Improved Academic Achievement and Student Perceptions of Learning through use of a Cell Phone-based Personal Response System

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Blended classroom

(Watson, 2017)
iClicker works
But not always

Sevian and Robinson, 2011
Gauci, Dantas, Williams, & Kemm, 2009
Hunsu, Adesope, & Bayly, 2016
<table>
<thead>
<tr>
<th>Introduction (Background)</th>
<th>Objective &amp; hypothesis</th>
<th>Materials &amp; methods</th>
<th>Results &amp; discussion</th>
<th>Conclusion</th>
</tr>
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</table>

Everyone has a phone

Distraction
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**Cell phone-based personal response system**
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<tbody>
<tr>
<td>to evaluate the impact of using CPPRS in an upper-level undergraduate Food Science course on <strong>academic achievement</strong> and <strong>student perceptions of learning</strong></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Students in FST/HORT 3114 Wines and Vines in Fall 2016 at a southeastern land-grant university

- Students must be at least 21 years old
- The data from students who primarily used TopHat on their laptops was not included.
• an undergraduate level course
• 3 credit
• covers world wine styles, wine appreciation, and sensory evaluation of wine
• over a 16-week period
<table>
<thead>
<tr>
<th>W 1</th>
<th>W 2</th>
<th>W 3</th>
<th>W 4</th>
<th>W 5</th>
<th>W 6</th>
<th>W 7</th>
</tr>
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<tbody>
<tr>
<td>L 1</td>
<td>L 2</td>
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<td>L 4</td>
<td>L 5</td>
<td>L 6</td>
<td>L 7</td>
</tr>
<tr>
<td>L 8</td>
<td>L 9</td>
<td>L 10</td>
<td>Exam 1 Cancelled</td>
<td>L 11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No TopHat™

<table>
<thead>
<tr>
<th>W 7</th>
<th>W 8</th>
<th>W 9</th>
<th>W 10</th>
<th>W 11</th>
<th>W 12</th>
<th>W 13</th>
<th>W 14</th>
<th>W 15</th>
<th>W 16</th>
</tr>
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<tr>
<td>L 12</td>
<td>L 13</td>
<td>L 14 &amp; L 15</td>
<td>L 16</td>
<td>L 17</td>
<td>L 18</td>
<td>L 19</td>
<td>Exam 2</td>
<td>L 20</td>
<td>No class</td>
</tr>
<tr>
<td>L 21</td>
<td>L 22</td>
<td>L 23</td>
<td>Sensory application</td>
<td>Review</td>
<td>Final exam (early)</td>
<td>Final exam</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

With TopHat™
Introduction

Objective & hypothesis

Materials & methods (Implementation)

Results & discussion

Conclusion

Two review questions 0-10 min

Two formative questions 20-30 min

Two closure questions 40-50 min
<table>
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<th>W 1</th>
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<td>L 7</td>
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No TopHat

With TopHat

Quiz 1

Quiz 2

Quiz 3

Quiz 4

Quiz 5

Quiz 6

Quiz 7

Quiz 8

Survey open
QUIZ

Ten multiple-choice questions in each quiz

- 6 questions—lower level of thinking
  Example: The world’s major cork stopper producing country is: B
  A. Chile
  B. France
  C. Portugal
  D. South Africa
  Correctness rate: 0 pt

- 4 questions—higher level of thinking
  Example: As a producer of Port wines in the city of Oporto, Portugal you would be likely to contract with vineyards located in: B
  A. Bordeaux
  B. Duoro
  C. Stellenbosch
  D. Vinho Verde
  Correctness rate: 2 pt

Bloom Taxonomy

Remember
Understand
Apply
Analyze
Evaluate
Create

Materials & methods (Statistical analysis)

- IBM SPSS Statistics (IBM Corporation)
  2 x 2 factorial design
  Repeated measures analysis of variance with a Greenhouse-Geisser adjustment

- Significance level was defined as $p > 0.05$

- Effect size (Cohen’s $d$)
  - Large: Cohen’s $d$ value is 0.8
  - Medium: Cohen’s $d$ value is 0.5
  - Small: Cohen’s $d$ value is 0.2.
Table 1 The average and standard deviation of 39 students’ correctness rates on the upper and lower level questions in eight quiz on the content which was delivered with/without TopHat™

<table>
<thead>
<tr>
<th>Correctness rates</th>
<th>Content delivered without TopHat™</th>
<th>Content delivered with TopHat™</th>
<th>All content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper level questions</td>
<td>0.84±0.10</td>
<td>0.88±0.08</td>
<td>0.86±0.08</td>
</tr>
<tr>
<td>Lower level questions</td>
<td>0.77±0.13</td>
<td>0.79±0.12</td>
<td>0.78±0.12</td>
</tr>
<tr>
<td>All questions</td>
<td>0.82±0.10</td>
<td>0.84±0.09</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Cohen’s $d$: 0.971

$p = 0.016$

Cohen’s $d$: 0.919

$p < 0.001$

Cohen’s $d$: 0.436

$p = 0.432$

Cohen’s $d$: 0.206

$p = 0.207$

Cohen’s $d$: 0.206

$p = 0.016$

Cohen’s $d$: 0.408
### Students’ perception

- impact of CPPRS on learning
- ease of use of CPPRS

<table>
<thead>
<tr>
<th>Options</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Somewhat agree</th>
<th>Somewhat disagree</th>
<th>disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
Responses from 28 students

- ALL students have a smartphone
- 21 out of 28 students used their cell phone primarily
- Gender: 6 female and 22 male students
- Age: 21 to 26 years (21.8±1.25)
- Ethnicity: white (1 being Hispanic or Latino)
- Majors:
  - 8 from Food Science and Technology
  - 3 from Horticulture major
  - 2 from viticulture minor
  - 15 from various majors
Table 1. Students’ perception on using TopHat™ from the survey (28 responses)

<table>
<thead>
<tr>
<th>Survey questions</th>
<th>Average score± standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Theme 1: the impact of using TopHat™ on learning</strong></td>
<td></td>
</tr>
<tr>
<td>Question 1: Using TopHat™ improved my learning.</td>
<td>4.46±1.20</td>
</tr>
<tr>
<td>Question 5: Using TopHat™ made me think more during class.</td>
<td>4.82±1.02</td>
</tr>
<tr>
<td>Question 9: Using TopHat™ increased my focus on the class.</td>
<td>4.29±1.15</td>
</tr>
<tr>
<td><strong>Theme 2: easy of use</strong></td>
<td></td>
</tr>
<tr>
<td>Question 2: Using TopHat™ was easy.</td>
<td>5.18±0.82</td>
</tr>
<tr>
<td>Question 6: Using TopHat™ was common sense.</td>
<td>4.93±0.60</td>
</tr>
<tr>
<td>Question 10: Using TopHat™ was straightforward.</td>
<td>5.00±0.77</td>
</tr>
</tbody>
</table>
Cell phone-based personal response system, such as TopHat, offers a strategy for turning ubiquitous phones into useful tools that can facilitate a collaborative teaching and learning environment.
• Dr. Amanda Stewart
• Dr. Peter Doolittle
• Dan Steger
• Graduate Teaching Scholar program in College of Agriculture and Life Sciences at Virginia Tech
• NACTA-CHS Foundation Travel Grants
Thank you!