Technology at work: Measuring Learning Outcomes Through Course Embedded Assessments

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Session Objectives

1. Learn about how the Heritage College’s opening of an extension campus led to transitioning to computer based testing.
2. Explore the iterative processes of measuring of learning outcomes at the Heritage College.
3. Discuss the successes and challenges of measuring learning outcomes in Osteopathic medical education.
Session Outline

1. Background
2. Piloting of Computer Based Testing (CBT)
3. Students Attitudes towards CBT
4. Faculty Training (Buy in)
5. Measuring Learning Outcomes through Course Embedded Assessment
6. Conclusion
1. Background

1. The growth of Heritage college - opening of a new campus necessitated change in exam taking process. Efficiency was pertinent and upholding of exam policies.

2. In addition it was important for the exam takers to have a similar platform that “mimicked” each other (Fox, McDonough, McConatha & Marlowe 2011).

3. CBT versus paper based testing.

4. On the other hand, anticipated changes in the exam taking process had to be communicated to students and faculty who would inevitably be affected.
1. Background

1. Ease in grading and accessing students’ performance statistics, students receive immediate feedback, and evaluate their scores relative to the entire class. Kitto (2003)

2. The demerits - fidelity of the exam taking process hence validity becomes doubtful when students collaborate.

3. We needed a platform that would ensure test security and line up with the college honor code, effective in ensuring that there would be equity at both campuses.

4. The college settled on CBT with measures in place for ensuring the observance of the honor code and test security.
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2. Piloting of Computer Based Testing (CBT)

The pilot process

• **Mock exam:** Set up mock exams in a manner that closely reflected the testing environment on actual exam days.

• **Low stakes exams:** worked with one faculty member in piloting actual low stakes exams

• **High stakes exam:** scaled up to a relatively high stake exam (mid-term exam)

• **Surveyed students:** after the mid-term exam we proceeded to use CBT for the final exam.
3. Students Attitudes towards CBT

![Recommend use of CBT](chart)

- **Yes**: 80%
- **Not Sure**: 20%
- **No**: 0%
3. Students Attitudes towards CBT

1. “It's so awesome. I was so sick of filling out bubble sheets, especially wasting the first 5 minutes of my exam filling in my name and all that. I take and review the exam so much faster now. I've been hoping for this since the beginning of the year”

2. “Taking the test on the computer is a little more difficult for me at this time because I like to mark my questions and write my notes next to the questions. However, if the boards are set up this way, I am hopeful I will adapt and become better at using this system. Until then, the extra time allowed to take the exam was nice. Thank you”

3. “Didn't think I would like it- but I was surprised that I did like it”
3. Students Attitudes towards CBT

1. Ear plugs for typing noise
2. CBT did not require more time compared to pen & paper
3. Technology support
4. Back up laptops
5. Reduced the number of back up paper copies
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4. Faculty Training  (Faculty–Buy in)

1. General faculty willingness to transition to CBT
2. Logistical feasibility
3. Identifying a ‘champion’
4. Working ahead of time - the reality that faculty members had to adjust to.
4. Faculty Training (Buy in)

1. Monthly meetings where all the relevant faculty were convened. These trainings entailed:
   a. Introducing computer based testing
   b. Sharing feedback from the pilot process
   c. Interpreting exam reports
   d. Using course assessments to measure learning outcomes
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5. Measuring Learning Outcomes through course embedded assessments - Tagging

1. The curriculum should be structured in a way that ensures students **attain the intended objectives** and mechanisms should be put in place that would actually assess if students have achieved these **outcomes** (Yin & Volkwein, 2010).

2. **Use of suitable and accurate measures** is essential in assessing students’ abilities (Pike, 2002).

3. Course embedded assessments- measurement tools for gauging if students have learnt concepts taught in the course.
5. Measuring Learning Outcomes through course embedded assessments – Assessment cycle
5. Measuring Learning Outcomes through course embedded assessments - Tagging

1. Test questions = **unit of analysis**.

2. **Mixed response** the effort resonated with the colleges’ effort of ensuring continuous quality improvement and closure of the learning loop for the students.

3. The **post exam analysis** - precision in identifying areas that students excelled and areas that students did not.

4. **Track students performance** relative to campus for comparison.
5. Measuring Learning Outcomes through course embedded assessments - Tagging

Item tagging
1. Year one: 4 exams fully tagged, 1 partially tagged, 2 not tagged
2. Year two: 3 exams fully tagged, 1 partially tagged, 1 not tagged

Reports
1. Item analysis
2. Summary report
3. Category report
4. Strength and opportunity report
### 5. Measuring Learning Outcomes through course embedded assessments – Item Analysis Report

<table>
<thead>
<tr>
<th>Question #</th>
<th>Correct Responses</th>
<th>Disc. Index</th>
<th>Point Biserial</th>
<th>Correct Answer</th>
<th>Response Frequencies (A indicates correct answer)</th>
<th>Avg Answer Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diff(p)</td>
<td>Upper</td>
<td>Lower</td>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>1</td>
<td>0.08</td>
<td>100.00%</td>
<td>93.94%</td>
<td>0.08</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>0.51</td>
<td>63.64%</td>
<td>42.42%</td>
<td>0.21</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

1: A 32-year-old postal worker comes to you with complaints of redness and irritation of the right eye. Fluorescein staining is performed. The best course of treatment is:

A: broad-spectrum oral antibiotic
B: oral nonsteroidal anti-inflammatory drug
C: topical antiviral agent
D: topical steroid-antibiotic combination drop
E: surgical debridement of the affected area

2: A 21-year-old man with a 4-year history of low back pain presents with a red, photophobic left eye. The most appropriate initial management is:

A: laser photocoagulation therapy
5. Measuring Learning Outcomes through course embedded assessments – Summary Report

**ExamSoft**

**SUMMARY REPORT**

OMM Yr 1 Fall MidTerm 2014

**Course:** OMM (A)  •  **Instructor:**

- Questions: 50  •  Exam Takers: 191

**ASSESSMENT PERFORMANCE**

- **88%**
  - Average Score: (43.9/50)
- **62%**
  - Low Score: (31/50)
- **98%**
  - High Score: (49/50)

**Assessment Score Reliability (KR-20)**

- 0.0
- 0.48
- 1.0

- **POOR**
- **SATISFACTORY**
- **GOOD**

Likelihood of students repeating the same performance.

**Assessment Analysis:** Tests with reliabilities below .50 should be used with skepticism.

**LEARNING OUTCOMES**

(Category Performance)

- Faculty
- Questions: 1
5. Measuring Learning Outcomes through course embedded assessments - Category performance report

<table>
<thead>
<tr>
<th>HCOM Discipline Codes</th>
<th># of Items</th>
<th>Correct #</th>
<th>Correct %</th>
<th>Incorrect #</th>
<th>Incorrect %</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM- Addiction Medicine</td>
<td>1</td>
<td>160.00</td>
<td>93.02</td>
<td>12.00</td>
<td>6.98</td>
</tr>
<tr>
<td>CPAT- Clinical Pathology</td>
<td>1</td>
<td>101.00</td>
<td>58.72</td>
<td>71.00</td>
<td>41.28</td>
</tr>
<tr>
<td>CPPH- Clinical prevention population health</td>
<td>12</td>
<td>1,664.00</td>
<td>87.95</td>
<td>228.00</td>
<td>12.05</td>
</tr>
<tr>
<td>Derm- Dermatology</td>
<td>9</td>
<td>1,212.00</td>
<td>78.29</td>
<td>336.00</td>
<td>21.71</td>
</tr>
<tr>
<td>EBM- Evidence Based Medicine</td>
<td>117</td>
<td>15,931.00</td>
<td>79.85</td>
<td>4,021.00</td>
<td>20.15</td>
</tr>
<tr>
<td>HIST- Histology (Microanatomy)</td>
<td>12</td>
<td>1,495.00</td>
<td>72.43</td>
<td>569.00</td>
<td>27.57</td>
</tr>
<tr>
<td>IDX- Infectious Diseases</td>
<td>38</td>
<td>5,228.00</td>
<td>79.99</td>
<td>1,308.00</td>
<td>20.01</td>
</tr>
</tbody>
</table>
5. Measuring Learning Outcomes through course embedded assessments - Strength and Opportunities report

**Strengths and Improvement Opportunities**

**I-I Final Exam 2014**

- Course: I & I
- Instructor: 
- Questions: 126
- StdDev = 9.06  •  Mean = 101.31  •  Median = 102.5  •  Percentile Rank = 95.122

**89.8%**  **79.1%**

My Score  Average Score

Overall, you scored above the class average. Please take note of the areas, noted in yellow or red, where you may have opportunities for improvement.

**MY SCORE  AVERAGE MEAN  SCORE RANGE  DOING WELL  NEEDS REVIEW  NEEDS IMPROVEMENT**

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>MY SCORE</th>
<th>AVERAGE</th>
<th>CORRECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM - Addiction Medicine</td>
<td>100.00%</td>
<td>92.68%</td>
<td>1/1</td>
</tr>
<tr>
<td>CPAT - Clinical Pathology</td>
<td>100.00%</td>
<td>61.79%</td>
<td>1/1</td>
</tr>
<tr>
<td>CPPH - Clinical prevention population health</td>
<td>90.91%</td>
<td>87.36%</td>
<td>10/11</td>
</tr>
</tbody>
</table>
5. Measuring Learning Outcomes through course embedded assessments - Course Maps

<table>
<thead>
<tr>
<th>Course Outcome</th>
<th>Learning Topics</th>
<th>Course Activity</th>
<th>Assessment - Data source</th>
<th>Bench Mark</th>
<th>Data analysis/Results</th>
<th>Actions, Innovations, Decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>As reflected in the course syllabus and/or in the block course goals document</td>
<td>There are 65 LTs as reflected in the MPGs. Ideally the Exam Blue print should be reflective of the same LTs</td>
<td>Map activity directly to course outcomes</td>
<td>List exams that measure course outcome</td>
<td>Target, or achievement level (usually a %) Statement of student Success</td>
<td>Summary statistics from grade book/ExamSoft</td>
<td>IoR was re-thinking the level of exam difficulty given the high mean score in the first exam. He was also concerned about the time allocated to the exam for the next two exams since he had five more questions to each of the exams. After exam 2 the analysis on time taken to complete the exam showed that most students finished the exam in good time and only one student ran out time.</td>
</tr>
<tr>
<td>Provides an introduction to musculoskeletal anatomy (back &amp; limbs)</td>
<td>12206, 12126, 12128, 12131, 12133, 12135, 12138, 13144, 13145, 13272, 13273, 13274, 13275, 13276, 13277, 13278, 13279, 13280, 13281, 13282, 13283, 13284, 13285, 13286, 13287, 13288, 13289, 13290, 13291, 13292, 13293, 13294, 13295, 13296, 13297, 13298</td>
<td>Lab Practical Lectures Required readings</td>
<td>Back Exam</td>
<td>72.5% Written and practical components will be weighted equally, but the three exams will be weighted as follows: back (20%), upper extremity (40%), and lower extremity (40%).</td>
<td>Back exam Mean=90% High=100% Low=67% &lt;72.5= 1</td>
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<tr>
<td>Introduces the anatomical vocabulary and palpatory skills needed by the osteopathic physician</td>
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<td>Approaches human anatomy from a clinical perspective</td>
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<td>Initiates the process of integrating clinical thinking and care</td>
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Instructor of Record: [Name] 
Course duration: 5 weeks 
Student population: 194 
Semester: Fall 2014 
Total lab Hours: 56 
Total lecture Hours: 24
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1. Assessment is an iterative process
2. Improve on the process of measuring learning outcomes
3. Facilitate student learning process and close the learning loop
4. Employ the use of exam blueprints.
5. Develop and maintain course maps
6. Document best practices in quality improvement
7. Keep training faculty
6. Conclusion
Discussion

1. How do you measure learning outcomes at your institution?
2. What are some strengths and weaknesses of this process?
3. Do you think there could be a global way of measuring learning outcomes for osteopathic medical education?
References


   [http://www.sfccmo.edu/pages/1499.asp](http://www.sfccmo.edu/pages/1499.asp)