

TEAM-BASED LEARNING (TBL) IN MEDICAL EDUCATION

Will Brooks, Ph.D.

Assistant Professor of Cell, Developmental & Integrative Biology

Director, Gross Anatomy Lab & Surgical Anatomy Lab

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

Phase 1

Individual Preparation
(pre-class)

Phase 2

Readiness Assurance
(in-class)

Phase 3

Application
(in-class)

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)

Phase 2

Readiness Assurance
(in-class)

Phase 3

Application
(in-class)

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

Team-based Learning (TBL)

Phase 1

Individual Preparation
(pre-class)

Phase 2

Readiness Assurance
(in-class)

Phase 3

Application
(in-class)

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

IRAT and GRAT

IMMEDIATE FEEDBACK ASSESSMENT TECHNIQUE (IF AT®)
Name SI1 Test # 1
Subject Quiz TBL-Vertebral Column Total _____

SCRATCH OFF COVERING TO EXPOSE ANSWER

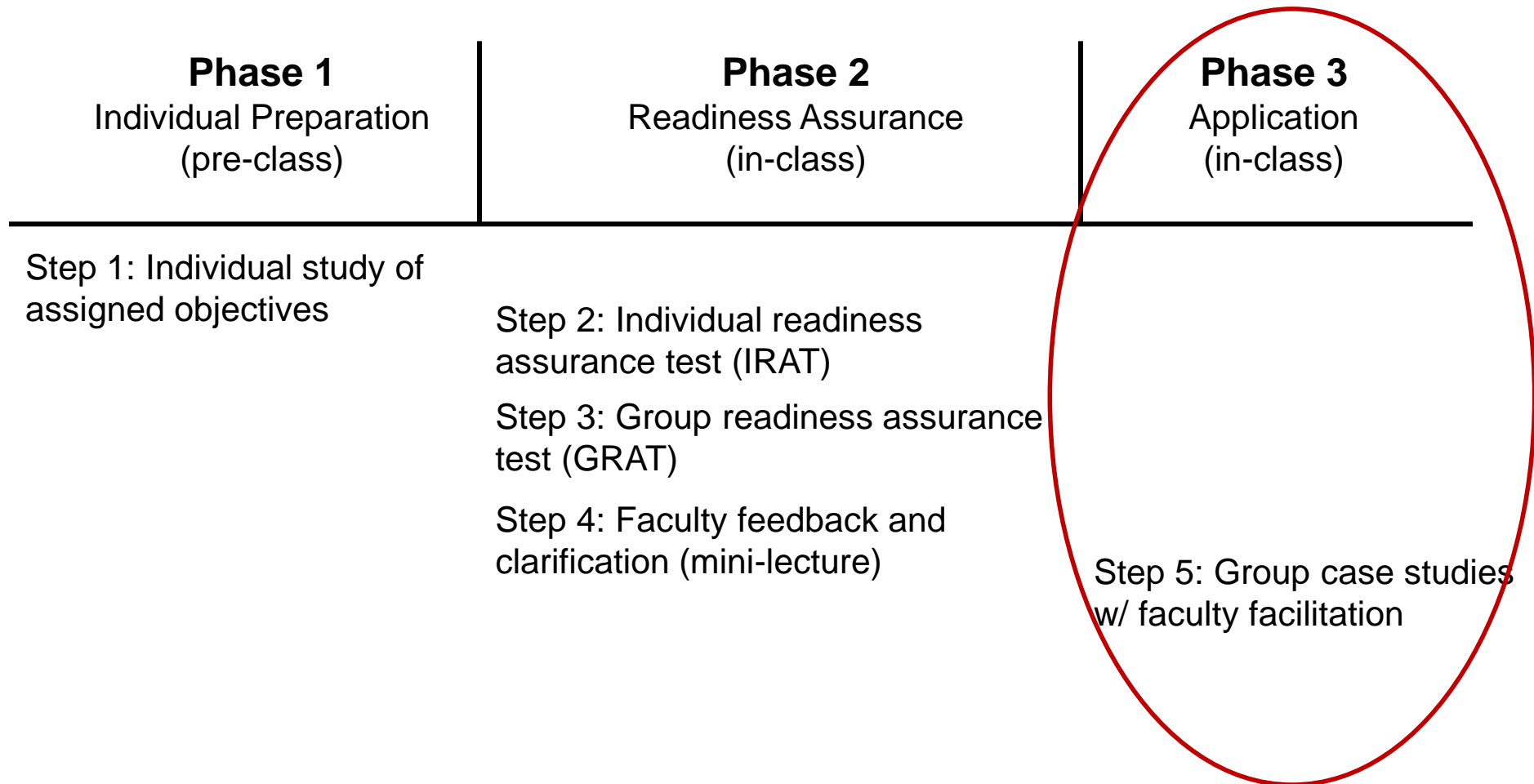
	A	B	C	D	E	Score
1.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<u>9.5</u>
2.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
4.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
6.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
8.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
9.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____

Form# E018 • © 2012 Epstein Educational Enterprises, Inc. U.S. Patent No. 6,210,171

Four S's of the Application Exercise

- **Significant Problem**
 - Should be something relevant to peak 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)



Application Exercise #1

- See handout

Application Exercise #2

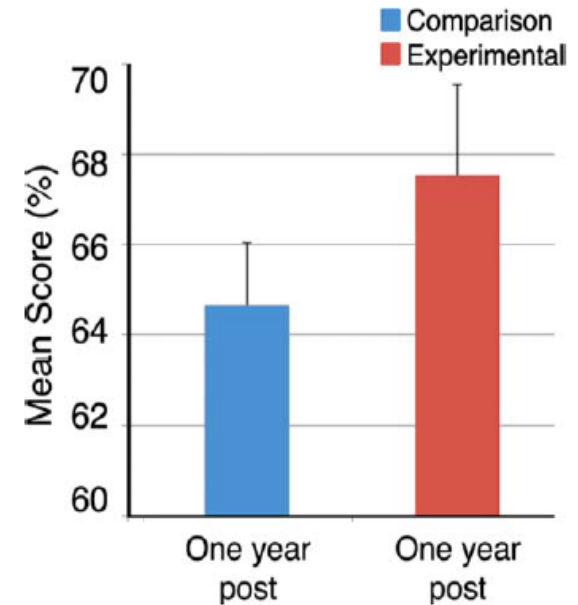
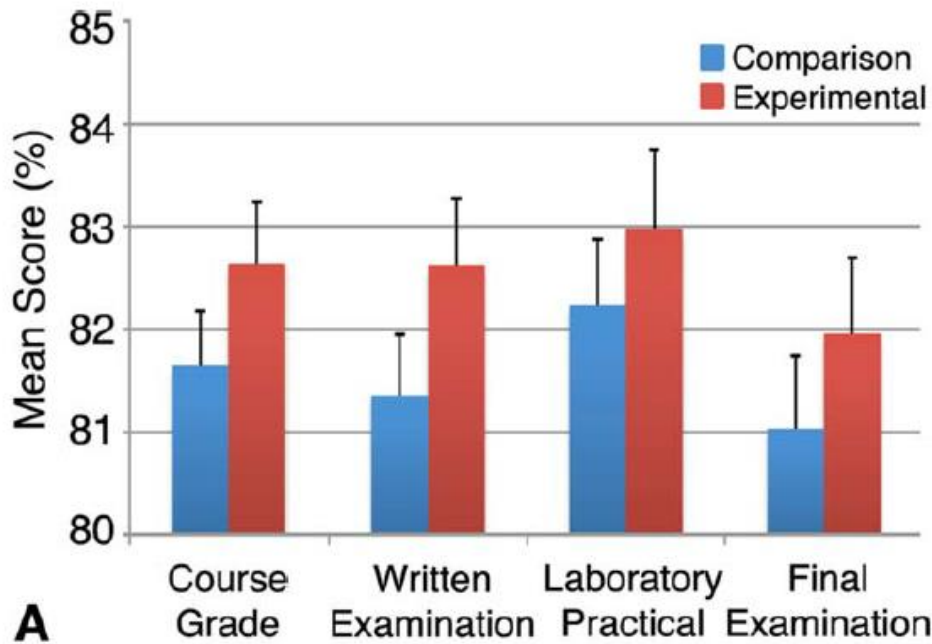
- See handout ...

Application Exercise #3

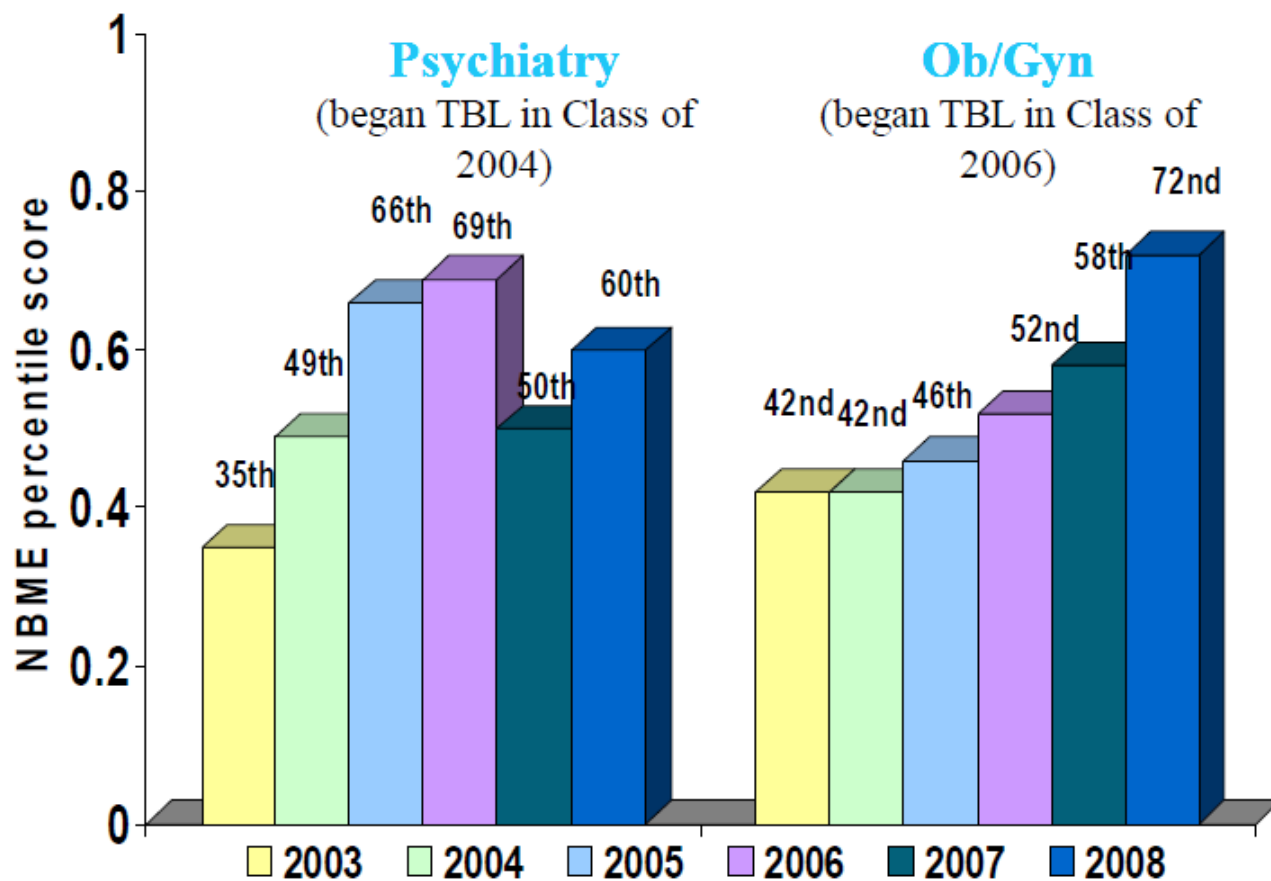
- Which is the most appropriate advance assignment for this module, given the two learning objectives and the 5-question application exercise in the handout?
 - A. The abdominal anatomy chapter in Clinically Oriented Anatomy, 7th ed, pp. 181-325
 - B. The liver section of Clinically Oriented Anatomy, 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



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*

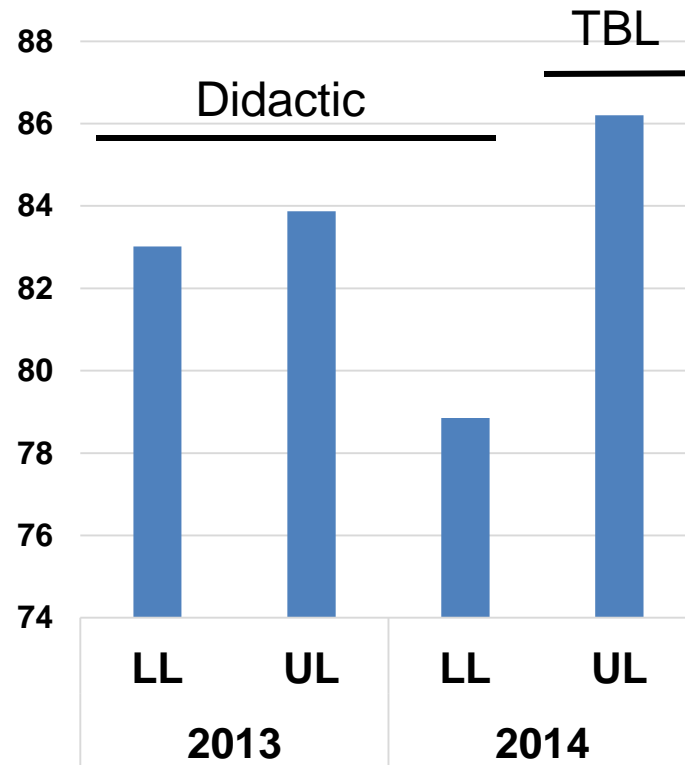
Academic quartile and group of PBQ	Score on all exams		Difference in scores [†]	
	Mean % (SD)	Range %	Mean % (SD)	Range %
Highest quartile				
TR	89.3 (4.0)	80.6 to 96.1	3.8 (5.4) [‡]	–7.7 to 13.3
TU	85.5 (3.2)	78.8 to 91.3		
Lowest quartile				
TR	77.5 (5.8)	64.0 to 86.8	7.9 (6.0) [‡]	–5.1 to 20.6
TU	69.6 (4.5)	59.7 to 77.5		

* 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



Resources

- Team-based Learning Collaborative

www.teambasedlearning.org

- Creating Modules for TBL, John Pelley, PhD

www.ttuhsu.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