Incorporating Moodle-wiki and Moodle-wiki-digital badges into undergraduate courses at HKU: Impact on students’ collaborative learning, motivation, behavioral engagement and academic performance

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Background

• The pedagogical use of e-learning tools in undergraduate exercise and health science courses at HKU is not very common.

• Moodle has been adopted in many courses as a platform to upload / download lecture notes, make announcements, and submit and grade assignments.

• Fully integrating Moodle in undergraduate curricula could enrich the learning quality of students (Juniu, 2011).
Background - Wiki

• Moodle 3.0 supports interfaces with Web 2.0 technologies (e.g., wikis) and other external applications.

• Web 2.0 tools have been widely acknowledged as providing an ideal computer-supported collaborative learning environment that can help students shift from rote learning to active collaborative learning (Chu et al., 2012, 2017; Salaber, 2014; Su and Beaumont, 2010).

• Wiki platforms have been identified as potentially very useful in promoting cooperative learning among students, due to their information-sharing and straightforward collaborative features (Schaffert et al., 2006).
Wiki platforms combine reading and writing within a web browser/Moodle, allowing students to edit text and create or link to webpages easily, thus enabling them to readily construct and share knowledge and ideas.

Teachers can also provide feedback to the students on the same platform.

A wiki may be the optimum learning and teaching strategy/platform, as it matches sports science students’ preferences and can thus improve academic performance (Peters et al., 2008).
Background – Fong et al., 2017

• **Aim:** To investigate the effectiveness of incorporating wiki technology in an undergraduate biostatistics course for improving HKU students’ collaborative learning, approaches to learning, and course performance.

• **Methods:** During a three year longitudinal study, twenty-one and twenty-four undergraduate students were recruited by convenience sampling and assigned to a **wiki group** (2014-2015) and a **control group** (2013-2014 and 2015-2016), respectively.

Figure 1: Flow of study for three cohorts of Bachelor of Science in Exercise and Health students over three years.
Background – Fong et al., 2017

- **Methods:** The students in the wiki group attended face-to-face lectures and used a wiki (PBworks) weekly for online-group discussion, and the students in the control group had no access to the wiki and interacted face-to-face only.
Methods: The students’ collaborative learning, approaches to learning, and course performance were evaluated using the Group Process Questionnaire (GPQ), Revised Study Process Questionnaire (R-SPQ-2F) and course results, respectively, after testing.
Results: Multivariate analysis of variance results revealed that the R-SPQ-2F surface approach score, surface motive and strategy subscores were lower in the wiki group than in the control group (p < 0.05).

The GPQ individual accountability and equal opportunity scores (components of collaboration) were higher in the wiki group than in the control group (p < 0.001).
Background – Fong et al., 2017

• **Results:** Looking at the Wiki Questionnaire results, the subscale and composite scores we obtained were 31.5% to 37.7% lower than the norm. The wiki was used at a frequency of about 0.7 times per week per student.

<table>
<thead>
<tr>
<th>Table 2. Outcome variables for Wiki Questionnaire and Wiki activity log.</th>
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<tbody>
<tr>
<td>Wiki group (n = 21)</td>
</tr>
<tr>
<td>Wiki Questionnaire</td>
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<tr>
<td>Learning/pedagogy score</td>
</tr>
<tr>
<td>Motivation score</td>
</tr>
<tr>
<td>Group interaction score</td>
</tr>
<tr>
<td>Technology score</td>
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<tr>
<td>Composite score</td>
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<tr>
<td>Wiki activity log, n</td>
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</tbody>
</table>

Values are mean ± standard deviation unless specified otherwise.
• **Conclusions:** Using Wiki technology (PBworks) in conjunction with traditional face-to-face teaching in a biostatistics course for exercise and health science students can enhance students’ collaborative learning (individual accountability and equal opportunity as measured on the Group Process Questionnaire) and approaches to learning (less surface learning as measured on the Revised Study Process Questionnaire), but not course performance.

• **However, the wiki activity log (exposure to wiki) was lower than expected (0.7 times/week).**
Interview results showed that students needed to log in to both the Moodle and wiki platforms to revise the teaching materials and to perform the group project, which could be inconvenient.

Therefore, incorporating wiki within Moodle could be extremely useful in supplementing face-to-face teaching and learning in the health science courses.
Background – Digital badges

• Digital badges are tokens that appear as icons, and signify a student’s achievement (Christy and Fox, 2014).

• Digital badges provide positive reinforcement that can motivate students’ behavioral engagement (Skinner, 1953; Woolfolk, 1998) and stimulate self-efficacy (Bandura, 1982).

• Previous research has proven that digital badges have a positive effect on motivating university students to engage with difficult tasks and the quality of artifacts produced by the students are higher than controls (Hew et al., 2016).
Background

- Moodle 3.0 is a very powerful e-learning platform for university students.
- Its advanced functions include both wiki and digital badges.
Background

• We expected that...
  • Adopting a Moodle-wiki in exercise and health science courses could enhance students’ collaborative learning and academic performance.
  
• Incorporating Moodle-wiki-digital badges into our health science courses could further improve students’ motivation, behavioral engagement, and thus academic performance.
A pilot study - Aim and hypothesis

• To investigate and compare the effects of Moodle-wiki and Moodle-wiki-digital badges on students’ collaborative learning, motivation, behavioral engagement and academic performance in our BSc (Exercise and Health) courses.

• We anticipated that incorporating Moodle-wiki-digital badges into BSc (Exercise and Health) courses may further improve students’ collaborative learning, motivation, behavioral engagement and academic performance than incorporating Moodle-wiki alone.
A pilot study - Methods

• **Sixteen** BSc (Exercise and Health) students participated in the study in academic year 2017-2018.

• During the **first semester**, students participated in online group discussion and co-constructed knowledge on the Moodle-wiki platform.
A pilot study - Methods

- In the second semester, students participated in similar online group discussion on the Moodle-wiki platform + they were awarded gold, silver or bronze digital badges based on their performance online.

- All students attended face-to-face lectures and tutorials in both semesters.

<table>
<thead>
<tr>
<th>Image</th>
<th>Name</th>
<th>Description</th>
<th>Criteria</th>
<th>Issued to me</th>
</tr>
</thead>
</table>
| ![Bronze Medal](image1.png) | A bronze medal | Students who opt for the easiest questions will be given a bronze medal. | Users are awarded this badge when they complete the following requirement:  
  • This badge has to be awarded by the users with ANY of the following roles:  
    - Manager  
    - Teacher |              |
| ![Silver Medal](image2.png) | A Silver Medal | Students who opt for medium-difficulty questions will be given a silver medal. | Users are awarded this badge when they complete the following requirement:  
  • This badge has to be awarded by the users with ANY of the following roles:  
    - Manager  
    - Teacher |              |
| ![Gold Medal](image3.png) | A Gold Medal | Students who opt for hard questions will be given a gold medal. | Users are awarded this badge when they complete the following requirement:  
  • This badge has to be awarded by the users with ANY of the following roles:  
    - Manager  
    - Teacher |              |
A pilot study - Methods

• Data was collected at the end of each semester.

• Outcome measures:
  • Collaborative learning measured with the Group Process Questionnaire (GPQ)
  • Motivation and behavioral engagement as reflected by the Moodle activity log
  • Overall course performance

• Paired t test (two-tailed alpha = 0.05).
A pilot study - Methods - Group Process Questionnaire

Part A: Group Process Questionnaire

This questionnaire measures the quality of group work and collaboration among members of a group. It is based on the conceptualization of Johnson, Johnson, and Holubec (1993) as well as Kagan (1994).

Looking back on the working process as a group, how much would you agree to the following experiences?

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Slightly Disagree</th>
<th>Somewhat Agree</th>
<th>Strongly Agree</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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</table>

Positive Interdependence

1. The group works together to complete the task.
2. The group provides support and help.
3. The group communicates effectively.
4. Each member feels a sense of belonging.

Individual Accountability

1. Each group member feels a sense of responsibility.
2. Each group member contributes to the group.
3. Each group member is clear about their role.
4. Some members rely on others and do not contribute to the group.

Some group members do not do their own work and rely on others to do their work.

Equal Opportunity

1. The distribution of work in our group is fair.
2. Every group member has an equal chance to participate.
3. Some group members do too much, others too little.

Some group members do too much, others too little.

Social Skills

1. We help each other and get along well in the group.
2. We take care of each other and hope to improve together.
3. There is little respect within the group.
4. We are often unable to resolve disagreements.
Part B. Collective Effiency and Self Efficiency

This questionnaire measures the extent to which students believe that their group can do the work assigned to them (collective efficiency) as well as their belief that they have personal agency (self-efficiency).

The following questions are in the context of the group project and ask you to rate your experience and perceptions.

Part C. Team Performance Scale

In this section we would like to ask for your evaluation of your own group performance. Please circle the appropriate number below.

1. Rate the overall performance of your group-mates:

   1 = Low performance
   2 = Very poor
   3 = Poor
   4 = Fair
   5 = Good
   6 = Very good
   7 = High performance

2. In my estimation, members of my group got their work done very effectively:

   1 = Strongly disagree
   2 = Strongly agree

3. My overall evaluation of group performance:

   1 = Very poor
   2 = Poor
   3 = Fair
   4 = Good
   5 = Very good
   6 = Excellent

Part D. Goals Attitude / Hope Scale

This scale was obtained from Snyder, Hays, and Pyszczynski (1987) and measures students' goal-oriented attitudes. Students who score high on this scale are more likely to set and pursue goals.

Please rate the extent to which you agree or disagree with the following statements:

1. I think I am doing pretty well.
2. I can think of many ways to get the things in life that are most important to me.
3. I am doing just as well as other kids my age.
4. When I have a problem, I can come up with lots of ways to solve it.
5. I think the things I have done in the past will help me in the future.
6. Even when others want to quit, I know that I can find ways to solve the problem.
A pilot study - Results

• Students scored higher in examinations and assignments after participating in the Moodle-wiki-digital badges activities than participating in Moodle-wiki activities alone (p = 0.004).

• However, the GPQ positive independence (p = 0.037), social skills (p = 0.036) and composite scores (p = 0.022) were higher after participating in the Moodle-wiki activities than participating in Moodle-wiki-digital badges activities.

• No significant changes were observed in Moodle activity log, GPQ individual accountability and equal opportunity scores throughout the study period (p > 0.05).
A pilot study - Conclusions

• Moodle-wiki-digital badges may be used to improve academic performance while Moodle-wiki may be used to improve collaborative learning of BSc (Exercise and Health) students.

• Both Moodle-wiki-digital badges and Moodle-wiki may not be useful in enhancing motivation and behavioral engagement in these students.
Future research direction

• HKU undergraduate exercise and health science students will be allocated to either a Moodle-wiki group or a Moodle-wiki-digital badges group.

• The Moodle-wiki group will participate in weekly online group discussions and co-construct knowledge. The Moodle-wiki-digital badges group will answer similar essay questions on the Moodle wiki forum weekly and will be awarded gold, silver, or bronze badges based on their performance.
Future research direction

- The outcome measures will be collaborative learning measured with the Group Process Questionnaire, behavioral engagement and motivation as reflected by the Moodle activity log, and students’ perceptions of these e-learning tools and the overall course performance.....
Key references


Acknowledgements

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Thank You!