"Two-stage” group exams can improve student learning

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Background

Learning through collaboration, even in a testing situation, has many benefits stemming from peer-to-peer interactions. A collaborative test, hereafter called a “two-stage exam”, typically has the following format:

1st Stage: Students write exam as individuals.

2nd Stage: Groups of 3-5 students immediately complete a second identical (or very similar) exam. The 2nd Stage typically takes much less time.

Students self-report many benefits of two-stage exams, including: reduced test anxiety, greater motivation to study and greater motivation to think critically during a two stage exam. There are studies reporting improved retention when testing using two-stage group exams. However, these studies failed to control for the additional “time-on-task” of a two-stage exam format (in which students are exposed to the same questions twice).

Research Questions

1) Does collaboration during a two-stage exam improve students’ retention of concepts more than a test written individually?

2) What, if any, specific effects does collaboration during a test have on students’ retention of concepts?

Methods

The Course

- Earth and Ocean Sciences non-majors course about natural disasters.
- 2.5 hr classes, 5 days / week, 3 weeks in summer 2012.
- 98 students, 59 first- and second-year, 41 third-year and above.
- Midterms each worth 30% total: each with 88% for individual test, 18% for group test.
- Study occurred over two midterms, each held on a Friday, with the learning test the following Monday.

Experimental Set-up: A Cross-Over Design (Figure 1)

Figure 1 outlines the experiment. We used two-stage exams as described above, with two extra parts:

- Individual retest: Students repeated, as individuals, five 1st stage questions. Acted as the control treatment. Used to make sure students in the individual mode work on questions for the same amount of time.
- Learning test: Individually-written quiz, 10 questions. Measure of students’ retention of concepts.

Data Analysis

- Each midterm analyzed separately. We included only scores of students who wrote both individual test and learning test (midterm 1: n=79; midterm 2: n=71).
- Each students individual test score was paired with their learning test score for each of the Topic 1 and Topic 2 questions. Class data set was then divided according to whether students had answered questions from a given Topic during the individual retest (i.e., control) or group retest (i.e., treatment).
- Percentage learning gain and normalized change (midterm 1: n=67, midterm 2: n=52) were calculated for each student using their baseline individual test and the follow-up learning test scores.

Results and Discussion

1) Does collaboration during a two-stage exam increase student’s retention of concepts more than a test written individually?

Working in groups resulted in significantly greater retention of concepts by students, for both midterms (Table 1 and Figure 2).

<table>
<thead>
<tr>
<th>Condition</th>
<th>Group</th>
<th>Individual</th>
<th>p-value (paired t-test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm 1</td>
<td>Group</td>
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<td>73.1</td>
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<td>Group</td>
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</tr>
<tr>
<td></td>
<td>Individual</td>
<td>2.6</td>
<td>2.1</td>
</tr>
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</table>

2) What, if any, specific effects does collaboration during a test have on students’ retention of concepts?

When comparing normalized gain by quantiles of the class (based on midterm mark) collaborative testing benefits all students equally, regardless of pre-intervention test performance (Figure 4).

<table>
<thead>
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<th>Condition</th>
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<th>p-value (paired t-test)</th>
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<tr>
<td></td>
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</table>

Conclusions

Students showed a significantly higher gain in retention when tested in a collaborative setting over a traditional, individual-written test setting.

Regardless of their performance prior to the two stage exam, all students appear to benefit equally when tested collaboratively.

References


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Want to try two-stage exams in your classroom?

Visit: http://www.cwsei.ubc.ca/resources/SEI_video.html

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