McNeill and Keenaghan, "Transitioning an Engineering Course to Studio Format," FIE2002

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Presentation Overview

• Motivation
• Test Drive
• Course Modifications
• Assessment / Student Response
• Conclusions
Course: EE4902 (Analog IC Design)

Motivation

Complaints

- Unsatisfying Lab experience for students
- Poor retention of material

New studio classroom:
- Completed Summer 2001
- Equipment suitable for EE4902

Course: EE4902 (Analog IC Design)

Motivation

Complaints

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Course: EE4902 (Analog IC Design)

Motivation
5-Step Change Model

1. Precontemplation
2. Contemplation
3. Preparation
4. Change
5. Maintenance

[Acknowledgment: Tom Balisteri]
5-Step Change Model

- Alcohol
- Drugs
- Traditional Lecture Delivery

Usually applied to bad "dependence" behavior:
<table>
<thead>
<tr>
<th>5-Step Change Model</th>
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<tbody>
<tr>
<td>Assessment</td>
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<tr>
<td>Modify Based on Student Feedback</td>
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<tr>
<td>Maintenance</td>
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<td>Studio Delivery in C2002</td>
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<tr>
<td>Change</td>
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<td>Preparation</td>
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<td>„Test Drive“ Lecture in Studio Format</td>
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<td>Contemplation</td>
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<td>Appeal to Different Learning Styles?</td>
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<tr>
<td>Pretest Interviewers: Students Clueless</td>
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<tr>
<td>Precontemplation</td>
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<td>Traditional Lecture Delivery</td>
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<tr>
<td>Event / Action</td>
<td>Year/Month</td>
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<td>Studio Delivery in C 2002</td>
<td>C term 2002</td>
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<td>„Test Drive“ Lecture in Studio Format</td>
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<tr>
<td>McNeill revises 4902 curriculum</td>
<td>Summer 2001</td>
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<tr>
<td>McNeill coordinates change with dept.</td>
<td>AV 2000-01</td>
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<td>E4902 “Blue Sheet” Reviews</td>
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Requires careful consideration, background research

Preparation: The Path to Successful Change
## Preparation: The Path to Successful Change

<table>
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<td>Studio Delivery in C 2002</td>
<td>2002</td>
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<tr>
<td>&quot;Test Drive&quot; Lecture in Studio Format</td>
<td>A Term 2001</td>
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<tr>
<td>McNeill revises 4902 curriculum</td>
<td>Summer 2000</td>
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<tr>
<td>Undergrad Program Committee</td>
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<td>C Term 2002</td>
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<tr>
<td>&quot;Test Drive&quot; Lecture in Studio Format</td>
<td>December 2001</td>
</tr>
<tr>
<td>Decision imposed on ECE community</td>
<td>November 2001</td>
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<tr>
<td>Frantic e-mails to Orr, Kornik</td>
<td>October 2001</td>
</tr>
<tr>
<td>McNeill MQP advising in Ireland</td>
<td>September 2001</td>
</tr>
<tr>
<td>&quot;Hey, I could teach 4902 in here!&quot;</td>
<td>3:02 pm</td>
</tr>
<tr>
<td>Check on studio classroom construction</td>
<td>3:01 pm</td>
</tr>
<tr>
<td>Token appearance at WPI</td>
<td>3:00 pm</td>
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<tr>
<td>10am-2pm: McNeill playing golf</td>
<td>August 1, 2001</td>
</tr>
</tbody>
</table>

Procrastination: The McNeill Path to Change
Problem

Experiment: "Test Drive!"

Is one-hour delivery of studio lecture possible?

- Usually longer lectures (2-3 hour), 2x / week
- Most studio classes:
  - Fixed at one hour, 4x / week
  - Lecture time:

Lecture time:
McNeill and Keenanahan, "Transitioning an Engineering Course to Studio Format.\textsuperscript{FIE2002}

- Students complete evaluation form afterward

- Test lecture with student volunteers
  - Explore feasibility of 50-minute lecture
  - Test lecture with student volunteers

- Plan:
  - 15 minutes of lecture
  - 20 minutes of lab measurements
  - 15 minutes of computer simulations
McNeill and Keenaghan, "Transitioning an Engineering Course to Studio Format," FIE2002

Test Drive Survey

Expected Effectiveness of Studio Format

- Classroom Issues
  (Theory, Experiment, Simulation)
- Content Distribution
- Pacing
- Working with Partner
- Format

Studio Preparatory work on web
Some had previously taken EE4902

Student Background

-
 Volunteers solicited by e-mail

- No restrictions: some had taken EE4902 already

FYI: Boynton also affiliated with Highland Liquors!!!

Bribe Incentive:

$20 gift certificate to a local restaurant
• Allow flexibility for students who need extra time
  - Three hour open lab, 1X / week
  - Lecture plus simulations other days
  - Lecture plus lab measurements some days
  - One hour lecture, 4X / week

Modify delivery for actual course:

• Lab and simulation in one lecture too much?
• Lecture lasted 20 minutes too long

Test Drive Results
McNeill and Keenaghan, "Transitioning an Engineering Course to Studio Format." FIE2002

Test Drive Student Feedback

• Most students preferred the new studio format.

• Students commented on the quick pace.

• Some students felt rushed trying to keep up.

• "The simulation took twice as long as expected."

• "Some of the time I feel rushed trying to keep up."

• "I think having a 2-hour class would allow more depth in topics."

• "I learn by doing - so combining the theory with practice at the same time is great."

• "I learn by doing - so combining the theory with practice at the same time is great."
McNeill and Keenaghan, "Transitioning an Engineering Course to Studio Format.

More Test Drive Student Feedback

+ Advantages or - Disadvantages

Work Alone or With Partner?

- Work Alone

+ I like to work at my own pace

+ One built circuit, other set up equipment

- One person just sat there

• With Partner

+ Advantages or - Disadvantages

Work Alone or With Partner?

• Alone

- One person just sat there

+ "I like to work at my own pace"

+ "One built circuit, other set up equipment"

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Work Alone or With Partner?
More effective (9/13)

“I like the hands on approach”

Visual learning is the most effective way to communicate advanced concepts

“Incentive to show up. I would feel if I missed more if I had to pay for it.”

“I learn by doing”

“More effective for learning”

“Step through a studio class”
<table>
<thead>
<tr>
<th>Valid</th>
<th>Count</th>
<th>Description</th>
</tr>
</thead>
</table>
| Not sure (1/13) |       | "I fear there would be too much of a rush."
|© Slow down!© |       | "Advantage of lab class ... some time passes"
|© Less effective (2/13) |       | "Amount of theory covered less"
|© About the Same (1/13) |       | "You did not explain why and how you were doing things ... did not pick up on the cue to SLOW down."
|© "McNeill and Keenaghan, "Transitioning an Engineering Course to Studio Format," FIE2002" |       | |

Studio Format More Effective for Learning?
Would you stay or would you go?

- Stay: 11 of 13
  - "I would stay if it was to learn something new"
  - "I like building stuff"
  - "Depends on my schedule"

- Go: 2 of 13
  - "What if you finish Studio Work Early?"

Would you stay or would you go?
Most in favor: a former 4902 student:

Finish Early: Optional Extra Credit Work?

---

M. McNeill and K. Keenaghan, "Transitioning an Engineering Course to Studio Format," FIE2002
Three exams given during the 7-week course

Hypothesis: Students would perform better on "studio questions" than on others

Example: Waveforms measured from oscilloscope;
"studio information"

On each exam, one question directly related to "studio information"
Result: 67% performed better on "studio" questions.
Student Response (Course Evaluations)

Positive: Studio format
- "Cool to see what we learned in lecture applied immediately after to relate the theory to practice"

Negative: Lecture period too short
- "Not enough time for labs! Make class 2 hours"
- "Made it to my 11:00 about 6 times"
- "Cool to see what we learned in lecture applied"
McNeill and Keenan, "Transitioning an Engineering Course to Studio Format, FIE2002

More Student Response (Course Evaluations)

- Didn’t like slide presentation
- Leave space for writing something in notebooks
- Computers slow and frustrating
- Make sure software, hardware are OK!
- Book was useless
- OK: deflect student frustration from professor to textbook authors

- Leave space for writing something in notebooks
Exam results encouraging

Studio format is well-received

Moving to 2 hour periods, 3X/week

50-minute lecture periods too short for studio

More assessment in next offering (C 2003)

Test drive is an excellent tool

Advance information that improved delivery

Caution: self-selection of student population

Conclusions
Test drive survey was an excellent tool
• Students have lots of ideas!
• They're different from us (remember?)
• Student role in education
• Make expectations clear
• Willing to respond when we ask (and expect) a lot

More Conclusions
McNeill and Keenanagh, "Transitioning an Engineering Course to Studio Format," FIE2002

Acknowledgments

• Brad Lister, PhD., RPI

• Judith Miller, PhD., WPI

• Brad Lister, PhD., RPI