Session T 236
Team Based Learning (TBL) in a Gross Anatomy Laboratory

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Lecture Objectives

• **Review the literature** for TBL and its use in medical education and anatomy courses.

• **Describe our protocol** for implementing TBL in the physician assistant curriculum.

• Describe the **specific assessment tools** used to analyze the impact of TBL on student outcome measures.

• Discuss **benefits, challenges and limitations** of utilizing TBL.
Cadaveric Dissection: Pedagogy in Gross Anatomy Lab

• Gold standard

• Widespread challenges
  • More students - decreased availability of cadavers
  • New curricula - decreased contact time
  • Availability of suitably trained instructional personnel
  • Costs associated with dissection

• Alternatives (Sugand et al 2010)
  • Prosection
  • Digital and interactive multimedia resources
  • Medical imaging
  • Models
A New Approach

Our Challenges in the Gross Anatomy Lab:
1. Availability of cadavers
2. Space for cadaveric dissection
3. Fiscal resources

**Purpose:** Choose a tool that supports the mission of PA education

**Desired Educational Outcomes:**
- Promote active learning
- Increase depth of learning
- Improve academic performance
- Facilitate teamwork
Team-based Learning (TBL)

- Student-centered, active learning pedagogy
- Promote application of knowledge (Michaelsen et al 2008)
- Develop collaborative, self-directed learners (Perksy and Pollack 2011)
- Challenge students’ curiosity to promote lifelong learning (Parmelee 2012)
- Promotes problem-solving skills, communication, and teamwork (Michaelsen et al 2008; Nieder et al 2005)

**Significance:**
- Well-supported in medical and pharmacy education literature (Michaelsen et al 2008; Nieder et al 2005)
- Research needed in Physician Assistant education
- Very little research in literature about replacement of cadaveric time with TBL (Huitt et al 2014)
1. Groups - must be properly formed and managed

2. Accountability - must hold students accountable for individual and group work

3. Feedback - students must receive frequently

4. Assignment design – must promote learning and team development

Formulating Groups

• 4-5 members / group

• Select to maximize group dynamics:
  o Problem solving
  o Task oriented nature
  o Interpersonal skills
  o Problem identification

• Do not change during course
<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation (pre-class)</td>
<td>Readiness Assurance (in-class)</td>
<td>Application (in-class)</td>
</tr>
<tr>
<td><strong>Step 1:</strong> Individual study of assigned objectives</td>
<td><strong>Step 2:</strong> Individual Readiness Assurance Test (IRAT)</td>
<td><strong>Step 5:</strong> Application activity with faculty facilitation</td>
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<td><strong>Step 3:</strong> Group Readiness Assurance Test (GRAT)</td>
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<td><strong>Step 4:</strong> Instructor feedback and clarification</td>
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</table>
1. Must be **Significant** to the students

2. Every team does **Same** assignment at same time

3. Every question requires team to choose **Specific** answer from list of plausible answers

4. Teams reveal their choices **Simultaneously**.

• UAMS IRB approved study
• 87 PA students enrolled in the UAMS Physician Assistant Studies program participated
• A mixed between-within design, divided into two groups:

<table>
<thead>
<tr>
<th></th>
<th>COMPARISON</th>
<th>EXPERIMENTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td># STUDENTS</td>
<td>54</td>
<td>33</td>
</tr>
<tr>
<td>SETTING</td>
<td>TRADITIONAL (Cadaveric Prosection)</td>
<td>HYBRID (Prosection and TBL)</td>
</tr>
<tr>
<td>TERM</td>
<td>Summer; 2013 or 2014</td>
<td>Summer 2015</td>
</tr>
<tr>
<td>LAB HOURS</td>
<td>45</td>
<td>30</td>
</tr>
<tr>
<td>TBL HOURS</td>
<td>0</td>
<td>15</td>
</tr>
</tbody>
</table>
1. Learning objectives distributed at least 1 week prior
2. Traditional lectures: 4 hours / week
3. Prosection lab: 2 hours / week
4. TBL: 1-2 hours / week
5. TBL protocol:

<table>
<thead>
<tr>
<th>90 Minutes</th>
<th>12 minutes</th>
<th>IRAT</th>
<th>Individual, 10 m/c Qs, paper</th>
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</thead>
<tbody>
<tr>
<td>25 minutes</td>
<td>GRAT</td>
<td>Group, Same quiz, IF-AT Cards</td>
<td></td>
</tr>
<tr>
<td>~55 minutes</td>
<td>Case Study</td>
<td>Group, response cards</td>
<td></td>
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</tbody>
</table>
TBL Pre-class Assignment
1. Read Grant’s Dissector
   a) pp. 22-24 (14th ed.)
   b) pp. 24-26 (15th ed.)
2. Review Gilroy’s Atlas Figures 24.30B

TBL Pre-class Learning Objectives
1. Describe the anatomy, innervation, blood supply and function of:
   a) Deltoid
   b) Supraspinatus
   c) Infraspinatus
   d) Teres minor and major
   e) Subscapularis
2. Identify the boundaries and contents of the quadrangular space and triangular space.
3. Describe the anatomy of the superior transverse scapular ligament.
4. Describe the course and innervations of the major nerves of the scapular region:
   a) Suprascapular nerve
   b) Axillary nerve
5. Describe the course and distribution of the major arteries of the superficial back:
   a) Suprascapular artery
   b) Posterior circumflex humeral artery
6. Identify the four muscles which comprise the rotator cuff.

IRAT and GRAT

- 10 MC questions stemming directly from learning objectives
  - Most level 1, factual
  - 1-2 level 2, clinical-type

- Immediate Feedback Assessment Technique (IF-AT) cards
Case Example

- Rich is a 62 yo man that presents to his PCP with complaints of shoulder pain with a gradual onset of symptoms over the past 2 years. He is a nurse who works on the critical care unit. His responsibilities include, among many other things, frequent patient transfers, scooting patients in their beds, making beds, and bending over patients in their beds while providing care. On his days off, he helps load trucks full of medical supplies for mission work in foreign countries. Upon examination, he shows a forward shoulder posturing and mild thoracic kyphosis. When asked to raise his left arm, he leans his trunk to the left as he raises his arm up ~15° then stands upright and is able to abduct his arm ~70° before he complains of increased pain. With palpation, the patient has tenderness on the greater tubercle of the humerus, directly distal to the tip of the acromion.

1. Which muscle has MOST likely been injured or torn?
   A. Supraspinatus
   B. Infraspinatus
   C. Teres minor
   D. Teres major
   E. Subscapularis

Assessment Measures

- Academic Performance
  - IRAT/GRAT scores
  - Unit exam scores
    - Written
    - Practical
  - Distribution of course averages

- Demographics
  - Gender
  - Incoming GPA (cumulative & science)
  - GRE
  - Undergraduate major

- Retention Data
  - Pretest
  - Post-test

- Student Perceptions of TBL and Teamwork
  - Team Based Learning Survey
  - Team Performance Survey

- Student Feedback
  - Student course evaluations
  - Focus group interviews

- Team Observation Rubric
Team Based Learning Survey

- 5 point Likert scale
- Administered to comparison group after gross anatomy course completed
  - either 1 or 2 years post
- Administered to experimental group before and after course completed
- Goal to assess students’ perceptions of course preparedness, critical thinking, teamwork and collaboration

(Modified from Vasaan et al)
<table>
<thead>
<tr>
<th>TBL Survey Question</th>
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</thead>
<tbody>
<tr>
<td>1. TBL will help me prepare for course examinations.</td>
</tr>
<tr>
<td>2. TBL will help me increase my understanding of the course materials.</td>
</tr>
<tr>
<td>3. TBL will be helpful in developing my critical thinking skills.</td>
</tr>
<tr>
<td>4. TBL will be helpful in developing my clinical thinking skills.</td>
</tr>
<tr>
<td>5. I have a positive attitude about working with my peers.</td>
</tr>
<tr>
<td>6. The ability to collaborate with my peers is necessary if I am to be a successful student.</td>
</tr>
<tr>
<td>7. Solving problems in a group is an effective way to practice what I have learned.</td>
</tr>
<tr>
<td>8. Working well with my peers will make me a better physician assistant.</td>
</tr>
</tbody>
</table>
Team Based Learning Survey

<table>
<thead>
<tr>
<th>TBL Survey Question Number</th>
<th>Scale Response (average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pre-TBL</td>
</tr>
<tr>
<td>2</td>
<td>Pre-TBL</td>
</tr>
<tr>
<td>3</td>
<td>Pre-TBL</td>
</tr>
<tr>
<td>4</td>
<td>Pre-TBL</td>
</tr>
<tr>
<td>5</td>
<td>Pre-TBL</td>
</tr>
<tr>
<td>6</td>
<td>Pre-TBL</td>
</tr>
<tr>
<td>7</td>
<td>Pre-TBL</td>
</tr>
<tr>
<td>8</td>
<td>Pre-TBL</td>
</tr>
</tbody>
</table>

- **Pre-TBL**
- **Post-TBL**
- **Control, 1 yr post**
- **Control, 2yr post**
Team Performance Survey

DESIGN
• 18 questions
• 6 point Likert scale
• Administered to experimental group midterm and end of course
• To assess quality of team interactions
• Ratings summed for a possible total of 108 points

RESULTS
• At both time points, students rated team interactions as being good
  • 98.87 midterm
  • 100.79 final
• Although no difference between two time points, positive rating at midterm and final indicates teams were well designed and highly functional
Team Observation Rubric

• Objective assessment of teamwork interactions during GRAT and application phases of TBL

• Individual students assessed on frequency of verbal contributions

• Teams assessed for conflict management, communication and leadership
# Team Observation Rubric

## GRAT Observation: Conflict Management

<table>
<thead>
<tr>
<th>Question</th>
<th>Never/No</th>
<th>&lt; ½ time</th>
<th>½ time</th>
<th>&gt; ½ time</th>
<th>Always/Yes</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do all members consent to an answer/decision for the team as a whole?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Does each person affirm a rationale when 2 or more answers are given?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Is there positive, non-verbal communication?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>List all observed non-verbal cues:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Application Observation: Communication/Conflict Management

<table>
<thead>
<tr>
<th>Question</th>
<th>Never/No</th>
<th>&lt; ½ time</th>
<th>½ time</th>
<th>&gt; ½ time</th>
<th>Always/Yes</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do all members of the group speak at least once?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Does the team seek to verify information if deemed doubtful or questionable?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<td></td>
<td></td>
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## Leadership

<table>
<thead>
<tr>
<th>Question</th>
<th>Never/No</th>
<th>&lt; ½ time</th>
<th>½ time</th>
<th>&gt; ½ time</th>
<th>Always/Yes</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the spokesperson prepared to answer the application questions?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Does at least one student ensure that all members consent to an answer?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
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Benefits, Challenges and Limitations

**BENEFITS**

- Specifically helps with low performers
- Introduces not content specific, professional skills, early
  - Critical thinking
  - Clinical thinking
- Process not resource intensive
  - One faculty facilitate many groups
- Individual students participate even in large class size

**CHALLENGES / LIMITATIONS**

- Logistics of implementing
- Analysis / assessment process
  - Measuring at right time
  - Designing comparison
Acknowledgements

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