CyberLab™, A New Paradigm in Distance Learning

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NSF Meeting
February 11, 2000
Content

- Educational needs
- Current status
- Cyberlab™
- Benefits
- Extensions
- Summary
Educational Observations

Demand for new educational tools:

- Experimental demonstrations in-class enhance the students learning experience
- Distance learning programs require laboratories for accreditation

Obstacles:

- “Wet Lab” space is a very expensive, and inefficient use of space
- Lab creation & maintenance hampered by personnel issues
  - Building a lab is hard work, with few rewards
Improved Learning

- Laboratory experience still requires physical presence

Traditional learning

Classroom teaching

SITN

Classroom teaching over the Internet
CyberLab™

Worldwide access to classroom and laboratory facilities
The Vision
Virtual Versus Remote Lab

• Virtual (computational) Lab:
  – Computations and simulations cannot capture full range of experimental phenomena
  – Real-life effects hard to model

• CyberLab™:
  – Real live experience with physical laboratory
  – Physical effects can be explored
  – Remote access brings real-world learning experience

• Combine Virtual and CyberLab™
Experiment

Diode Laser Driver | Collimating Lens | Collimating Lens | Fourier Transforming Lens | Imaging Lens | CCD Camera

Diode Laser | Spatial Filter | Objects | Filters | Fourier Transforming Lens

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CyberLab™ Building Blocks

- Analysis tools
- Message board
- Professor
- Experiment
- Student notebook
- Reference materials
- Scheduler
- Lab information

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Lab Notebook

Contains all information about the experiment:

- Handouts
- Correspondence
- Data
- Reports
- To do list
CyberLab Proto Demonstration

- Notebook manages collected information
- Schedule allows sharing of resources
- Real-time laboratory
- Information on lab equipment
- Data Analysis
- Instructor Correspondence
- Main Navigation Tool
CyberLab™: A new Paradigm!

- Remote quantitative observation of student behavior
- Computer assisted learning
- Cost effective sharing of experimental facilities
- Impact: Professional evaluation from School of Education at Stanford
Professional Evaluation

- School of education evaluation:
  - Pre-laboratory questionnaire (anonymous)
  - Observation of 1/2 the students by independent observer (designer of the questionnaire, Sandy Paik)
  - Post-laboratory questionnaire
  - Evaluation of results
  - Report to Principal Investigator
Key Questions - Educational Value of CyberLab

- Can better identify inaccuracies
- Improves understanding of material
- Improves understanding: interpreting experimental data
- Enhances knowledge of optics and understanding of physical world
Benefits

• Instill good laboratory practices
• Student excitement stimulates learning
• Provide access to laboratory, computational, and reference facilities worldwide
• Cost effective learning tool
• Sharing of resources
• Convenient and fun
Vision

Life-long business education/training

Home user

CyberLab TM

Universities

National labs

Manufacturer
Summary

- CyberLab™ provides a new paradigm for life-long learning: *At the users schedule and location*
- Application to many scientific, educational and entertainment fields
- Pilot program in 1998 was very successful
- Extensible to remote training, remote research collaboration, remote data collection, etc.
- **Most importantly:** It is *convenient and fun!*
Acknowledgments

- Stanford CTTL-98 grant for pilot project
- Intel for donation of computers