Building a National Science, Mathematics, Engineering and Technology Education Digital Library

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Outline

• What is an NSDL?
• NEEDS—The National Engineering Education Delivery System
• Prototype: www.smete.org
Vision...

“... a network of learning environments and resources for Science, Mathematics, Engineering and Technology education, will ultimately meet the needs of students and teachers at all levels—K-12, undergraduate, graduate, and lifelong learning—in both individual and collaborative settings.”

National Science Foundation

July 2000
Our Goals

• Establish a national digital library for SMETE that is a dynamic learning community
  – To promote and support SMET education in the 21st century
  – To provide educators and learners with seamless access to partner collections and shared services to improve learning
  – To support educators and learners in K-12, higher education and life-long learning
Towards A National SMETE Digital Library...

NSF should establish and fund a National Science, Mathematics, Engineering and Technology Education Digital Library

- **April 1996 - NSF Committee Meeting (LIBUSE)**
  - “Towards a National Library for Undergraduate Science Education Resources in Science, Mathematics, Engineering and Technology”

- **August 1997 National Research Council**
  - Digital National Library for SME&T Education Workshop

- **July 1998 National Science Foundation**
  - SMETE-Lib Workshop

- **January 1999 National Science Foundation**
  - Digital Libraries and Education Workshop

NSF should establish and fund a National Science, Mathematics, Engineering and Technology Education Digital Library.
National SMETE Digital Library Program

• Test-bed funding under the Digital Libraries Initiative—Phase 2, 1998-2001
• Demonstration and full scale development, 2000-2006?
  – Four focus areas
    • Core Integration System
    • Collections
    • Services
    • Targeted Research
NEEDS—The National Engineering Education Delivery System
www.needs.org
NEEDS is the foundation for the National SMETE Digital Library at www.smete.org.
What Is NEEDS?

• Digital Library of Multimedia Engineering Courseware
  – Bibliographic records with downloadable courseware
  – Multimedia elements—downloadable movies, images, and text

• Multilevel Courseware Evaluation System
  – Peer and user review mechanisms
  – *Premier Award for Excellence in Engineering Education Courseware*

• User Services and Features
How does NEEDS help users “re-use” learning materials?

• Provides mechanisms to help user locate materials
  – Uses standardized descriptions (metadata) to describe resources
• Provides mechanisms to help users evaluate the “quality of materials”

• Developed upon an extendable platform to:
  – Support multiple uses
  – Integrate new services and features
  – Integrate research
Quality Review of Courseware

• Establish credibility of NEEDS as a source of Quality educational material
• Enhance recognition of scholarly and creative effort of courseware developers

– Premier Award for Excellence in Engineering Education Courseware
– Peer/Expert Review of Courseware
– User Reviews of Courseware
The Premier Award for Excellence in Engineering Education Courseware

• A 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 (via CD’s and promotional materials at engineering education conferences).
Premier Courseware of 1997-1999

- Virtual Disk Drive Design Studio
- Drill Dissection and Bicycle Dissection
- Mars Navigator
- Della Steam Plant
- MDSolids
- Structural Engineering Visual Encyclopedia - UNH
- Engineering Graphics
- Cracking Dams

Over 6,700 CD-ROMs Distributed
For more info or to receive copies go to http://www.needs.org/engineering/premier/

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Prototype at www.smete.org
Prototype: www.smete.org

Test-bed/Prototype Goals (1998-2001)

Develop a Prototype National SMETE Digital Library

- test interoperability of federated searches/shared services with partners
- perform requirements analysis with science, mathematics and K–12 communities
- develop criteria and standards to assess the impact of learning objects across disciplines
- implement community feedback systems, evaluate services
Needs Assessment with Members of the Math, Science and Engineering Community

Purpose:
To understand the math, science and engineering communities of educators and examine their needs in order to design services and structures to support users from multiple communities.

Research Questions:
• What services, features & programs are integral to success?
• What do users expect with regards to quality of the holdings?
• Who makes up the SMETE digital library community?

American Association of Physics Teachers, American Mathematical Society, American Association for the Advancement of Science, members of the NSF Chemistry Consortia and the NSF Engineering Education Coalitions

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Translating Findings into Services & Features

Quality

• System to rapidly identify the quality of holding
• Place to comment about a learning object or regarding something of interest to the community
• Reviewers should include experts in pedagogy and content
Translating Findings into Services & Features

Community
• Embedded structures for developing and maintaining communication links
• Developing community should be on par with building content
• Build on discipline based communities to establish connection to a broader community

Content
• Useful content and community interaction ensures user participation as authors, reviewers, adapters/adaptors, and consumers
Building a National SMETE Digital Library at www.smete.org

• Searching for learning resources
• Cataloging (adding) learning resources
  – Standards, IEEE and IMS
• Evaluating the quality of learning resources
  – “User” reviews
  – “Expert” reviews
• Forming a community of users in SMETE
  – PKAL workshops and seminars
  – Research on adapters
Systems Development

• Expanding www.smete.org/NEEDS platform
  – Continuing to participate in the development of IEEE/IMS Learning Object Metadata Standards
  – Adopting emerging IEEE standards
  – Expanding user comments
  – Implementing discussion systems
  – Implementing customized user profiles

• Expanding Collections
  – Expanding into Chemistry, Physics, and Mathematics

<table>
<thead>
<tr>
<th>Total Collection</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>54%</td>
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<tr>
<td>Chemistry</td>
<td>21%</td>
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<tr>
<td>Physics</td>
<td>17%</td>
</tr>
<tr>
<td>Math</td>
<td>5%</td>
</tr>
<tr>
<td>Other</td>
<td>3%</td>
</tr>
</tbody>
</table>

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Collaborating with Partners

• Working with Eisenhower National Clearinghouse and Math Forum
  – Identify common metadata
  – Exchange records for common searching
  – Working together as part of the American Mathematics Metadata Task Force

www.mathforum.com  www.enc.org
Collaborating with Partners

• Working with University of California Office of the President - (10 campuses)
  – Identifying courseware under development systemwide
  – Developing TLT@UC Website to showcase teaching and learning with technology at the University of California
Challenges Toward the Future...

- Continuing to understand and support changing user needs
- Improving ability to encapsulate the instructional intent and use of materials
  - Metadata standards and cataloging practice
- Supporting communities of use and practice
  - pedagogy
  - content
Challenges Toward the Future...

- Continuing to understand and support changing user needs
- Improving ability to encapsulate the instructional intent and use of materials
  - Metadata standards and cataloging practice
- Supporting communities of use and practice
  - Pedagogy
  - Content
- Which allows for a user to find what they’re really looking for as well as personalization of content.

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NSDL Goals (2000-)

- Develop the National SMETE Digital Library
  - Provide seamless access to services and resources
  - Create a dynamic learning community that promotes and supports SMET education in the 21st century
- Expand Partnerships
- Expand Services and Community
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Copies of this presentation will be available at:
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