Effect of changing from closed book to textbook allowed examinations for final year pharmacy students

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Open book exams – reported benefits

- Decreased student anxiety (Feller 1994)
- Encourages "a deeper engagement with the course material on the part of the students" (Gharib et al 2012) & “thinking at higher cognitive levels” (Eilertsen & Valdermo 2000)
- “Fosters understanding of learning processes in terms of real-life performance as opposed to a display of inert knowledge” (Williams & Wong 2009)
Australian Medicines Handbook (AMH)

- “An important clinical resource for health practitioners concerned with the quality use of medicines”
- Independent, evidence-based
- Contains:
  - Individual drug monographs
  - Drug class statements
  - Drug interactions section
  - Therapeutic information for some diseases

https://shop.amh.net.au/products/books/2018
2014: Decision made to have the AMH allowed as a specifically permitted item in the final year, second semester written examinations for all four semester long subjects (units)

First semester written examinations were “closed book”
Aim & hypotheses

Aim: To determine if allowing AMH use in examinations modifies students' learning behaviour & improves students' learning outcomes

Hypotheses:

1. Students allowed the AMH in examinations are able to answer more difficult exam questions
2. Reduced perceived student anxiety levels when students are able to use an AMH in examinations
3. No effect on study "time on task" during semester
Mixed methods approach

1. Student surveys after 1st & 2nd semester exams in 2015 & 2016
   • General questions about age & gender
   • Time on task questions
   • Study approach statements (5 point Likert scale) (Biggs, Kember et al. 2001)
   • Statements about experiences of exams & perceptions of studying with the AMH

2. Student open ended comments of their experiences

3. Questions from all 4th year exams assigned to “high” or “low” according to Bloom’s taxonomy (Bloom 1956)

4. Student performance in exams compared across semesters & years
## Results

1. Student surveys after 1st & 2nd semester exams in 2015 & 2016  
(Semester 1: no AMH, Semester 2: AMH allowed)

<table>
<thead>
<tr>
<th>Hours of study per week</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks 1-6 of semester</td>
<td>11.8 ± 1.4</td>
<td>10.0 ± 1.0</td>
</tr>
<tr>
<td>Weeks 7-12 of semester</td>
<td>17.0 ± 1.7</td>
<td>15.9 ± 1.3</td>
</tr>
<tr>
<td>Non-teaching week and examination period</td>
<td>40.4 ± 3.7</td>
<td>50.4 ± 4.7</td>
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<tr>
<td></td>
<td>44.7 ± 3.2</td>
<td>51.6 ± 4.5</td>
</tr>
</tbody>
</table>
Results

1. Student surveys after 1st & 2nd semester exams in 2015 & 2016
   (Semester 1: no AMH, Semester 2: AMH allowed)

Approach to study

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Surface Approach Semester 1</th>
<th>Surface Approach Semester 2</th>
<th>p-value</th>
<th>Deep Approach Semester 1</th>
<th>Deep Approach Semester 2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>Mean 25.9</td>
<td>27</td>
<td>0.215</td>
<td>30.06</td>
<td>28.2</td>
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<tr>
<td></td>
<td>SD 6.845</td>
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<td>7.409</td>
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<td>N 51</td>
<td>45</td>
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<td>51</td>
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<tr>
<td>2016</td>
<td>Mean 25.43</td>
<td>27.08</td>
<td>0.516</td>
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<td>SD 7.636</td>
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<td></td>
</tr>
</tbody>
</table>
Results

1. Student surveys after 1st & 2nd semester exams in 2015 & 2016
   (Semester 1: no AMH, Semester 2: AMH allowed)

Exam satisfaction

- The exams were intellectually challenging
- The exams aligned well with the learning outcomes of the unit
- The exam questions allowed me to demonstrate my knowledge (command) of the topic
- The format of the exam questions were relevant to pharmacy
- The exam questions were engaging
- No effect of semester (p = 0.10) or year (p = 0.14)
Results

1. Student surveys after 1st & 2nd semester exams in 2015 & 2016
   (Semester 1: no AMH, Semester 2: AMH allowed)

Open book preference

• I prefer open book to closed book exams

• No effect of semester ($p = 0.07$) or year ($p = 0.39$)

"Using the AMH was definitely an engaging way of learning some of the differences between drugs and helped with higher order levels of thinking required of some questions"
Results

1. Student surveys after 1st & 2nd semester exams in 2015 & 2016 (Semester 1: no AMH, Semester 2: AMH allowed)

Anxiety

- I felt anxious about the exams during the semester
- I felt anxious about the exams just prior to taking them
- No effect of semester ($p = 0.10$) or year ($p = 0.33$)

“Having the AMH close by also made me feel a little bit more at ease as I didn't have to rely upon my memory for things such as medication side effects. I can't imagine life without my AMH”
Results

1. Student surveys after 1st & 2nd semester exams in 2015 & 2016 (Semester 1: no AMH, Semester 2: AMH allowed)

Refer to AMH during study

- During my study, I frequently referred to an Australian Medicines Handbook (AMH)

- Significant effect of semester ($F_{1,144} = 32.41$, \(p<0.0001\))
- No effect on year ($p = 0.11$)
Results

2. Student open ended comments of their experiences

- Main themes identified:
  - Students overwhelmingly want more real life like exams, rather than just rote learning information and regurgitating it on an exam
    - Eg: “The use of an AMH in the exam, I believe closely resembles actual practice as a pharmacist where there is a big focus on finding the information from the correct place rather than memorising and rote-learning” and “AMH-allowed exams are an excellent idea”
  - Students appreciate the importance of studying with and becoming familiar with the AMH
    - Eg: “During my rural PEP [placement] I started to read my AMH for hours a night. I feel like this was the best thing I have done to increase my pharmacy understanding”
Results

2. Student open ended comments of their experiences

- Not all comments were positive:
  - “I usually do prefer closed book exams as the exam writers will only expect you to remember a certain amount of information”
  - “I hated having it in the exam!! Unnecessary waste of time! Looking through the thing was time consuming”
  - “Students who utilised the AMH were able to do better than those who simply memorised and studied the lecture material”
Results

3. Questions from all 4th year exams assigned to “high” or “low” according to Bloom’s taxonomy (Bloom 1956)

- Significant effect of semester ($F_{1,5} = 9.15$, $p<0.05$)
- No effect of year ($p = 0.21$)
4. Student performance in exams compared across semesters & years

- No effect of semester ($p = 0.58$) or year ($p = 0.86$)
Conclusion

- Enabling the AMH into exams did not affect self-reported time on task, study approach, self-perceived anxiety.
- Comments suggested students prefer AMH allowed exams to closed book exams.
- AMH allowed exams have more questions requiring higher Bloom’s levels (application, analysis, evaluation, synthesis). Students did as well on these exams as on exams with less high level questions.
  - These results have informed the use of the AMH in examinations in the new Monash Pharmacy degree (1st cohort in 2017).