Adding points of synchronization to asynchronous content delivery.

Celina Berg
Computer Science
CSC 110 – Introduction to programming

• required for CS Honours and Majors as well as combined CS programs and minors
• service course required by other programs (ie. Math)
• fullfills CSC 100 level course requirement for many degrees in Science, Social Science, Economics, etc.
• wide range of students
• Summer offering
  • started with ~140 students
  • ended with ~90 students
## Course component weighting

<table>
<thead>
<tr>
<th>Course Work</th>
<th>Number across the term</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Lecture Quizzes</td>
<td>~20</td>
<td>10%</td>
</tr>
<tr>
<td>Labs</td>
<td>10</td>
<td>15%</td>
</tr>
<tr>
<td>Assignments</td>
<td>10</td>
<td>30%</td>
</tr>
<tr>
<td>Midterm Exams</td>
<td>3</td>
<td>45%</td>
</tr>
</tbody>
</table>
## Asynchronous materials

<table>
<thead>
<tr>
<th>Pre-Lecture Videos/Slides</th>
</tr>
</thead>
<tbody>
<tr>
<td>- minimal set of slides</td>
</tr>
<tr>
<td>- ~5 min videos introducing a concept</td>
</tr>
<tr>
<td>- 10-30 minutes per pre-lecture</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-Lecture Quizzes</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 5 to 20 questions</td>
</tr>
<tr>
<td>- unlimited tries</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lab material</th>
</tr>
</thead>
<tbody>
<tr>
<td>- specification document</td>
</tr>
<tr>
<td>- opportunity for clarification (forum)</td>
</tr>
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<table>
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<th>Assignment material</th>
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<td>- specification document</td>
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<table>
<thead>
<tr>
<th>Lecture recordings</th>
</tr>
</thead>
<tbody>
<tr>
<td>- post these for those with connectivity issues</td>
</tr>
</tbody>
</table>
adding points of synchronization

a typical week...

<table>
<thead>
<tr>
<th></th>
<th>Mon</th>
<th>Tues</th>
<th>Wed</th>
<th>Thurs</th>
<th>Fri</th>
<th>Sat</th>
<th>Sun</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Videos</strong></td>
<td>to be watched before quiz</td>
<td></td>
<td>to be watched before quiz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Quizzes</strong></td>
<td>due before lecture</td>
<td></td>
<td>due before lecture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lecture</strong></td>
<td>problem solving students given a chance to <em>try/ask questions</em> solution is demoed</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lab</strong></td>
<td>released</td>
<td>optional help in registered labs</td>
<td>due by end of day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Assignment</strong></td>
<td>released</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>due by end of day</td>
</tr>
</tbody>
</table>

*try/ask questions*
Ensuring Academic Integrity

• unlimited opportunities on pre-lecture quizzes (up to deadline)
• assignment/lab submissions
  • run Moss (turnitin for code)
    • 18 cases reported to CSC Academic Integrity Committee
    • monitor Chegg (homework solution site)
      • have had them remove >6 copies of assignments/solutions
• Midterm – strict constraints
  • academic integrity pledge
  • time limited – less time than I would give for a written exam
  • randomization of order students see questions
  • cannot go back and forth between questions
  • multiple versions (4-6) of each question
  • graders flag students who answer questions they did not see
  • course outline states: “Exam performance can be verified using an oral exam component if the instructor deems necessary.”
Midterm 1 results

average: 75%
median: 77%
Midterm 2 results

average: 57%
median: 55%
Midterm 3 results

average: 71%
median: 80%
Midterm challenges for students

• difficult for students to budget their time not knowing how easy/hard they will find the future questions
• if they need time to think about a question, no opportunity to comeback to it
• student may encounter the ‘hardest’ question first, sets the tone for their performance on the remainder of the exam
• strict constraints have detrimental impact on those with exam anxiety and/or lack confidence in their knowledge
Midterm structural support

• get a TA to write the exam for time to establish fair time limits
• provide a “dummy” exam to allow them to experiment with the interface before their first exam
• provide an overview of the question topic/weight to allow students to budget their time based on knowledge (did this on midterm 3)
• assign time weighted marks to questions ~1 mark/minute
• give 10 minutes on top of mark/minute
  • account for connectivity issues
  • flex time to use on questions they deem hard
• no recall/tracing questions
  • all require analysis and application of concepts
  • given a solution, identify error (challenging for students, quick to grade)
• give everyone warm-up question first (easiest) and randomize the order of the remaining questions (have not tried this yet)
• manual grading to allow for partial marks
Reflection and Analysis

- students that have gamified progress are struggling when put under time constraints
  - don’t watch videos and reattempt the quiz until they get 100% (forming/strengthening misconceptions)
  - trial-and-error programming

- students using course materials as intended are becoming proficient

- TA support in Labs was under utilized

- attendance dropping off at a more rapid rate than face-to-face

- data, data, data – how do we get answers from it?
  - number of quiz attempts
  - video views (when, how long, how many times)
  - attendance in lecture/labs
  - preliminary analysis...
Minutes spent in Lab to Final Grade (correlation: 0.117)

![Graph showing the relationship between minutes spent in lab and final grade.](image-url)
Minutes spent in Lecture to Final Grade (correlation: 0.281)
Quiz Attempts to Final Grade
(correlation: 0.354)
slides viewed before lecture to Final Grade (correlation: 0.405)
videos viewed before lecture to Final Grade (correlation: 0.467)
Thoughts for next time...

• Introduce evaluation within Labs
• Limit quiz attempts
• Introduce restriction require video access before quiz attempt
• Provide solutions to practice problems in the form of videos as opposed to static text files