An Interactive Learning System for Improving Student’s Learning Experience in Mass Lectures

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As indicated, several key terms... inform the below outline:

A. Background
   – Mass lectures and interactive learning system
   – Measurement of learning experience

B. Methods

C. Results

D. Discussion

E. Conclusion
A. Background: Mass lectures and interactive learning system

A. Background: Mass lectures and interactive learning system

  
  — Advantages:
    • **Effective** delivery of the content to large no. of students (usually >100)
    • **Consistent** in delivery standard content
  
  — Shortcomings:
    • Lack of teacher-student interaction
    • Difficult of pacing students’ learning
    • Difficult to assess students’ knowledge acquisition instantly
    • Difficult to assess students’ engagement & participation
A. Background: Mass lectures and interactive learning system

- Shortcomings:
  - Lack of teacher-student interaction
  - Difficult of pacing students’ learning
  - Difficult to assess students’ knowledge acquisition instantly
  - Difficult to assess students’ engagement & participation

- Some solutions: in-class polling, exercises or quizzes for monitoring knowledge acquisition...

- But...
  - instant feedback is always infeasible...
  - engagement is difficult to be assessed
A. Background: Mass lectures and interactive learning system

• Technological based instant response system – Student Response System (SRS)
  – An instructional technology that offers great promise for allowing individualized formative feedback in large classrooms (Hoffman & Goodwin 2006).
  – Increase student feedback (Jones et. al. 2012)
  – Improve student engagement in a large classroom setting (Jones et. al. 2012)
  – Increase teacher-students interaction (Blasco-Arcas et. al. 2013)
A. Background: Mass lectures and interactive learning system

• SRS components:
  – Server: data processing
  – Receiver device: connecting to the server
  – Software
  – Handheld remote: for every students to input their choices and view the results (optional)

• International & local experience on SRS
  – Favorable result on various areas: engagement, active learning, knowledge, deeper learning, motivation ...
  – Some examples as below:
A. Learning experience: Knowledge

• Multiple-choice questions: Acquisition & retention of knowledge (Ausubel, 2000)
  – Truly assess the knowledge
  – Can differentiate the students of different abilities in correct manner (Gajjar, 2014)

• Bloom’s taxonomy
  – Understanding
  – Remembering

Bloom’s Taxonomy (Revised)
A. Learning experience: Engagement

• Engagement
  – Predicting:
    • Academic performance (Handelsman, Briggs, Sullivan, & Towler, 2005; Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Seckman, 2014; Skinner, Wellborn, & Connell, 1990)
    • School completion & motivation (Appleton, Christenson, & Furlong, 2008; Horstmanshof & Zimitat, 2007; Salamonson, Andrew, & Everett, 2009)
  – As important factor that leads to educational reform and evaluation (Coates, 2010; Kuh, 2003)
  – 3-dimensional construct of engagement (Fredricks & Paris, 2004)
    • Including: Behavioral, emotional & cognitive dimensions
    • Widely accepted model
B. Methods

• Aim: To evaluate students’ knowledge acquisition and engagement with the practice of SRS.
• Design: Descriptive study with repeated measures for 3 times
• Participants: A convenience sampling of ~200 yr. 1 students in Higher Diploma in Nursing studies in 2015-16 and 2016-17.
B. Methods: Questionnaires

• 3 knowledge-based questions (Pre-test & Post-test)
  – To access students’ knowledge acquisition during the lecture
    • 3 questions on reproductive system
  – To access students’ knowledge acquisition 1-week after the lecture
    • 3 questions on immunity & pharmacology.
  – 1 point for each correct answer (0-3 point(s))

• 4-item Generic Student Engagement Scale (GSES)
  – To evaluate students’ engagement by the use of SRS
  – Rated on 5-point Likert scale (1 to 5 point, from very disagree to very agree)
  – Brief, reliable and valid (CFA: $\chi^2$/df= 1.56, CFI=0.99, TLI=0.99, RMSEA=0.053) (Chong et. la., 2016)
B. Methods: Data collection

Convenience sampling:
233 Yr.1 nursing students in lecture

At the beginning of the Lecture:
Pre-test (3 Knowledge-based questions)

Lecturing

At the end of the Lecture:
Post-test (3 Knowledge-based questions + 4-item GSES)

One-week later:
Re-test (3 knowledge-based questions)

2016 students

2015 students

12
C. Results

• Knowledge acquisition:
  – Student performance:
    • 2015 reproductive system (N = 233)
      – Pre-test: Mean score = 1.81 (SD 0.87)
      – Post-test: Mean score = 2.53 (SD 0.63)
        » Paired t-test: t=-11.43, p < 0.001
    • 2016 Immunity (N = 232)
      – Test: Mean score = 1.67 (SD 0.86)
      – 1-week re-test: Mean score = 1.94 (SD 0.90)
        » Paired t-test: t=-4.08, p < 0.001
    • 2016 Pharmacology (N =227)
      – Test: Mean score = 0.93 (SD 0.82)
      – 1-week re-test: Mean score = 1.84 (SD 1.01)
        » Paired t-test: t=-10.88, p < 0.001
C. Results- sample from 2015 students
C. Results- sample from 2016 students
C. Results

- Student engagement:

<table>
<thead>
<tr>
<th>Item</th>
<th>Dimensions (1=very agree, 5=very dis.)</th>
<th>2015 students</th>
<th>2016 students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>Behavioral engagement</td>
<td>2.77 (0.78)</td>
<td>89.01%</td>
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<td></td>
<td></td>
<td></td>
<td>2.11 (1.05)</td>
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<tr>
<td>Q2</td>
<td>Emotional engagement</td>
<td>2.68 (0.81)</td>
<td>89.74%</td>
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<td></td>
<td></td>
<td></td>
<td>2.17 (1.08)</td>
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<tr>
<td>Q3</td>
<td>Cognitive engagement</td>
<td>2.58 (0.74)</td>
<td>93.41%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>1.99 (1.01)</td>
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<tr>
<td>Q4</td>
<td>Overall engagement</td>
<td>2.61 (0.77)</td>
<td>91.57%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>2.10 (1.06)</td>
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</tbody>
</table>
D. Discussion

• Pedagogical benefits:
  – SRS originated as simple as the handheld whiteboards-facilitating the teachers to adjust their teaching plans accordingly
  – SRS added the features of instantly display the pooled results-initiating students’ discussion
  – SRS makes something possible in class
    • E.g., pre-instruction assessment, formative assessments, comprehension checks ...

• Our findings indicated that:
  – SRS as effective way to assess students’ knowledge and better understanding the retention of those acquired knowledge.
  – Teacher-students interaction was improved with the use of SRS.
  – Students’ engagement favored with the adoption of SRS in lecture.
D. Discussion

• Future studies:
  – Use control group to investigate whether SRS can effectively enhance students’ knowledge acquisition.
  – Assess the correlation between student engagement and knowledge acquisition.
  – Conduct similar studies in other lectures on various topics to further improve data reliability.
  – Expand the use of SRS to nursing students in various year of studies to explore whether similar results can be achieved in foundation courses versus high-level courses.
E. Conclusion

- SRS has successfully established in the mass lectures.
- SRS can assess the students’ knowledge & instantly display the pooled results
- Students’ engagement favored with the adoption of SRS in lecture
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References