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Current Practices in On-line Learning

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WEB SESSIONS

Teaching Engineering Online

by



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Online teaching, in general, presents many challenges. Teaching and learning engineering presents additional challenges unique to programs with highly technical content. This presentation will address the challenges of teaching and learning engineering online and discuss the Master of Civil Engineering Program at Norwich University as an example of a technical engineering graduate degree program offered online.



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Teaching Engineering Online


A Review of Challenges and Solutions to Teaching Technical Content in Online Courses

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Master of Civil Engineering




Overview




- Common myths/concerns of online education
 - Technical content at distance
 - Laboratories a part of online courses
- Concerns specific to teaching technical content online
 - Organizing/presenting technical content
 - Options for teaching laboratories
- Tips for getting started

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Introduction




- What challenges have you faced, or are worried about facing?
- Common myths/concerns
 - Enrollment
 - Quality of learning outcomes
 - The need for instructors will decline
 - Security/authenticity




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Enrollment



4,600,000
College students are taking at least one class online

that number will increase to
By 2014 18.65 Million

1/2 of the **4500**
brick-and-mortar colleges in the US offer their degree programs online

96% of traditional universities offer at least one class in an online-only format

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Image credit: <http://blogs.jblearning.com/blog/common-myths-of-online-learning/online-learning-stats/>

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Quality of Learning Outcomes

- No significant difference
 - Database of literature that compares distance ed outcomes to traditional face-to-face outcomes (>350 papers)
 - Evidence supports that distance learning outcomes are as good or better than face-to-face



Source: <http://www.nosignificantdifference.org/>

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Need for instructors

- Some research (e.g., Sloan-C & Babson Research Group) suggests that online learning increases the need for instructors (e.g., some institutions limit class sizes to 20 or less).
- Another line of research on the *Community of Inquiry* framework (e.g., Garrison, Anderson, & Archer, 2000) shows that learner-instructor interactions and peer-learner interactions are important components of creating meaningful learning experiences online.

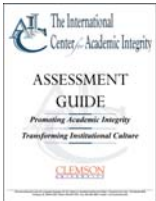
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Security/Authenticity

- Services available:
 - Clemson University & ICAI Assessment Guide
 - Random password and security questions
 - Proctor centers
- Other techniques
 - Video conferencing
 - Establishing honor codes




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Technical Content Online

- Specific challenges:
 - Complex mathematical and visual models
 - Communicating and engaging students with technical concepts in text-based environment
 - Hands-on laboratories



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Technical Content Online

Choosing the right tech:

- Video/screen capture software (e.g., Jing/Camtasia)
- Tablet PCs
- Smart pen (Livescribe) that links hand-writing to audio

Designing the course for online environment:

- How will students interact with instructor(s)?
- How will students interact with each other?
- What will students be required to learn (e.g., clear and measurable objectives)?
- How will learning materials prepare students for success?

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Options for Labs


- Remote labs
 - At-home kit
- Virtual labs
 - Real-time, virtual control of physical lab equipment
- Simulation labs
 - Simulating an experiment through computer software
- Intensive residency periods
 - One or two short periods of time spent in a face-to-face lab

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Remote Labs




- Advantages:
 - High authenticity
- Limitations:
 - Not easily scalable
 - Limited to experiments that use common materials and instruments

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Virtual Lab




- Advantages
 - Authentic (generates real data, user makes decisions)
 - Scalable
- Limitations:
 - Requires on-site staff for set-up
 - May require more sophisticated equipment than if same lab were performed face-to-face
 - Some of the “hands-on” feel is lost
- Recommendations:
 - May be more appropriate for well-established programs

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Simulation Lab




- Advantages:
 - Good for illustrating concepts and relationships between variables
 - Real-time feedback without setting up mu
 - Scalable
- Limitations:
 - Simulated data may not be truly representative of real data
 - Expensive to generate or purchase software
- Recommendations:
 - May be best used as pre-lab exercise

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Intensive Residency Labs




- Advantages:
 - Use existing laboratory equipment and procedures without additional investment
 - Authentic hands-on lab in supervised environment
- Limitations:
 - Requires time commitment and travel that some students may find challenging

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Tips for Getting Started




- Cost depends on delivery model


<p><u>Low Cost Model</u></p> <ul style="list-style-type: none"> • Modules consist of readings and problem sets from textbook 	<p><u>High Cost Model</u></p> <ul style="list-style-type: none"> • Modules consist of, readings, interactive discussions, supplemental “lecture notes,” demonstrations, examples of complex models, immediate feedback self-evaluation quizzes
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- About \$3k for low cost model, up to \$50K for high cost model.
- In general, the goal would be to fall somewhere in between

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Tips for Getting Started




- Anecdotal best practices from the MCE program
 - Use short screen casts explain difficult concepts
 - \$500 - \$1000 for software depending on instruction and needs; free software is available, but with limitations
 - A typical 50-minute lecture will reduce to 2-3 (20-30 minutes total)
 - Asynchronous and can be replayed as much as needed.
 - Organize content into modules
 - Generally organized into “weeks” for convenience
 - Group learning materials, activities, and assignments into chunks that will help students follow the curriculum and gradually build understanding

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Tips for Getting Started




- Anecdotal best practices from the MCE program
 - Incorporate peer interaction
 - Group discussion
 - open-ended questions that encourage students to explore difficult concepts in a way other than plug-and-chug equations
 - Peer review
 - professional skill expected in the work force
 - Group work
 - reinforce teamwork skills for distributed teams


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Thank you!



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