THE UNIVERSITY OF ARIZONA
College of Medicine

Team Learning

A Faculty Primer

OMSE
Office of Medical Student Education

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Team Learning- A Faculty Primer

This document reviews the basic components of team learning (TL) and provides examples of TL activities. It is intended as a supplement for faculty members who are developing TL sessions.

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Contact Information

For assistance with developing TL sessions, please contact:

Susan Ellis, EdS
Associate Specialist, Faculty Development
Office of Medical Student Education
626 3654
sellis@email.arizona.edu

Chris Cunniff, MD
Director, Faculty Instructional Development
Office of Medical Student Education
ccunniff@peds.arizona.edu
626 5175

What is Team Learning (TL)?

Team Learning (TL) is a hybrid instructional method that permits a single instructor to conduct multiple small groups simultaneously in the same classroom. As an instructional technique, TL can

- Enhance students' problem-solving skills
- Replace or reduce lecture time
- Ensure that students are prepared
- Promote team work among student groups

Students participate in TL in & out of class

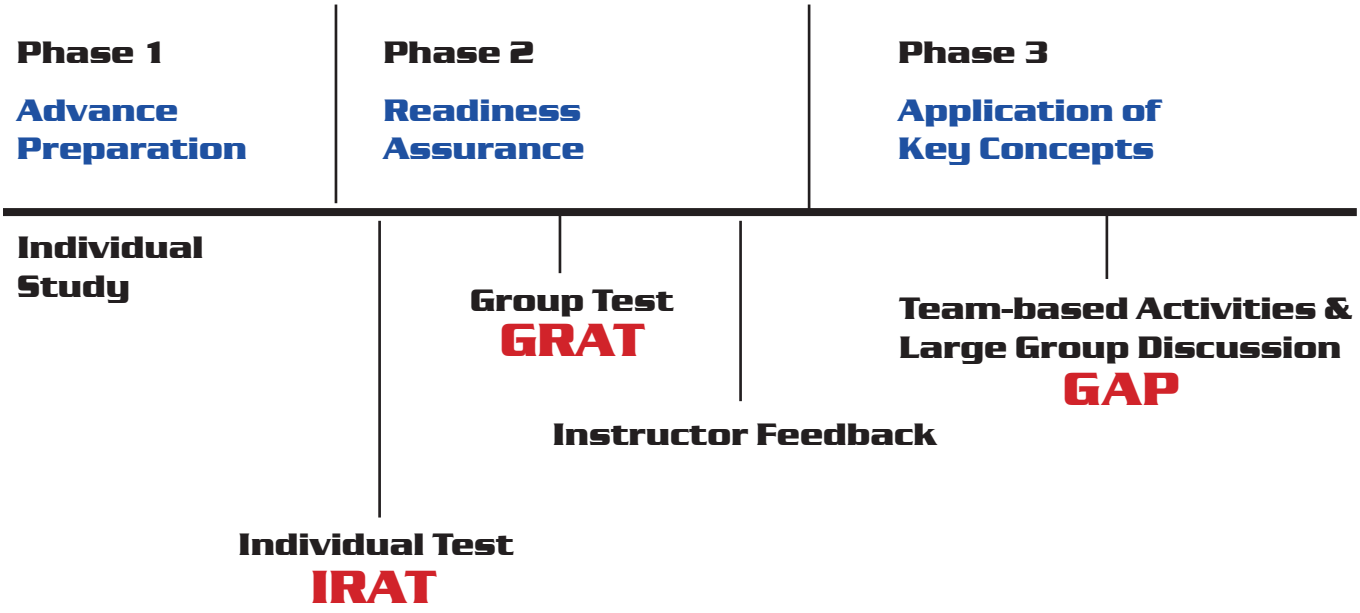
- Pre-class assignments
- In-class activities & group discussion

Instructor retains control of the educational content of a TL activity

- Facilitator & content expert

Instruction shifts away from learning facts toward application & integration of information.

The TL Process



Phase 1 - Advance Preparation

The TL session starts with preparatory work, assigned by the faculty instructor and completed by students outside of class time. These activities are

- Done in advance of TL session
- Can be a single task or combination
- Examples:
  - Assigned reading
  - Attendance at lecture
  - Participation in lab
  - Review of objectives from previous blocks

To facilitate students' preparation, be specific when assigning advance activites. Rather than "Review Dr So-and-So's Lecture," refer to the particular element you'd like students to review. Is it the lecture presentation or the lecture's objectives? If the students review their notes from the lecture is that sufficient?

Confine the advance assignment to core concepts. Keep the introduction of new concepts to a minimum.

Write specific learning objectives, focusing on the knowledge pertaining directly to the TL activity to guide students' preparation.

Sample Learning Objectives

A. Give a definition for lactic acidosis. At what pH does a patient enter acidosis?
B. Describe the steps leading to increased lactate production resulting from hypoxia.
C. List the various causes of hypoxia.
D. Describe the action of rotenone, amytal, antimycin A, oligomycin, and pentachloro phenol in the mitochondrion.
E. Describe the action of fluoride on glycolysis.
F. Describe the metabolism of lactate by the liver in the normal patient.
G. Describe the steps involved in the nonenzymatic glycosylation of proteins. What is the effect of this process in renal glomeruli?
H. Describe the activity of the polyol pathway in type 2 diabetics.
I. Compare the effect of insulin on gluconeogenesis in a normal patient and a patient with Type 2 diabetes.
J. Give the two causes of hyperglycemia in diabetes mellitus.
K. Compare fat mobilization in type 1 and type 2 diabetes.

Sample Advance Preparation Activity

1. Review of lecture notes from Block 1
2. Reading assignment- Meisenberg; pp 303-304, pp 653-657.

Phase 2- Readiness Assurance

The second portion of a TL session is designed to

- Assess students' understanding of key concepts from Phase 1
- Ensure preparedness

The components of Phase 2 are the

- Individual Readiness Assessment Test- **IRAT**
- Group Readiness Assessment Test - **GRAT**
- Instructor feedback

Individual Readiness Assessment Test- IRAT

The IRAT is a multiple choice quiz addressing the key concepts students need to know in order to complete the application portion of the TL session.

- Multiple choice quiz ≤ 5 items
- "Single correct answer" items
- Correlate with specified learning objectives
- Focus on major content
- Students are graded for their individual performance

Group Readiness Assessment Test - GRAT

The GRAT is the **SAME QUIZ AS THE IRAT**

- Retaken as a group
- Gets individuals within the group to common level of understanding
- Groups receive single grade
- Builds accountability to group members
- Peer teaching

Instructor Feedback

Following completion of the IRAT & GRAT, the faculty facilitator should briefly review the quiz items.

- Review key concepts
- Clear up student confusion
- Opportunity for student and faculty interaction

Sample IRAT/GRAT Items

1. Which of the following would NOT produce lactic acidosis?
   - A. Carbon monoxide poisoning
   - B. Impaired gluconeogenesis
   - C. Impaired pentose phosphate shunt
   - D. Impaired pyruvate oxidation
   - E. Cyanide poisoning

2. The rate of glycolysis is increased by:
   - A. glucose 6-phosphate.
   - B. fructose 2,6 bisphosphate.
   - C. citrate.
   - D. lactate.
   - E. acetyl-CoA

3. Which of the following best describes the role of lactate dehydrogenase?
   - A. disposal of excess NADH in fast twitch muscle cells
   - B. utilization of lactate for energy in red cells
   - C. conversion of lactate into TCA cycle intermediates
   - D. synthesis of pyruvate during hypoxia
   - E. shunt pathway for pyruvate to enter gluconeogenic pathway

4. Which of the following is true for the nonenzymatic glycosylation of proteins?
   - A. It is a fast and reversible reaction.
   - B. It forms a stable reaction product.
   - C. It involves the formation of ester bonds.
   - D. Glycosylated sites are genetically determined.
   - E. Sorbitol is the final form of the sugar attached .

5. Which of the following best describes fat mobilization in the diabetic?
   - A. Lipolysis leads to ketoacidosis in Type 2 diabetes
   - B. Lipolysis only occurs in the Type 1 diabetic.
   - C. Lipolysis is due to activation of lipoprotein lipase
   - D. Metformin would likely suppress lipolysis in adipose tissue.
   - E. Formation of ketones can be regulated in the liver.

Phase 3- Application of Concepts

The final portion of the TL session is the Group Application Problem (GAP). In this segment, students work together in their teams to answer the GAP questions. After the teams have completed the GAP items, there is a large group discussion during which students debate and defend their team's answers.

- Application of concepts promotes deeper learning
- Opportunities for peer teaching
- Teamwork & communication
- Instructor feedback

Group Application Problem (GAP)

During the Group Application Problem (GAP) students apply the concepts from the advance assignment to clinical situations. We recommend using multiple choice items in order to encourage discussion among the groups. However, unlike the IRAT/GRAT, these items should be written as "single BEST answer" items. In the context of the GAP, the reasoning underlying the students' answers is just as important as identifying the "right" answer.

Analogy: A GAP is like a math problem. It is important to get the right answer but it is also important to show your work.

Sample GAP Item

A 74 year old female has come to your office suffering from hyperventilation, malaise, dizziness, and muscle pains. She was diagnosed with Type 2 diabetes at the age of 50 and has managed her disease successfully with diet, exercise, and hypoglycemic agents. She was initially put on a hypoglycemic agent called an oral sulfonylurea (chlorpropamide), but recently was switched to metformin which is better tolerated in the elderly. Her blood pH is 7.2 and her serum lactate is 10X normal levels. Her creatinine clearance and serum creatinine concentrations indicate diminished renal function.

1. This patient has a blood pH of 7.2 because
   - A. ketones from excess fat mobilization are making her blood acidic.
   - B. increased glycolysis and reduced TCA cycle activity leading to excess lactate formation.
   - C. hypoxia resulting from inhibition of electron transport is creating excess carbon dioxide.
   - D. increased blood sugar increasing glycolysis and lactate production in red blood cells.

2. Metformin action in the production of lactic acidosis is most analogous to which of the following?
   - A. Fluoride
   - B. Pentachlorophenol
   - C. Cyclic AMP
   - D. Oligomycin

3. Metformin-induced lactic acidosis in this patient was precipitated by
   - A. reduced renal function due to glycosylation of renal membrane proteins.
   - B. acceleration of glycolysis due to the increased concentration of glucose in the blood.
   - C. resistance to insulin leading to uncontrolled fat mobilization.
   - D. accelerated gluconeogenesis in the liver due to insulin resistance.

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