Lessons and Highlights from Blended Physics Courses

Saif Rayyan
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1. MOOCs should be aligned with Residential Courses.

2. Blended/Flipped/Online Classes Increase Flexibility of Advanced Course Offerings.

3. Immediate Feedback is Essential to Blended Learning, and Students Approve.

4. Blended Learning Should Increase Interactive Engagement, and Encourage Good Study Habits.

5. The Right Tools Enable Better Instruction.
Align MOOCs with residential courses

- 8.01: Physics I
- 8.02: Physics II
- 8.05: Quantum Mechanics II
- 8.13: Junior Lab I
- 8.14: Junior Lab II
- 8.421: Atomic Physics (Graduate)
- 8.SHIP: School of Heavy Ion Physics (Graduate)
- 8.851 (EFTx): Effective Field Theory
Blended @ Physics

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New Model of Course Offerings

• Lectures are replaced by Interactive Learning Sequences (video/checkpoint exercises/tutorials)
• Homework is Done Online.
• Keep Recitations/ Interactive Face time.
• 8.S05 Quantum Mechanics II: Additional Spring Offering (Spring 2015, Spring 2016).
• 8.S421 Atomic and Optical Physics: (Fall 2015)
• 8.S851 Effective Field Theory: (Fall 2014 + Self Study)
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### Reading Summaries (at the beginning of Pre-class assignments)

- N/A (Not used): 21%
- Not Helpful: 5%
- Somewhat Helpful: 24%
- Moderately Helpful: 25%
- Very Helpful: 17%
- Extremely Helpful: 9%

### Pre-Class Questions

- N/A (Not used): 5%
- Not Helpful: 19%
- Somewhat Helpful: 35%
- Moderately Helpful: 25%
- Very Helpful: 12%
- Extremely Helpful: 5%

### Online Problems Submitted on MITx

- N/A (Not used): 13%
- Not Helpful: 11%
- Somewhat Helpful: 24%
- Moderately Helpful: 35%
- Very Helpful: 28%

### Checkable answers on MITx for written Pset problems

- N/A (Not used): 0%
- Not Helpful: 13%
- Somewhat Helpful: 79%

### Submitted Written Psets

- N/A (Not used): 12%
- Not Helpful: 6%
- Somewhat Helpful: 24%
- Moderately Helpful: 40%
- Very Helpful: 28%

### Readings from the textbook

- N/A (Not used): 23%
- Not Helpful: 8%
- Somewhat Helpful: 25%
- Moderately Helpful: 21%
- Very Helpful: 15%
- Extremely Helpful: 9%

### Piazza

- N/A (Not used): 37%
- Not Helpful: 10%
- Somewhat Helpful: 23%
- Moderately Helpful: 14%
- Very Helpful: 10%
- Extremely Helpful: 6%

### Walter Lewin Lectures

- N/A (Not used): 64%
- Not Helpful: 4%
- Somewhat Helpful: 12%
- Moderately Helpful: 10%
- Very Helpful: 6%
- Extremely Helpful: 4%

### TEAL simulations on MITx

- N/A (Not used): 47%
- Not Helpful: 12%
- Somewhat Helpful: 22%
- Moderately Helpful: 12%
- Very Helpful: 42%

Checkable answers on MITx for written Pset problems

Very Helpful

Extremely Helpful

0.24% 13% 79%

Yes 95% (541)

No 5% (27)

Should 8.02 continue to use MITx?

Do you think other physics courses could benefit from using MITx?

Yes: 92% (518)

No: 8% (48)

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8.01 TEAL (Technology Enabled Active Learning)
8.S05- (16 responses) Q: Compared to other courses you have taken at the physics department at MIT (e.g. 8.04), would you say that you did more or less of the following:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Much More in 8.S05</th>
<th>Much More in traditional courses</th>
<th>About the Same</th>
<th>More in 8.S05</th>
<th>More in traditional courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work with other on Psets</td>
<td></td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Finish all problems in Psets</td>
<td></td>
<td>6</td>
<td>4</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Study solutions of Psets</td>
<td></td>
<td>6</td>
<td>4</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Keep record of solutions for problems</td>
<td></td>
<td>2</td>
<td>2</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Work on Pset questions in sequence</td>
<td></td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Ask questions directed to professor and course staff</td>
<td></td>
<td>7</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Read the textbook/lecture notes</td>
<td></td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>
8.05- (16 responses) Q: Compared to other courses you have taken at the physics department at MIT (e.g. 8.04), would you say that you did more or less of the following:

**Work with other on Psets**

- Much More in traditional courses: 5 respondents
- More in traditional courses: 3 respondents
- About the same: 4 respondents
- More in 8.05: 1 respondent
- Much more in 8.05: 3 respondents
“I definitely worked with other students more in 8.S05 than in most of my other courses. I want to make it clear that this wasn't because we all got together and copied each other's work or something - we were very honest about not sharing solutions. But, it was much more helpful to work with other people because we could explain to each other a question and we would know that we were thinking about it correctly. In other classes, it is often the situation where several different people have different answers and aren't able to articulate why their method is better than the others. You might think that would lead to great educational debates, but in reality it just leads to frustration and often skipping the question and just working on it alone because you don't want to argue with people. “
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No description provided.
8.MechCx 1T2015 Preview
Thanks to

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And many many more....