

Criteria for Selecting Instructional Software in Engineering Education

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NEEDS — National Engineering Education
Delivery System



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Outline

- Introduction to NEEDS
- Overview of criteria for the *Premier Award for Excellence in Engineering Education Courseware*
- Overview of ILT research on successful adaptation
- Proposed process/criteria
- Conclusion

Berkeley
Stanford

Northern
Arizona

UMBC
Virginia
Tech

- **National digital library emerging from the Synthesis Coalition (1990 - 1999)**
- **Integrated database of multimedia courseware**
- **Multilevel courseware evaluation system (peer review, *Premier Award for Excellence in Engineering Education Courseware*)**
- **Community of Engineering Educators**



A Digital Library for Engineering Education

Search for Learning Resources

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Aircraft Dynamics



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Title: Aircraft Dynamics

Authors: [Robert F Stengel](#)

Publisher: [Princeton University \(01/1998\)](#)

Courseware

Series:

Version: 1999.02.20

Summary: This web-based software teaches the user concepts about aircraft dynamics.

The Premier Award

- National competition rewards authors of high-quality, non-commercial courseware that promotes effective learning practices



1999 - Engineering Graphics, Cracking Dams

1998 - Della Steam Plant, MDSolids, Structural Engineering Visual Encyclopedia - UNH

Bicycle
Navigat



June, 2000

ASEE - St. Louis, MO

1997 - Virtual Disk Drive Design Studio, Drill Dissection & Dissection, Mars

Premier Award Selection Criteria

- Engineering Content
 - Is the content error free?
- Software Design
 - Is it well designed and usable?
- Instructional Design
 - Will students learn from the courseware?



<http://www.needs.org/premier/1999/criteria.html>

ILT Research on Effective Adaptation*

Adaptation successful when faculty

- Chose LT to support learning goals
 - Improve performance
 - Increase student engagement
 - Improve student attitudes towards SMET
 - Curriculum deficiency

* 9 Case Studies of effective adaptation by SMET educators in diverse institutional types and disciplines conducted in 1999-2000

Effective Adaptation, continued

- Selected LT to support good instructional practices
 - Collaborative learning
 - Faculty/student interaction
- Viewed technology as tool rather than driving force for course
 - Visualizaton, simulation, real-time data acquisition, speed
 - communication

P/A Criteria - Instructional Design

- Interactivity: promotes active learning - interaction enhances learning
- Cognition/conceptual change: learning appears to be significant and long lasting, and strong, useful cognitive models can be built
- Content: well chosen and structured
- Multimedia use: effective and promotes learning objectives and goals
- Instructional Use/Adaptability: useful in a variety of settings

P/A Criteria - Software Design

- Engagement: software holds the interest of a diversity of learners.
- Learner Interface and Navigation: software is easy to use
- Technical Reliability: software is free from technical problems

P/A Criteria - Engineering Content

- Accuracy: content is error free
- Organization: structure is consistent with typical engineering instruction
- Consistent with Learning Objectives: content matches stated learning objectives and goals

Conclusions

- How do I know this courseware/LT is good?
 - Instruction design criteria most difficult to apply - must begin process by articulating clear learning goals
 - Software design criteria critical to students' motivation to use the LT
 - Know your students and their equipment

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