Collaborative Testing: An Opportunity for Student-centered Feedback & Peer Learning

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Presentation Objectives

I. Describe the SoTL Model as a process for conducting educational research in anatomy

II. Demonstrate the implementation of the SoTL model through a case study: Collaborative Assessment
1. Scholarship of Teaching and Learning

2. Investigate teaching practices by engaging deeply into an evidence-based analysis of how students learn effectively
3. Characteristics of all forms of Scholarship:
   1. Clear goals & objectives
   2. Adequate preparation
   3. Appropriate methods
   4. Significant results
   5. Dissemination of results
   6. Critique & evaluation
4. SoTL as a bridge between research & teaching

a) The endeavors of the Professoriate:
Three levels of the teaching endeavor:
1. **Basic Teaching** – routine teaching & testing of students
   
   a) often stagnant and repetitive
   
   b) “Faculty teach the way they were taught”
2. **Scholarly Teaching** – a subset of teachers who continually **improve** their **own** teaching by being informed:

a) Pedagogical knowledge → Ed Literature

b) Feedback

So, when theory & practice come together, teaching becomes.......... **scholarly**!
3. Scholarship of Teaching & Learning (SoTL) –

a) a subset of scholarly teachers who engage in educational research

b) Becomes a bridge
The SoTL Process Model

1. Innovation Phase
   - To address a teaching problem or issue
   - Grounded in the educational literature
   - Implementation

2. Evaluation Phase
   - Study design
   - Statistical Analysis

3. Dissemination Phase
   - Key product to peer-review
   - To impact teaching beyond one’s own classroom
The Process: The Scientific-Method Approach:

1. Observation
2. Question
3. Hypothesis
4. Study Design & Experimentation
5. Analysis & Conclusion
II. Case Study: Collaborative Testing

1. Observation
2. Question
3. Hypothesis
4. Study Design & Experimentation
5. Analysis & Conclusion
1. “What is the most common approach a student uses to learn human anatomy?”

Memorizing – passive, lowest level of processing
- study in isolation
2. Assessment:
Lecture tests are *summative* - traditionally measure how much students have learned
2. Research Question:

Note: Question must be well framed:

- Examine the pertinent literature in education
- Sharpen & refine broad, vague questions into specific, well-defined, answerable questions
a) Memorization:

How can we promote deeper, long-lasting learning?

Terrell, 2006

[Diagram of memory system with labels: Long-Term Memory, Sensory Memory, Working Memory, Attention, Encoding, Retrieval, Memory Loss (99% discarded), Memory Loss (non-relevant Information), Output (test answers), Rehearsal.]
b) Isolation:

How can we promote interaction & positive collaborative relationships among students?

  - #15 = work in interdisciplinary teams

- **Institute of Medicine (2001)** – developed a 5-step plan for creating a strong health-care system → must collaborate in order to care for the patient

→ Collaborative working relationships among health professionals are vital in ensuring quality patient care.
Level of Educational Interactivity between the student and:

a) Professor
b) Course content
c) Peers
- **Usability of Collaborative Learning Practices**
  - Must actively engage learners around **central issues**
  - Improves student knowledge, enhances critical thinking, & promotes teamwork skills

- **Usage of cooperative learning?**
  - a) frequently used in labs
  - b) limited in large lectures
  - c) rare in assessment practices
c) Assessment:

How can we transform a summative evaluative measure of student performance into a formative learning tool?

- The most powerful single modification that enhances achievement is feedback (Hattie, 2009):
  1. Feedback should be “corrective” in nature.
  2. Feedback should be timely.
  3. Feedback should be specific.
  4. Students can effectively provide some of their own feedback.
Refined Research Question:

- Can student learning be improved by adding a collaborative feedback component to a traditional lecture exam in an anatomy course?
By discussing exam questions in small groups, students will:

a) learn from each other, transforming the exam into a formative learning tool.
b) provide immediate feedback on questions they missed and the reasons for their errors.
c) perform higher on comprehensive final exam.
d) Increase interactivity & decrease isolation
4. Experimentation

1. **Course:** Undergraduate Human Anatomy; large lecture hall; 400 students / semester

2. **Examinations:** 5 objective-type lecture exams
   a) Exam 1 = Individual effort (control)
   b) Exam 2 = Individual + Group (combined) effort
   c) Exam 3 = Individual + Group (combined) effort
   d) Exam 4 = Group effort
   e) Final exam = Individual effort (control)

3. **Combined format:** 80 question were reduced to 40 questions to be taken twice

4. **Duration of study:** 4 semesters = 1,600 students
5. Data analysis: Quantitative

Compared scores between:

a) individual and group scores on the same exam

b) final exams for semesters using and not using collaborative testing

c) sections of the final exam corresponding to content tested & not tested collaboratively

d) correlation analyses between similar questions missed on lecture exams and final exam
6. Qualitative Data Analysis: Student-completed questionnaires containing to measure perceptions of collaboration:
a) Likert scale
b) open-ended questions
A. Empirical Analyses

1. Combined format - Individual vs. Group scores:
   a) Mean individual test score = 76%
   b) Mean group test score = 95% (P < 0.001)

2. Final exam - Long-term knowledge retention:
   a) Mean final exam scores were 4.6% higher during semesters that used collaborative assessment (P < 0.01).
   b) Differential sections on the final corresponding to collaborative assessment were 7.1% higher than sections using non-collaborative assessment (P < 0.01).
   c) Correlation between similar missed questions on unit exams and final is significantly lower (r = 0.58) when collaborative lecture exams are used; without collaborative assessment (r = 0.95)
B. Qualitative Analyses

1. “Discussing test questions with my group members increased my understanding of anatomy”
   
   80% = SA; 15% = A

2. “I studied more for the combined-format tests than if the tests were individual effort only”
   
   39% = SA; 28% = A

3. “Group testing increased my satisfaction of the course”
   
   59% = SA; 29% = A

4. “Group testing increased my testing confidence”
   
   38% = SA; 45% = A
5. “How effectively did your group collaborate?”

<table>
<thead>
<tr>
<th>Rating</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Very well</td>
<td>55%</td>
</tr>
<tr>
<td>Well</td>
<td>36%</td>
</tr>
<tr>
<td>Adequate</td>
<td>7%</td>
</tr>
<tr>
<td>Poorly</td>
<td>1%</td>
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6. “My preferred assessment technique was:”

<table>
<thead>
<tr>
<th>Technique</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Group tests</td>
<td>31%</td>
</tr>
<tr>
<td>Individual tests</td>
<td>4%</td>
</tr>
<tr>
<td>Combined</td>
<td>54%</td>
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7. “Group testing increased the likelihood that I would study in a group, rather than by myself”

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Very likely</td>
<td>70%</td>
</tr>
<tr>
<td>Likely</td>
<td>18%</td>
</tr>
<tr>
<td>No effect</td>
<td>8%</td>
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6. Discussion

1. Improved long-term knowledge retention – higher final exam scores suggest that students:
   a) collaboratively engaged in reasoning and problem solving skills to defend their answers among their peers →
   b) Increased the depth cognitive processing & learning

2. The combined format:
   a) ensured individual preparatory accountability
   b) increased motivation & sense of community

3. Increased the formation of study groups → inc. metacognitive skills of self-monitoring & regulating

4. Immediate feedback - increased:
   a) student satisfaction
   b) learning & reduced concept misconceptions
1. SoTL provides a vehicle by which to conduct evidence-based, hypothesis-drive research

2. Student Interactivity & feedback are the most powerful modifications that enhances achievement

3. Collaborative Testing - assessment approach that applies cooperative learning in order to provide peer-led feedback:
   a) Individual exams provided accountability
   b) students learn from peers & the exam
   c) Promotes growth & development of the learner both cognitively & collaboration skills
   d) Reflects the true collaborative nature