Test-enhanced Learning in a Therapeutics Course

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BACKGROUND

• Test-enhanced learning refers to an increase in retention of knowledge or skills by testing
  – Testing improves learning by requiring active retrieval of information and/or helping develop an effective test-taking strategy

• The Therapeutics II course is the second of four Therapeutics courses in the UCSF Doctor of Pharmacy curriculum

• In 2017, 4 graded written tests were administered instead of 2 graded written tests in the preceding years

• Having 4 vs 2 graded written tests may increase test-enhanced learning

• In addition, having 4 graded tests may improve students’ time management skills

• However, more graded tests may increase levels of students’ perceived stress and test anxiety

PURPOSE

• To confirm test-enhanced learning with 4 graded written tests compared with 2 graded written tests

• To assess student perception of and preferences for having 4 vs. 2 graded written tests

METHODS

• To confirm test-enhanced learning with 4 graded written tests
  – We included students who took Therapeutics II in 2016 and 2017.
  – Student cohort who took the course in 2016 (i.e., 2016 cohort) served as a historical control.
  – We compared the median score change from the first to the last tests between 2017 and 2016 student cohorts
  – In 2017, the median score change was measured from Test 1 to Test 4
  – In 2016, the median score change was measured from midterm to final test

• To assess students’ perception and preferences
  – We surveyed the 2017 student cohort after the course
  – Since Therapeutics I course administered 2 graded written tests, we surveyed students about the change in levels of perceived stress and test anxiety as well as self-confidence in time management skills by using Likert scale
  – We also surveyed on helpful and unhelpful aspects of having 4 vs. 2 graded written tests
  – In addition, we asked about their preference between having 4 and 2 graded written tests in a Therapeutics course

RESULTS

1. Comparison of test score change between the 2016 and 2017 cohorts

• 124 and 119 students enrolled in 2016 and 2017, respectively

Table. Characteristics Between 2016 and 2017 Cohorts Taking Therapeutics II.

<table>
<thead>
<tr>
<th>Item</th>
<th>2016 (n=124)</th>
<th>2017 (n=119)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (%)</td>
<td>42 (35.3)</td>
<td>37 (31.6)</td>
<td>0.82</td>
</tr>
<tr>
<td>Students repeating the course (%)</td>
<td>2 (1.7)</td>
<td>4 (3.2)</td>
<td>0.56</td>
</tr>
<tr>
<td>Therapeutics I grade (%)</td>
<td></td>
<td></td>
<td>0.40</td>
</tr>
<tr>
<td>A</td>
<td>5 (4.3)</td>
<td>11 (9.1)</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>60 (51.3)</td>
<td>53 (43.8)</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>37 (31.6)</td>
<td>37 (30.6)</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>12 (10.3)</td>
<td>18 (14.9)</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>3 (2.6)</td>
<td>2 (1.7)</td>
<td></td>
</tr>
</tbody>
</table>

While the median score of the final written test was not significantly different from that of the midterm test in 2016 cohort (p=0.95), the median scores of the 2017 cohort increased over time and the median score of the last test was about 7 points higher that that of the first test (84.0 vs. 76.9; p<0.0001)

2. Perception and preferences

• Survey response rate: 91.6%

• Compared with having 2 tests, –81.9% of students reported having 4 tests improved level of stress substantially or slightly

• –87.3% reported having 4 tests improved level of test anxiety substantially or slightly

• –89% reported having 4 tests improved time management skills substantially or slightly

• 69% reported studying learning materials as planned in Therapeutics II compared with 37.3% in Therapeutics I (p=0.004)

• Only 29.1% reported cramming before a test at least once in Therapeutics II compared with 46.6% in Therapeutics I (p=0.001)

• Top 3 helpful aspects of having 4 tests were staying on track of learning materials, retaining knowledge longer, and additional opportunities to recover

• Top 3 unhelpful aspects were increased academic workload, decreased time for relaxation, and reduced time to study for the other courses

• 92.7% students preferred having more than 2 written graded tests in a Therapeutics course

LIMITATIONS

• Instead of concurrent control, a historical control was used

• Different tests were administered between the 2016 and 2017 cohorts due to test security

• Only the 2017 cohort was surveyed

• Content delivery models were different between Therapeutics I and II courses

CONCLUSIONS

• Having more than two graded written tests in a Therapeutics course may enhance student learning, improve time management skills, and reduce stress and tests anxiety

Approved by the UCSF Committee on Human Research