
The SMETE Digital Library at www.smete.org

Brandon Muramatsu
SMETE Project Director
UC Berkeley
mura@smete.org



Outline

- **What are “Educational” Digital Libraries?**
- **The SMETE Open Federation and SMETE.ORG?**
- **Projects**
- **Challenges**

“Educational” Digital Libraries



- **What do you think I mean?**
 - Who’s the user?
 - What services or features are available?

Campus Libraries and Research Digital Libraries



- **Traditional “brick and mortar” campus libraries**
 - Catalogs of resources
 - Repository of books, periodicals, etc.
- **Research digital libraries**
 - Typically provide convenient access to vast holdings, access to journals and databases

“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 Open Federation and SMETE.ORG



- **The SMETE Open Federation is a virtual, e-learning partnership that:**
 - Offers a comprehensive collection of STEM education content and services to learners educators and academic policy-makers
 - Serves as the integrative organization and distribution mechanism for pedagogical material through a tightly coupled federation of digital libraries
 - Promotes educational reform through participatory communities of learners
- **SMETE.ORG at UC Berkeley**
 - Is the organizational home of the SMETE Open Federation
 - Is a technology demonstration site for “educational” digital libraries
 - Is supported through the National STEM Education Digital Library Program at NSF

The SMETE Open Federation...



- **Believes we must...**
 - Cover a broad range of disciplines across all of science, mathematics, engineering and technology
 - And should emphasize the interdisciplinary and interconnectedness of learning materials
 - Focus on teaching and learning at the undergraduate, and K-12 levels
 - We recognize that faculty and educators need specific support to teaching and promote learning with these resources
 - Elevate social aspects of developing “educational” digital libraries to the same level as technical ones
 - Have tightly federated/integrated collections and services to allow users the best possible experience
 - Supports each partner collection as a gateway to the whole
 - Enables users at existing partner sites to gain benefits of partnership while remaining at the partner site.

Reach of the Open Federation



- Identifiable audience of **9.25 million** users
- About **250,000** directly accessible community members
- Collectively has **42,000** high-quality, web-accessible digital learning resources
 - 28% Math
 - 17% Physical Sciences (physics, chemistry)
 - 19% Life Sciences
 - 4% Engineering
 - 3% Computer Science
 - 29% Non-STEM (History, World languages, etc.)
- K-12/Higher Education
 - Higher education resources 65%
 - K-12 education resources 35%

As of April 2002

SMETE Open Federation

Collaborating Organizations and Projects/Collections

Access Excellence
(www.accessexcellence.org)

American Association for the
Advancement of Science
(www.aaas.org)

American Association of
Physics Teachers
(www.aapt.org)

Association of Women in
Science (www.awis.org)

BioQUEST Curriculum
Consortium
(www.bioquest.org)

Biosci Ed Net
(www.benproject.org)

Coalition for Networked
Information (www.cni.org)

CITIDEL (www.citidel.org)

ComPADRE/Physical
Sciences Resource Center
(www.compadre.org/
psrc.aapt.org)

Computer Science Teaching
Center (www.cstc.org)

Digital Chemistry
(
[ist-socrates.berkeley.edu/
~kubinec](http://ist-socrates.berkeley.edu/~kubinec))

Digital Library for Earth
Systems Education
(www.dlese.org)

Education.au Limited
(
[http://
www.educationau.edu.au/](http://www.educationau.edu.au/))

Education Development
Center (www.edc.org)

Eisenhower National
Clearinghouse (www.enc.org)

Exploratorium
(www.exploratorium.edu)

Gender and Science Digital
Library (www.gsdl.org)

iLumina
(www.ilumina-project.org)

Instructional Architect
(ia.usu.edu)

Interactive University
(iu.berkeley.edu)

Internet Scout Project
(scout.cs.wisc.edu)

Learning Matrix
(thelearningmatrix.enc.org)

Learning*Online* Network with
CAPA (www.lon-capa.org)

Mathematics Association of
America (www.maa.org)

MathDL (www.mathdl.org)

Math Forum
(www.mathforum.com)

MERIT Network
(www.merit.edu)

MERLOT
(www.merlot.org)

Michigan Teacher Network
(mtn.merit.edu)

National Center for
Supercomputer
Applications
(www.ncsa.org)

NEEDS—A Digital Library
for Engineering Education
(www.needs.org)

Project Kaleidoscope
(www.pkal.org)

SRI International, Center
for Innovative Learning
Technologies
(www.cilt.org)

University of California
Teaching and Learning
with Technology Center
(www.ucltlc.org)

University of Maryland,
Baltimore County
(www.umbc.edu)

Utah State University
(www.usu.edu)

- **The difference is *learning*, not just bibliographic information retrieval**
 - Teaching and learning require something more
- **Guided by *user needs* and philosophy of education that is constructivist**
- **Link content to community and services**
- **Build integrative tools and incorporate “best of breed” tools from partners**

- **Many partners each have a decade or more of experience promoting STEM Education reform**
 - Collections: ENC, NEEDS, Math Forum, BioQUEST
 - AAAS, Project Kaleidoscope, NACME, Mathematical Association of America, SRI International

- **On-Going**
 - Federated Search*
 - Recommender Systems
 - Metathesaurus Research
 - NEEDS (Engineering) Collection Development*
 - *Premier Award**
- **New**
 - Exploratorium Online
 - Digital Chemistry

* Covered in this Presentation

What is Federated Search?



- **Search across multiple collections, whose item-level metadata has been “federated” into a “union catalog”**
- **Strategies**
 - Metadata harvesting: Build a centrally-located union catalog by “harvesting” item-level metadata from multiple remote collections
 - Example: Open Archive Initiative Protocol for Metadata Harvesting
 - Distributed Search: Build a “virtual union catalog” by querying multiple remote repositories based on user initiated action
 - Example: Z39.50, WSDL and SOAP

- **Metadata harvesting**

- Advantages

- Strong guarantee of “quality of service” to end-users

- Disadvantages

- Requires central repository to physically catalog and store item-level metadata
 - Timeliness of item-level metadata at central repository dependent on reliability and frequency of harvesting

- **Distributed search**

- Advantages

- Remote collection retains tighter control over re-distribution of item-level metadata
 - Real-time changes to item-level metadata reflected immediately

- Disadvantages

- Potentially lower quality of service (time-outs, Internet outages)



Address: @

go



Search for Learning Resources

GO

[FIND](#) [BROWSE](#) [WORKSPACE](#) [ABOUT SMETE](#) [HELP](#)

[HOME](#) > [Find Partner Collection Learning Resources](#)

Find More Resources

- [Find SMETE Learning Resources](#)
- Find Partner Collection Learning Resources
- Related Terms Not Available
- Find Scholarly Articles and Books at the California Digital Library

Find Partner Collection Learning Resources

Find learning resources in our external Partner Collections using our federated search technology. Search by entering one or more keywords and selecting one or more collections.

Keyword(s):

Partner Collections: NEEDS MERLOT

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Find More Resources

- Find SMETE Learning Resources
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Results of search for frog

This page shows 1 through 10 of 17 results for your search sorted by Title

More results by page: 1 2

CLOCKWORK PANDA,

SAVE TO WORKSPACE

By Maeda Mameo
Other Contributors: [none]

 PLATFORM
  COST
  REVIEWS

Keywords: [Unknown]
Search Score: 82
Possible Uses: Simulation

MERLOT COLLECTIONS

Costa Rica: Land of Pure Life, 2002

SAVE TO WORKSPACE

By Mount Arenal Observatory Lodge
Other Contributors: U. S. Army Corps of Engineers
Publishers: Public Broadcasting System, Digital Library for Earth System Education
Keywords: Biology, Ecology, Environmental science
Search Score: 27
Possible Uses: [Unknown]

 PLATFORM
  COST
  REVIEWS

DL|ESE COLLECTIONS

NEEDS—A Digital Library for Engineering Education



www.needs.org

- “Core” Collection in SMETE.ORG maintained at UC Berkeley
- Established circa 1992 from NSF Synthesis Coalition (engineering education reform)
- Collection of digital learning resources for engineering education (search, browse, catalog)
- Served as technology platform for SMETE.ORG
- Recently re-launched to incorporate advances from SMETE.ORG

Premier Award for Excellence in Engineering Education Courseware



www.needs.org/premier/

- An annual, national competition to identify and reward the authors of high-quality, non-commercial courseware designed to enhance engineering education
 - The *Premier Award* is about the entire experience of using the courseware by learners, not just the courseware itself
- A dissemination system to distribute the Premier Courseware
 - 14 Courseware packages have been recognized as Premier Courseware since 1997
 - Over 10,000 CD-ROMs of Premier Courseware distributed



- **Appropriately identifying “Quality” digital learning resources**
 - Definition is elusive and varies
 - Mechanisms to identify/demonstrate “Quality” vary
- **Integrating external collections of resources like SMETE.ORG into learning management systems**
 - Standards help, but policy and social aspects of acceptance still stumbling blocks
- **Linking together existing work on collections of resources and services by distributed providers**
 - Standards and technology architectures help, but policy and social aspects still key