Digital National Library

For Undergraduate Science, Mathematics, Engineering, and Technology Education

National Research Council Study Chair:
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The Study

- Computer Science and Telecommunications Board (CSTB)
- Center for Science, Mathematics, and Engineering Education (CSMEE)
- August 7-8, 1997 at NAS
- 50 participants

Issues

- Curricular, Pedagogical, and User Issues
- Logistic and Technology Issues
- Economic and Legal Issues
- Over-arching issues

Curricular, Pedagogical, and User Issues

- Who is the potential user population?
- What types of materials should be included?
- What impact can be expected?

Logistic and Technology Issues

- What kinds of editorial oversight are needed?
- What kinds of technology are currently available to build such a national library?
- How can a multi-year project like this adapt to new technologies that might emerge?

Economic and Legal Issues

- How can we estimate or measure the costs and benefits of establishing an NL?
- What are the long term financial implications?
- How could intellectual property, copyright, and "fair use" issues be resolved?

Over-arching Issues

- Is the NL a good idea for improving undergraduate SME&T education?
- Is the NL a better idea than other initiatives that might compete for the same funds?
- If the NSF does commit: what kinds of information and issues will it need to consider? (Efficiency, Cost Effectiveness)

Conclusions: Users and Needs

- Pervaded the workshop
- SME&T Faculty
- Improve and enhance learning of SME&T
- Students? No consensus.
- Too few faculty at workshop.

Conclusions: Content

- At least pointers to materials.
  - Cheaper, Unreliable pointers, lack of quality control, can't catalyze developments
- Allow users to add materials?
  - Role of publishers or societies?
- Who provides editorial oversight? Standards? Peer review?
  - This is critical.

Conclusions: Content

- 4. Creators
  - faculty, publishers, societies, and students?
- 5. Tools for browsing and searching
  - coming and are an important component
- 6. Is the proposed NL a library?
  - Goes well beyond a "library." interactive, extendable, etc.

Conclusions: Economic and Legal Issues

- Needs to become self sustaining after start-up.
  - No general agreement as to how.
- Legal
  - Intellectual property, liability, privacy
  - being solved by the community and not by NL
- Technologies
  - focus on User needs, adaptive flexible
  - work with the library,ed. and publishing comm.

Recommendations

- Clarify Customers (focus groups)
- Articulate priorities for content, tech, and economic and legal models prior to establishment.
- Develop and issue one or more RFP's.

Focus groups

- Faculty: tenure & non. At all ranks, all institutions
- Faculty in research and practice in sci. and math ed.
- Middle and High School Teachers
- Undergraduate students
- Graduate and Post-Doc students
- Librarians
- Social and behavioral scientists
- Computer and Information System specialists
- Directors of higher ed. IT services
- Commercial publishers
- Societies
- Other non-profit sector

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Thank you.

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Undergraduates Too Often Shortchanged in the Past

- Nevertheless, the research universities have too often failed, and continue to fail, their undergraduate populations. Tuition income from undergraduates is one of the major sources of university income, helping to support research programs and graduate education, but the students paying the tuition get, in all too many cases, less than their moneys worth.
  - The Carnegie Foundation

Are Research Universities Cheating Undergraduates?

- "Untrained teaching assistants groping their way…tenured drones who deliver set lectures from yellowed notes," anybody we know?
- A report released by the Carnegie Foundation for the Advancement of Teaching bluntly accused the nation's research universities of false advertising.
  - What's New @ APS by Robert L. Park

The bad news

- Physics is often one of the worst examples at the research universities
- ABET has removed any requirement for Physics taught by Physics Departments

More bad news

- 1960's: Physics was perceived as "challenging, boring, and vital."
- 1990's: Physics is perceived as "challenging, boring, and irrelevant."

Some good news

- The Physics Community has been the leader in reforming the undergraduate experience.
- Much of the research on which new programs are based was done in physics.
  - (just not enough deployment)

Bright spots

- **Lecture based models**
  - Active learning physics systems (Ohio State)
  - Peer Instruction/ConcepTests (Harvard)
  - Interactive Demonstrations (Oregon)
- **Studio/Workshop models**
  - Workshop Physics (Dickinson)
  - The Physics Studio (RPI)
  - Physics by inquiry (U. Washington)
- **Lab models**
  - Tools for Scientific Thinking (Tufts-Dickinson)
  - RealTime Physics (Dickinson-Oregon)
- **Recitation models**
  - Cooperative Problem solving (Minnesota)
  - Tutorials in Intro. Physics (U. Washington)
  - Mathematical Tutorials (Maryland)

Proposed Study

- Study initiation 13 May 1997 (Lederman)
- "to prepare a report that will promote improvements in the teaching and learning of physics, with a particular focus on the introductory undergraduate physics courses…"
- Case studies
- Recommendations
- Dissemination
- Phase II Follow progress

Related work

- 1991 Conference on the Introductory Physics Course
- APS/AAPT Joint Study (Hilborne)
- APS Forum on Education (Krane, Wilson +)
- Workshop for new faculty (Krane)

Additional Foci

- Physics in the High Schools
- Advanced Undergraduate Physics
- Undergraduate Research

Deliverables

- NRC Report (~100 pages)
- Web site
- APS, AAPT, other AIP Meeting Sessions
- Participation: Physics Chairs Conference