NEEDS, SMETE.ORG and Educational Digital Libraries

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Key Topics

- Evolution of NEEDS
- “Educational” Digital Libraries

NEEDS: A Project of Synthesis

Synthesis Coalition

- **Reform of undergraduate education**
  - Mechatronics became key focus
- **8 Universities across the US**
- **First of many Coalitions (SUCCEED, ECSEL)**
- **Funded by the National Science Foundation 1989-1998**

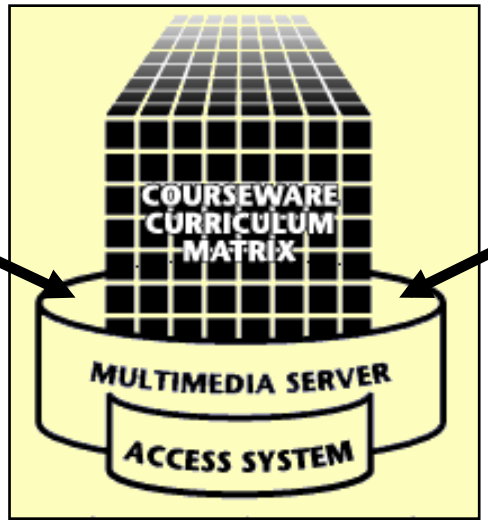
SYNTHESIS
innovation

NEEDS: Original Concept

Delivery

- Classrooms
- Instructional Labs
- Small Study Groups
- Residences
- Libraries
- Anywhere

Three Components Connected Through the Internet



Development

- Courseware Studios
- Instructional Labs
- Faculty Offices & Residences
- Libraries
- Anywhere

Since the early 1990's NEEDS has evolved from a courseware development and delivery system into an "educational digital library".

NEEDS: Circa 1993

NEEDS: Circa 1993

- **Primary Audience:**
  - Engineering educators
- **Systems:**
  - Iowa State OPAC special collection
  - Gopher and Telnet versions
- **Metadata and Cataloging:**
  - US MARC, 856 field
  - Focuses on bibliographic description of the resource
- **Contents:**
  - Almost exclusively internal to Synthesis Coalition
  - "Archives" available from NEEDS FTP servers: Mostly relatively small courseware and software (a few hundred KB)
  - Some multimedia courseware only available on CD-ROM (1x or 2x speeds)

NEEDS Circa 1997

The World Wide Web Happened…

NEEDS: Circa 1997

- **Primary Audience:**
  - Engineering educators
- **Secondary Audience(s)**
  - Undergraduate engineering students
  - Expanding to educators and students in Science, mathematics and technology (e.g., Chemistry, Physics)
- **Systems:**
  - Web-based access to relational database
- **Metadata and Cataloging:**
  - Evolved from USMARC bibliographic description
  - Beginnings of “use” and “context” in Learning Object Metadata
- **Contents:**
  - Mostly references to external websites
  - Some historical “archives” (Synthesis)

Looking Toward the Future: NEEDS Circa 1997

- **Expansion of Cataloging**
  - Physical sciences and mathematics
  - Tackling problem of everything that's out there now—trying to help users identify and select those resources
- **New Services Under Development**
  - *Display of results*
  - *User Comments (Amazon.com)*
  - *"Peer Review"*
  - Beginnings of *recommender systems*
  - "Self-cataloging"
  - A number of others possible…
    - Using Web technologies, taking cue from what access and systems Web makes possible

Issues in Providing Access to Educational Resources

- **Ever expanding number and scope of resources being developed and made available**
  - Variety of technical and pedagogical formats
  - Transient nature and half-life of content and technology
- **Varying definition of "quality"**
- **Parallel efforts in other domains and for other audiences**
- **Increasing clarity of specific needs of end-users**
  - Specifically K-12

Issues in Providing Access to Educational Resources (cont.)

- **New expectations from users (for content and services)**
  - Web technologies (& CS/DL research) enables new services
- **Specific standards and specifications efforts for education initiated**
  - IEEE Learning Technology Standards Committee, IMS Global Learning Consortium, Dublin Core

CONNECTING
Science
Mathematics
Engineering
Technology
Education

…and now for something different…

SMETE.ORG

…and “Educational” Digital Libraries

From NEEDS to SMETE

How did <u>we</u> get from NEEDS to SMETE?

- **NSF 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**

Background on Our Efforts

- **To build a successful National STEM Education Digital Library …**
  - We focus 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 we face in developing a National SMETE Digital Library
  - To cover target audiences and disciplines
  - To share in the development efforts

Shared Vision

- **The SMETE Open Federation is committed to providing a service…**
  - to support 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

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)

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

Education.au Limited (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.uctltc.org)

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

Utah State University (www.usu.edu)

"Working" Description of "Educational" Digital Libraries

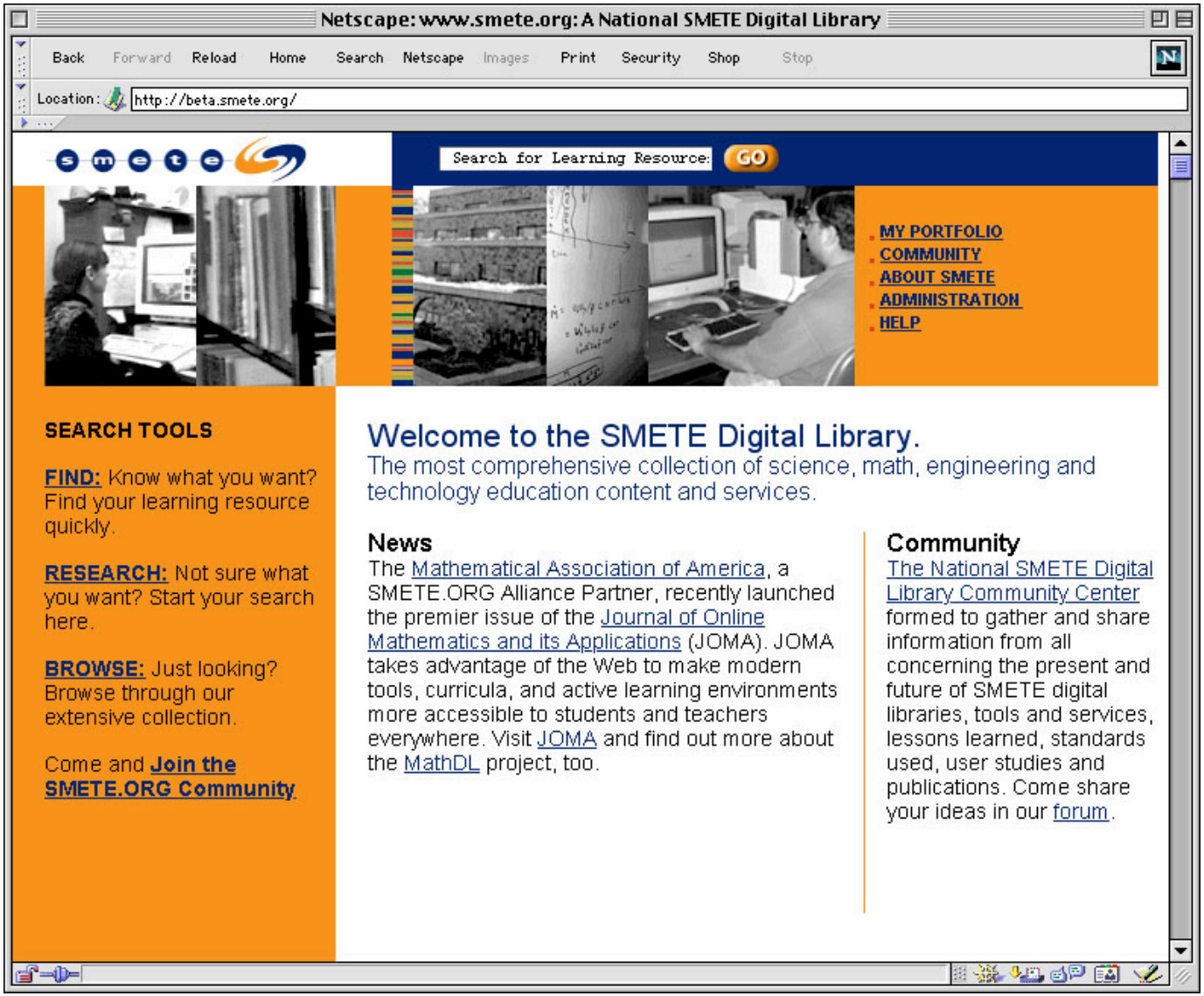
…or…how they go beyond traditional brick and mortar library or "research" digital libraries…

- 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

Portal at www.smete.org



SMETE Technologies

- **Union Catalog and Federated Search**
  - OAI-PMH
    - Data provider (limited)
    - Harvest other collections
  - Specialized Harvesting
  - Federated Search
    - SOAP and WSDL
- **Multiple recommender systems**
- **User Comments (Amazon.com)**
- **"Peer Review"**
  - NEEDS *Premier Award*

SMETE and NEEDS: Today

CONNECTING
Science
Mathematics
Engineering
Technology
Education

SMETE and NEEDS: Today

- **Primary Audience:**
  - Engineering, science, mathematics and technology educators
- **Secondary Audience(s)**
  - Undergraduate students
  - K-12 teachers and students
- **Systems:**
  - Commercial application, database servers
  - Production-quality systems
- **Metadata and Cataloging:**
  - IEEE Learning Object Metadata (1484.12.1-2003)
  - Exportable to Dublin Core
- **Contents:**
  - Mostly references to external websites
  - Some historical “archives” (Synthesis)

SMETE and NEEDS: Today

- **SMETE is the technology platform**
  - Proof of concept and testing of new services
  - Deployed to NEEDS as available
- **Multiple approaches to providing access to collections**
  - Harvesting (OAI-PMH) and Federated Search (SOAP and WSDL)
- **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

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 those strengths
- **Build upon strengths of partners**
  - While SMETE.ORG can be a portal, it doesn't try to be the be all, end all

Lessons Learned (cont.)

- **Community and social aspects as important, if not more important, as technical aspects**
- **Focus on unique qualities of work**
  - Key recommendation to other "Educational Digital Libraries" and collections
  - Track work of others

http://alpha.needs.org/

Search for Learning Resources: GO

HELP | EDIT PROFILE

needs

Home

- About NEEDS
- Search
- Community
- My Portfolio
- Premier Award

You Are Logged In as: mura@bits.me.berkeley.edu

NEEDS — A Digital Library for Engineering Education

Welcome to the new home for NEEDS

NEEDS — The National Engineering Education Delivery System is a digital library of learning resources for engineering education. NEEDS provides web-based access to a database of learning resources where the user (whether they be learners or instructors) can search for, locate, download, and comment on resources to aid their learning or teaching process. In addition NEEDS supports a multi-tier evaluation system from our national award competition sponsored by John Wiley and Sons, Inc. to user-based reviews of individual learning resources.

More...

2002 Premier Award Competition Call for Submissions

Submission Deadline: Friday, July 12, 2002, 5 p.m. PT

We welcome your submissions for the 2002 Premier Award. The Premier Award competition is open to a wide range of submissions of "high-quality, non-commercial courseware designed to enhance engineering education." Please visit our 2002 Premier Award Submission page for more information.

http://alpha.needs.org/

Search for Learning Resources: GO

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needs

Home > Search > The Virtual Disk Drive Design... > Summary

- About NEEDS
- Search
  - > Summary
  - Usage Tips
  - Download
  - Recommended Learning Resources
- Community
- My Portfolio
- Premier Award

Actions

- Log In / Register
- Save to Workspace

You Are Logged In as: mura@bits.me.berkeley.edu

Learning Resource: The Virtual Disk Drive Design Studio

Title:	The Virtual Disk Drive Design Studio
Authors:	David Y. Yu , Alice Merner Agogino
Publishers:	University of California at Berkeley
Courseware Series:	Multimedia Case Studies of Design in Industry
Summary:	The Multimedia Virtual Disk Drive Design Studio is an engineering design case study using interactive multimedia courseware for undergraduate engineering and science students. The purpose of this multimedia case is to introduce students to the world of mechatronics in the form of a disk drive. Students play the role of a project engineer for the ACME disk drive company and will have to mine out the necessary information from a multimedia archive in order to build a new disk drive model. Students will have to keep track of the development and production costs. They will also be asked to launch their new disk drives in a certain time frame, simulating the idea of time-to-market. This interactive disk drive case study is ideally complemented by hands-on mechanical dissection of an actual disk drive. This entire project is put together using Macromedia Director. This cross-platform software will allow us to distribute CD-ROMs to a wide spectrum of students around the country with 2x CD-ROM drives. The author is currently collaborating with Western Digital Corporation and IBM Almaden Research Center in San Jose. Western Digital Corp. provided the

http://alpha.needs.org/

Search for Learning Resources: GO

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needs

Home > My Portfolio > My Community

- About NEEDS
- Search
- Community
- My Portfolio
  - My Workspace
  - My Profile
  - My Interests
  - > My Community
- Premier Award

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My Community: Recommended Members and Learning Resources

Based on your profile and the learning resources you have downloaded, we have found members of the NEEDS community who have interests similar to yours. Listed are some of the learning resources that they have downloaded:

Greg from UC Berkeley

- Chemist's Art Gallery
- Rapid Prototyping
- Applied Computer Visualization and Planning for Construction Engineers
- Math activities for K-12 teachers
- Mattel Color Spin: A Multimedia Case Study in Engineering Design

Jialong from Not Specified

- Visual Quantum Mechanics
- AC Power Analysis and Design
- Mattel Color Spin: A Multimedia Case Study in Engineering Design
- Department of Pharmacology and Experimental Therapeutics
- Usability: The New Dimension of Product Design

Alice from UC Berkeley

- The Engineering Design Process
- BGESS Home Base: Historic Contributions of Black Scientists and Engineers
- Usability: The New Dimension of Product Design
- Cracking Dams
- Visualizing Molecules

Rickard from Not Specified

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