1) About PeerWise

PeerWise is a web-based MCQ repository created by students.
Institutions signing up per year:

<table>
<thead>
<tr>
<th>Year</th>
<th>Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009:</td>
<td>22</td>
</tr>
<tr>
<td>2010:</td>
<td>66</td>
</tr>
<tr>
<td>2011:</td>
<td>204</td>
</tr>
<tr>
<td>2012:</td>
<td>266</td>
</tr>
<tr>
<td>2013 (Jan-Jun):</td>
<td>214</td>
</tr>
</tbody>
</table>

Growing content repository:

<table>
<thead>
<tr>
<th>Course</th>
<th>Logins/month</th>
<th>Questions</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,500</td>
<td>75,000</td>
<td>600,000</td>
<td>12,000,000</td>
</tr>
</tbody>
</table>

Why student authored questions?

• A student contributing a new question would develop the question stem:

A student authored question
HUBS192, 2010
University of Otago

Why student authored questions?

• And a set of plausible alternatives
• Of course, the correct answer must be indicated
Why student authored questions?

- And a set of plausible alternatives
- Of course, the correct answer must be indicated

### Alternatives

<table>
<thead>
<tr>
<th>OPTION</th>
<th>ALTERNATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>The kidneys compensate by excreting H+, thereby increasing pH level</td>
</tr>
<tr>
<td>B</td>
<td>The lungs compensate by inhaling more CO2, thereby decreasing pH level</td>
</tr>
<tr>
<td>C</td>
<td>The lungs compensate by exhaling more CO2, thereby decreasing pH level</td>
</tr>
<tr>
<td>D</td>
<td>The kidneys compensate by synthesising more HCO3-, thereby decreasing pH level</td>
</tr>
<tr>
<td>E</td>
<td>The lungs compensate by exhaling more CO2, thereby decreasing pH level</td>
</tr>
</tbody>
</table>

### Explanation

Firstly, you need to understand that metabolic acidosis refers to excess H+ in kidneys (renal), leading to a decrease in pH (more acidic), hence the appropriate response would be compensation by the lungs. This involves exhaling more CO2, shifting the equation to the left, thereby reducing H+ levels, hence increasing pH (less acidic), hence C is right answer.

A) is referring to compensation for respiratory acidosis
B) is referring to compensation for metabolic alkalosis
C) if kidneys synthesis more HCO3-, it would decrease H+ level, but increase pH
D) if lungs exhale more CO2, H+ levels would decrease, so increase in pH (as in C)

Why student authored questions?

“Don’t really understand how much or how little you know about a concept until you try to devise a good, original question about it”

“The aspect I found truly useful was the creation of questions, which reinforced much of [my] understanding while also actively making me clarify and solidify my thought processes (especially the explanation parts)"

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### Student feedback

- Correct
  - A: 0%, close to 100%
  - B: 10%, 90%
  - C: 5%, 95%
  - D: 0%, 100%
  - E: 5%, close to 100%

- Agree with author
  - A: 100%, 0%
  - B: 10%, 90%
  - C: 5%, 95%
  - D: 0%, 100%
  - E: 5%, close to 100%

- Most popular answers
  - A: 0%, close to 100%
  - B: 10%, 90%
  - C: 5%, 95%
  - D: 0%, 100%
  - E: 5%, close to 100%

- Understand
  - A: 0%, close to 100%
  - B: 10%, 90%
  - C: 5%, 95%
  - D: 0%, 100%
  - E: 5%, close to 100%

- Feedback
  - Student feedback for Ques. 1:
    - Quality: 1
    - Difficulty: Easy
    - Comments: "This question was clear and well-explained."

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### Notes

- "Buffer regulation" involves calcium homeostasis, glucose homeostasis, insulin effects on "lipid metabolism", "protein degradation" (catabolism), and "cell regulation".
- "Second messengers" include "cyclic AMP" and "cyclic GMP".
Badges Points Leaderboards

PeerWise student generated content for enhanced engagement and learning

2) Hands-on session

Your turn: open a new window in your browser

Google: peerwise
Start typing: British Columbia......

Welcome to PeerWise
Ask | Share | Learn

Welcome to PeerWise
To log in, select your school / institution from the list below
The university of British Columbia (BC, Canada) Call in

Or go direct to the URL:
http://peerwise.cs.auckland.ac.nz/at/?ubc_ca
Registration

Step 1 – choose a name

Our recommendation: please use your first initial and your surname (e.g. rgalloway)

Step 2 – enter a password

Step 3 – enter the Course ID

Course ID: 7634
Step 4 – enter your Identifier

3-digit number between 100 and 500

That’s it!

Choose the “WCSE 2013” course

now log in...
1) Unanswered questions: “view”

2) Choose question

3) Select answer

1) Your questions: “view”

2) Create new question

3) Preview

4) “Make changes” or “Save question”

Research highlights

• Relationship between activity and performance
• The quality of student-authored questions
• Influencing student behaviour with rewards

PeerWise: student generated content for enhanced engagement and learning

3) Research highlights
Activity and learning

• Generally, students:
  – Participate beyond minimum requirements
  – Engage in community learning, correcting errors
  – Create problems, not exercises
  – Provide positive feedback

Table 2: Expected and actual numbers of questions authored and submitted for each module

<table>
<thead>
<tr>
<th>Module Title</th>
<th>Students</th>
<th>Questions Authored</th>
<th>Questions Submitted</th>
<th>Questions Answered</th>
<th>Submitted</th>
<th>Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry (Edinburgh)</td>
<td>155</td>
<td>2x155=310</td>
<td>877</td>
<td>10x155=1550</td>
<td>11466</td>
<td></td>
</tr>
<tr>
<td>Genes and Gene Action (Edinburgh)</td>
<td>215</td>
<td>3x215=645</td>
<td>282</td>
<td>10x215=2150</td>
<td>19807</td>
<td></td>
</tr>
<tr>
<td>Physics (Edinburgh)</td>
<td>172</td>
<td>3x172=516</td>
<td>742</td>
<td>5x172=860</td>
<td>7530</td>
<td></td>
</tr>
<tr>
<td>Physics (Edinburgh)</td>
<td>143</td>
<td>4x143=572</td>
<td>615</td>
<td>8x143=1144</td>
<td>8865</td>
<td></td>
</tr>
<tr>
<td>Chemistry (Nottingham)</td>
<td>163</td>
<td>1x163=163</td>
<td>340</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Correlation with end of course outcomes

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Number of students</th>
<th>Mean exam score</th>
<th>Standard error</th>
<th>p value</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA (N=192)</td>
<td>104</td>
<td>63.2</td>
<td>1.6</td>
<td>&lt;0.001</td>
<td>0.29</td>
</tr>
<tr>
<td>HPA</td>
<td>89</td>
<td>53.6</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPA</td>
<td>94</td>
<td>61.9</td>
<td>1.8</td>
<td>&gt;0.001</td>
<td>0.36</td>
</tr>
<tr>
<td>IB (N=182)</td>
<td>88</td>
<td>46.8</td>
<td>2.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* all scores expressed as percentages
* HPA / LPA denote higher / lower than median PeerWise activity
Question quality

Comprehensive categorisation of >50% of repository for two successive academic years

Principal measures to define a ‘high quality question’
- cognitive level of question
- explanation quality
- other binary criteria

Cognitive level of question

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Create (synthesise ideas)</td>
</tr>
<tr>
<td>5</td>
<td>Assess</td>
</tr>
<tr>
<td>4</td>
<td>Analyse (multi-step)</td>
</tr>
<tr>
<td>3</td>
<td>Apply (1-step calcs.)</td>
</tr>
<tr>
<td>2</td>
<td>Understand</td>
</tr>
<tr>
<td>1</td>
<td>Remember</td>
</tr>
</tbody>
</table>

Results: Question level Physics 1A / 1B 2011

- First semester N = 350
- Second semester N = 252

Do rewards work?

- Badge / achievement system
- Randomised controlled trial (n > 1000)
Implications

- Badges can have a measurable positive impact on some student actions
- No negative effects on activity or perceptions: a low-risk proposition

### Table

<table>
<thead>
<tr>
<th></th>
<th>“badges on” (n=516)</th>
<th>“badges off” (n=515)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals Questions</td>
<td>1311</td>
<td>1309</td>
<td></td>
</tr>
<tr>
<td>Totals Answers</td>
<td>52599</td>
<td>43086</td>
<td></td>
</tr>
<tr>
<td>Totals Days active</td>
<td>3617</td>
<td>3199</td>
<td></td>
</tr>
<tr>
<td>Averages Questions</td>
<td>2.54</td>
<td>2.54</td>
<td>+22%</td>
</tr>
<tr>
<td>Averages Answers</td>
<td>101.9</td>
<td>83.6</td>
<td>+13%</td>
</tr>
<tr>
<td>Averages Days active</td>
<td>7.01</td>
<td>6.21</td>
<td></td>
</tr>
<tr>
<td>Medians Questions</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Medians Answers</td>
<td>68</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Medians Days active</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Answers correct (%)</td>
<td>69.29%</td>
<td>69.26%</td>
<td></td>
</tr>
</tbody>
</table>

Distribution of answers per student differs significantly between groups: p < 0.001
Distribution of days of activity differs significantly between groups: p < 0.001
No difference between groups with respect to answer correctness

Please join us!

http://www.peerwise-community.org/

4) Q & A
Publications

“Student-generated content: using PeerWise to enhance engagement and outcomes in introductory physics courses”

“Student-generated content: Enhancing learning through sharing multiple-choice questions”

“Assessing the quality of a student-generated question repository”

“The Effect of Virtual Achievements on Student Engagement”