TEAM-BASED LEARNING (TBL) IN MEDICAL EDUCATION

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Overview

• The TBL Basics

• IRAT/GRAT

• Application Exercise

• TBL Research
• Traditional Lecture
  • Teacher-centered
  • Passive transfer of information
  • Minimal chance for application until exam

• Team-based Learning
  • Student-centered
  • Active transfer of information
  • 75% of class time spent on application
Team-based Learning (TBL)

• Instructional strategy utilizing:
  1. Pre-class self-learning
  2. In-class team-focused active learning

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
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<td>Individual Preparation (pre-class)</td>
<td>Readiness Assurance (in-class)</td>
<td>Application (in-class)</td>
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Step 1: Individual study of assigned objectives

Step 2: Individual readiness assurance test (IRAT)

Step 3: Group readiness assurance test (GRAT)

Step 4: Faculty feedback and clarification (mini-lecture)

Step 5: Group case studies w/ faculty facilitation
Benefits of TBL over Didactic

- Improved learner engagement during class
  - No longer are students passive participants

- Better content retention through active learner engagement
  - Research shows higher cognitive engagement improves retention

- Development of problem-solving and critical thinking skills
  - A goal we all want

- Team-building
  - Long-term use of same group trains learners how to function in teams

- Development of communication skills
  - Verbal defense/explanation of answers forces learners to articulate their thoughts within groups and to entire class
Four Essential Elements of TBL

1. **Groups** - must be properly formed and managed

2. **Accountability** - must hold learners accountable for their individual and group work

3. **Feedback** – learners must receive feedback often

4. **Application design** – must promote learning and team development
Designing a TBL Module

• Backwards Design

1. Identify learning objectives
   • What are major learning goals?
   • Should be desired actions learners can do after TBL completion.
   • Must guide independent pre-class learning! Not too specific…not too broad.

2. Write application exercise
   • Hardest part…
   • Questions should force choice between multiple feasible/defensible answers
   • Doesn’t have to have 1 absolutely correct answer – goal is to spark deep levels of thinking

3. Construct RAT
   • Vary levels of difficulty (recall, higher order thinking)
   • MUST correspond to learning objectives!
   • Should have 1 correct answer

4. Choose appropriate pre-class assignment
   • Should cover all objectives
   • Text reading, journal articles, pre-recorded lectures, etc.
Team-based Learning (TBL)

Phase 1
Individual Preparation (pre-class)

Step 1: Individual study of assigned objectives

Phase 2
Readiness Assurance (in-class)

Step 2: Individual readiness assurance test (IRAT)
Step 3: Group readiness assurance test (GRAT)
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Phase 3
Application (in-class)

Step 5: Group case studies w/ faculty facilitation
Team-based Learning (TBL)

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IRAT and GRAT
Four S’s of the Application Exercise

- **Significant Problem**
  - Should be something relevant to peek learner interest

- **Same Problem**
  - All teams work on same case study so that they can engage one another

- **Specific Choice**
  - Multiple choice questions allow more efficient reporting and discussion

- **Simultaneous Reporting**
  - Prevents certain answers from becoming “contagious”
Team-based Learning (TBL)

**Phase 1**
Individual Preparation (pre-class)

- Step 1: Individual study of assigned objectives

**Phase 2**
Readiness Assurance (in-class)

- Step 2: Individual readiness assurance test (IRAT)
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**Phase 3**
Application (in-class)

- Step 5: Group case studies w/ faculty facilitation
Application Exercise #1

- See handout
Application Exercise #2

• See handout …
Application Exercise #3

• Which is the most appropriate advance assignment for this module, given the two learning objectives and the 5-question application exercise in the handout?

A.  The abdominal anatomy chapter in Clinically Oriented Anatomy, 7th ed, pp. 181-325
B.  The liver section of Clinically Oriented Anatomy, 7th ed, pp 268-277
C.  A review article focused on diagnosis of liver injuries by CT radiography
D.  A live lecture on clinical anatomy of the abdomen, delivered by an experienced anatomist/educator
E.  A recorded lecture on clinical anatomy of the abdomen, delivered by an experienced anatomist/educator
Research on TBL in Medical Education
Comparison of DPT Gross Anatomy Performance

Comparison of Psychiatry and Ob/Gyn Clerkship Performance

**Psychiatry**
(began TBL in Class of 2004)

- 2003: 35th percentile
- 2004: 49th percentile
- 2005: 50th percentile
- 2006: 60th percentile

**Ob/Gyn**
(began TBL in Class of 2006)

- 2003: 42nd percentile
- 2004: 42nd percentile
- 2005: 46th percentile
- 2006: 52nd percentile
- 2007: 58th percentile
- 2008: 72nd percentile

Levine et al. Teaching and Learning in Medicine 2004;16:270-275, Levine 2010; personal communication
### Performance of Second-Year Medical Students in the Highest Academic Quartile (n = 45) Versus Those in the Lowest Academic Quartile (n = 45) on Pathology-Based Examination Questions (PBQs), Boonshoft School of Medicine, 2003–2005*

<table>
<thead>
<tr>
<th>Academic quartile and group of PBQ</th>
<th>Score on all exams</th>
<th>Difference in scores †</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Mean % (SD)</td>
<td>Range %</td>
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<tr>
<td>Highest quartile</td>
<td></td>
<td></td>
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<tr>
<td>TR</td>
<td>89.3 (4.0)</td>
<td>80.6 to 96.1</td>
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<tr>
<td>TU</td>
<td>85.5 (3.2)</td>
<td>78.8 to 91.3</td>
</tr>
<tr>
<td>Lowest quartile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TR</td>
<td>77.5 (5.8)</td>
<td>64.0 to 86.8</td>
</tr>
<tr>
<td>TU</td>
<td>69.6 (4.5)</td>
<td>59.7 to 77.5</td>
</tr>
</tbody>
</table>

* TBL, team-based learning; TR, TBL-related PBQ; TU, TBL-unrelated PBQ.
† TR versus TU scores.
‡ $P = .001$ for two-way ANOVA interaction comparing the difference in mean scores on TR and TU questions for highest- versus lowest-quartile students.
Comparison of MS2 Exam Performance in MSK & Skin Module

![Bar chart showing comparison of exam performance in MSK & Skin Module between 2013 and 2014. The chart indicates higher performance in TBL method compared to Didactic method.]
Resources

- Team-based Learning Collaborative
  www.teambasedlearning.org

- Creating Modules for TBL, John Pelley, PhD
  www.ttuhsc.edu/som/success/documents/creating_effective_tbl_modules.pdf

- Teaching Skills for Facilitating TBL, Derek Lane, PhD
  onlinelibrary.wiley.com/doi/10.1002/tl.333/abstract

- MedEdPortal
  www.mededportal.org

- Will Brooks wbrooks@uab.edu