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An Introduction to Team-Based Learning

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Concluding thoughts 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.

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• Be ready to implement TBL in your own math course.

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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.

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Structure of a TBL module



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Lets 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.

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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.



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Team Readiness Assurance Test (tRAT)

IF-AT cards



Recommended scoring: 4-2-1-0

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Just-in-Time Teaching



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Activity 1

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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.

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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)

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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!

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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.

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Structure of a TBL module



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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

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- 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.

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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

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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

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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?

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

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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

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• Team members need to be accountable to each other.

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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.

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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.

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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.

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• Force students to rank teammates on various criteria.

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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%)

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• Even easier if you use Specifications Grading!

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Activity 4

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TBL is most similar to which other active learning pedagogy?

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

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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.

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Activity 5

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Which math class would be easiest to implement TBL in?

- (A) Pre-Calculus
- (B) Calculus
- (C) Linear Algebra

(D) Topology

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Resources

- Team-Based Learning Collaborative http://www.teambasedlearning.org/
- Team-based Learning: A Transformative Use of Small Groups in College Teaching. Larry Michaelsen, Arletta Bauman-Knight, and Dee Fink (2003) Sterling, VA: Stylus Publishing.

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• These slides are available at http://clontz.org/mathfest

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Questions?

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