An Introduction to Team-Based Learning

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At the end of this workshop, you will

- Be able to describe the basic components of Team-Based Learning.
- Be able to explain how the components of TBL aid student learning.
- Be ready to implement TBL in your own math course.
Team-Based Learning (TBL)

TBL is a highly structured form of collaborative learning.

- Students work in permanent, heterogeneous teams
- Students complete pre-readings to free up class time for engaging activities
- Students work in teams during class on significant problems to deeply learn the material.
Structure of a TBL module

**In-Class**
- RAP:
  1) iRAT
  2) tRAT
  3) Appeals
  4) JIT teaching

**Out-of-Class**
- Reading Practice

**Preparation**

**Practice/Feedback**
- Group Work (4-S Activities)

**Assessment**
- Exam
- Self Evaluation

**Homework**
- Review
- Practice/Feedback
Let’s form teams!

- Let $X$ be the number of years you have been teaching.
- Add 10 to $X$ for each of the following pedagogies you have ever tried in a class: Flipped Learning, IBL, PBL, POGIL
- Add 30 if you have ever used TBL before.

Now, stand up and arrange yourselves in a monotonic sequence according to your number.
Readiness Assurance Process

Every module begins with the readiness assurance process

- First, students take the test individually.
- Second, teams take the same test again collaboratively.
- Teams file written appeals (if appropriate).
- Conclude with Just-In-Time teaching.
**Team Readiness Assurance Test (tRAT)**

**IF-AT cards**

<table>
<thead>
<tr>
<th>Immediate Feedback Assessment Technique (IF AT®)</th>
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<tbody>
<tr>
<td>Name ____________________________ Test # _____</td>
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<td>Subject __________________________ Total ____</td>
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<td>SCRATCH OFF COVERING TO EXPOSE ANSWER</td>
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<table>
<thead>
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**Recommended scoring:** 4-2-1-0
## Just-in-Time Teaching

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<th>Quiz Name:</th>
<th>iRAT Module G</th>
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<tr>
<td>Subject:</td>
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### Introduction to Team-Based Learning

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- **Readiness**
- **Assurance**
- **Process**
- **Application**
- **Activities**
- **Peer Evaluation**
- **Concluding thoughts**
The primary purpose of the Readiness Assurance Process is
(A) To test students’ mastery of simple concepts
(B) To ensure students have done the pre-reading
(C) To hold students accountable for doing assignments
(D) To ensure teams are ready for the application activities.
Resources for Readiness Assurance

Many different ways to help students prepare:

- Assign reading from the textbook
- Assign homework problems
- Assign Youtube videos
- Create more targeted videos
- Use tools like Edpuzzle to embed practice questions in videos (Example)
Possible topics for RAP

Depending on your goals for the module, outcomes of the RAP can vary.

- Review material from prerequisite classes
- Introduce simple definitions or concepts
- Teach mechanical/computational processes

**Highly recommended**: Explicitly list learning outcomes for your students!
A linear algebra example

Before beginning this module (on determinants and eigenvalues), students should be able to

1. Calculate the area of a parallelogram.
2. Find all roots of quadratic polynomials (including complex ones).
3. Find the standard matrix corresponding to a linear transformation of Euclidean spaces.
4. Recall and use the definition of a linear transformation.
5. Interpret the statement “A is an invertible matrix” in many equivalent ways in different contexts.
**Structure of a TBL module**

**In-Class**

**Preparation**
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**Practice/Feedback**
- Group Work (4-S Activities)

**Assessment**
- Exam

**Out-of-Class**

**Reading Practice**

**Practice/Feedback**
- Homework

**Review**
Application Activities

The bulk of class time is spent with students working in teams on 4-S “Application Activities.”

- Same Problem
- Significant Problem
- Specific Choice (Specific Commitment)
- Simultaneous Response
Application Activities

- Teams discuss/solve the problem **within their group** first.
  - Instructor circulates, eavesdropping and facilitating intra-team discussions.
- Teams *simultaneously* report their response to the class.
- The facilitator asks teams to explain their reasoning.
Activity 2

Which of the four S’s do you think is **most important**?

(A) Same Problem
(B) Significant Problem
(C) Specific Choice
(D) Simultaneous Response
Activity 3

Which of the four S’s do you think is **most difficult to implement** in a math course?

(A) Same Problem  
(B) Significant Problem  
(C) Specific Choice  
(D) Simultaneous Response
More on Specific Choice

We found being faithful to Specific Choice to improve discussions.

**Old activity:** What is the dimension of the vector space of all polynomials of degree 7 or less?

**New activity:** What is the dimension of the vector space of all polynomials of degree 7 or less?

(A) 6  (B) 7  (C) 8  (D) Infinite
Team dynamics

TBL calls for **permanent, diverse teams**.

- Permanent teams allow groups to grow into cohesive teams.
- Diverse teams ensure varied perspectives
- Instructor-assigned teams reduce impact of pre-existing relationships on team dynamics
- Team members need to be accountable to each other.
Team Accountability

TBL has several mechanisms for ensuring team members are accountable to each other.

- The Readiness Assurance Process requires team members to come to class prepared to contribute to the tRAT.
- Team members must come to class ready to contribute to team work on application activities.
- Periodic peer evaluation of team-mates provides additional accountability.
Peer Evaluation

Each team member should evaluate each of their teammates.

- Should be formative and summative.
- Should have quantitative and qualitative elements.
- Instructor should encourage students to provide constructive feedback.
- Evaluations should be anonymized and distributed to respective students.
Quantitative methods

Many different methods for quantitative peer evaluation.

- Let students decide on criteria to evaluate each other on.
- Let students distribute a fixed number of points among teammates in various criteria.
- Force students to rank teammates on various criteria.
Student-assigned grade weights

In TBL, students assign weights to various graded components.

- iRAT
- tRAT
- Peer evaluation
- Attendance or Participation

Note:

- Many instructors place some restrictions (e.g. exams must count at least X%)
- Even easier if you use Specifications Grading!
Activity 4

TBL is most similar to which other active learning pedagogy?

(A) Flipped Learning
(B) Inquiry Based Learning
(C) Problem Based Learning
Team-Based Inquiry Learning (TBIL)

- RAP focuses on pre-requisite material or material from earlier in course
- Application activities are IBL focused: 3 types
  - Guided discovery
  - Practice/computation
  - Extension/application

A full set of TBIL linear algebra materials is available to interested instructors.
Activity 5

Which math class would be easiest to implement TBL in?

(A) Pre-Calculus
(B) Calculus
(C) Linear Algebra
(D) Topology
Resources

- Team-Based Learning Collaborative http://www.teambasedlearning.org/
- These slides are available at http://clontz.org/mathfest
Questions?

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