMETE Open Federation</th>
<th>Collaborating Organizations and Projects/Collections</th>
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<td>Access Excellence</td>
<td>(<a href="http://www.accessexcellence.org">www.accessexcellence.org</a>)</td>
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<td>American Association for the Advancement of Science</td>
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<td>American Association of Physics Teachers</td>
<td>(<a href="http://www.aapt.org">www.aapt.org</a>)</td>
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<td>CITIDEL</td>
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<td>Computer Science Teaching Center</td>
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<td>Digital Chemistry</td>
<td>(ist-socrates.berkeley.edu/~kubinec)</td>
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<td>Digital Library for Earth Systems Education</td>
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<td>Education.au Limited</td>
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<td>Exploratorium</td>
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<td>Gender and Science Digital Library</td>
<td>(<a href="http://www.g">www.g</a> sdl.org)</td>
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<td>iLumina</td>
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<td>Instructional Architect</td>
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<td>Interactive University</td>
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<td>Internet Scout Project</td>
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<td>Learning Matrix</td>
<td>(thelearningmatrix.enc.org)</td>
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<td>Mathematics Association of America</td>
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<td>Michigan Teacher Network</td>
<td>(mtn.merit.edu)</td>
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<td>National Center for Supercomputer Applications</td>
<td>(<a href="http://www.ncsa.org">www.ncsa.org</a>)</td>
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<td>NEEDS—A Digital Library for Engineering Education</td>
<td>(<a href="http://www.needs.org">www.needs.org</a>)</td>
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<td>Project Kaleidoscope</td>
<td>(<a href="http://www.pkal.org">www.pkal.org</a>)</td>
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<td>SRI International, Center for Innovative Learning Technologies</td>
<td>(<a href="http://www.cilt.org">www.cilt.org</a>)</td>
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<td>University of California Teaching and Learning with Technology Center</td>
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<td>University of Maryland, Baltimore County</td>
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<td>Utah State University</td>
<td>(<a href="http://www.usu.edu">www.usu.edu</a>)</td>
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“Working” Description of “Educational” Digital Libraries

…or…how they go beyond traditional brick and mortar library or “research” digital libraries...

- Either a repository or index to teaching and learning resources
- Directly supports teaching and learning activities of students
  - Undergraduate and K-12
- Provides support for adapting or adopting resources developed by others (through comments of use, lesson plans, etc.)
- Uses technology to support collaboration, personalization, recommendation of resources
- Supports communities of users

And in SMETE’s case…
- Covers a wide range of science, mathematics and engineering subject areas, encouraging connections between disciplines
SMETE Technologies

- **Union Catalog and Federated Search**
  - OAI-PMH
    - Data provider (limited to NEEDS *Premier Award*)
    - Harvest other collections (DLESE)
  - Specialized Harvesting (Michigan Teacher Network and LON-CAPA)
  - Federated Search (MERLOT)
    - SOAP and WSDL

- **Multiple recommender systems**

- **Metathesaurus**

- **User Comments (Amazon.com)**

- **Cataloging systems**

- **“Peer Review”**
  - NEEDS *Premier Award*
SMETE and NEEDS: Today

- **Primary Audience:**
  - Engineering educators

- **Secondary Audience(s):**
  - Science, mathematics and technology educators
  - Undergraduate students
  - K-12 teachers and students

- **Systems:**
  - Commercial application & database servers
  - Production-quality systems

- **Metadata and Cataloging:**
  - Exportable to Dublin Core

- **Contents:**
  - Almost entirely references to external websites/resources
  - Some historical “archives” (Synthesis)
SMETE and NEEDS: Today

- **SMETE** is the technology platform
  - Proof of concept and testing of new services

- **NEEDS** is the collection of engineering related educational resources

- **Multiple approaches to providing access to collections**
  - Federated Search (SOAP and WSDL) and Harvesting (OAI-PMH)

- **Multiple approaches to determining “Quality” that are more community based**
SMETE and NEEDS: Today (cont.)

• Not Really an Archive
  – Hold some materials
  – Could use Internet Archive techniques
  – Life-span and usefulness of educational resources tends to be limited

• Metadata and services focus on more than bibliographic description
  – “Context” of use
  – Recommending “Similar” resources
Welcome to the SMETE Digital Library.
The most comprehensive collection of science, math, engineering and technology education content and services.

News
The Mathematical Association of America, a SMETE ORG Alliance Partner, recently launched the premier issue of the Journal of Online Mathematics and its Applications (JOMA). JOMA takes advantage of the Web to make modern tools, curricula, and active learning environments more accessible to students and teachers everywhere. Visit JOMA and find out more about the MathDL project, too.

Community
The National SMETE Digital Library Community Center formed to gather and share information from all concerning the present and future of SMETE digital libraries, tools and services, lessons learned, standards used, user studies and publications. Come share your ideas in our forum.

SEARCH TOOLS

FIND: Know what you want? Find your learning resource quickly.


BROWSE: Just looking? Browse through our extensive collection.

Come and Join the SMETE.ORG Community
Lessons Learned

• Transitions
  – There will be a lot of change, evolving standards and specifications

• Collaboration necessary
  – One group can’t do it all
  – Recognize strengths and history of partners

• Build upon strengths of partners
  – While SMETE.ORG can be a portal, it doesn’t try to be the be all, end all
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