IAMSE Webinar Team-Based Learning: Voices of Experience

Edward E. McKee, Ph. D. Associate Professor Biochemistry and Molecular Biology, Indiana University School of Medicine-South Bend edemckee@iupui.edu

Brenda Roman, M.D., Professor and Director Student Education in Psychiatry, Boonshoft School of Medicine, Wright State University brenda.roman@wright.edu

Using TBL in a Medical Biochemistry and Molecular Biology Course

Edward E. McKee, Ph. D. Associate Professor Biochemistry and Molecular Biology, Indiana University School of Medicine-South Bend
edemckee@iupui.edu

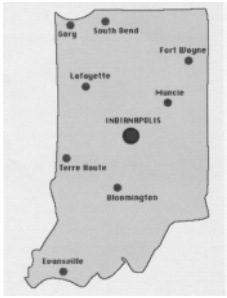
- Outline:
  - 1. Indiana University School of Medicine System and Curriculum
  - 2. TBL Training
  - 3. Peer Evaluation and feedback in TBL
    - Importance
    - Training
  - 4. Putting together a Basic Science TBL
    - TBL Structure
    - Writing IRATs/GRATs
    - Creating Applications
    - Facilitation
    - Student perception

Indiana University School of Medicine Campus Wide System

IUSM is second largest medical school in country (322 student).

Students are distributed between Indianapolis (~150) and a statewide network of 8 branch campuses.

The South Bend campus will have 24 students in each of the 1st and 2nd year classes in the coming year.



1st Year Teaching Program

- 1st Semester:
  - Embryology - 1 week
  - Gross Anatomy – 7 weeks
  - **Biochemistry and Molecular Biology 5.5 weeks**
  - Histology and Cell biology – 4 weeks
  - Health Care in America- 2 hr week full semester
- 2nd Semester:
  - Neuroscience – 4 weeks
  - Physiology – 5 weeks
  - Immunology and Microbiology 6 weeks
- Introduction to Clinical Medicine – Both Semesters
- Medial Genetics has been a 2 credit course 3 hours / week for 10 weeks in the second semester of the second year
- TBL is an important component of most courses.

- Prior to TBL, my course was 7 credits meeting 7 hours a week for 15 weeks.
  - 74 hr lectures
  - 12 hr Case based PBL "light" (6 X 2 hr each)
  - 6 hr discussion/review
  - 8 hr exams (2 hr each)
  - Total class time = 100 hr
- With TBL
  - 52 hr lectures (2006) 48 hr lectures (2009)
  - 20 hr (2006) 26 hr (2009) TBL (13 X 2 hr each)
  - 8 hr exams
  - Total class time = 82 hr (2009)
  - Students are responsible for ~ 20 hr of lecture material on their own.
  - **Goal** is increase TBL to 40 hr (20 X 2 hr each) with further reduction in lecture time.

- **Biochemistry and Molecular Biology**
  - 1. Nutrition and Metabolism (Starvation)
  - 2. Protein Structure (Mutations, Folding, Prions)
  - 3. Hemoglobin (HbS/β-Thalassemia)
  - 4. Thermodynamics, Enzyme kinetics, and pH
  - 5. Genomics (Genetic tests)
  - 6. Protein Targeting
  - 7. Hormones and Signal Transduction (21 Hydroxylase def.)
  - 8. Carbohydrate metabolism (von Gierke's)
  - 9. Ethanol and Drug P450 Metabolism
  - 10. Lipid Metabolism (MCAD)
  - 11. Protein Metabolism (Methyl malonyl-CoA mutase def.)
  - 12. Purine metabolism (Gout)
  - 13. Iron Metabolism (Hemochromatosis)
- Medical Genetics
  1. Pedigree, population and conditional risk analysis
  2. Analysis of indirect genetic tests (RFLPs)
  3. Analysis of Karyotypes

Team Selection

- 24 medical students are purposefully assigned at orientation of the 1st year to one of 4 teams using defined criteria:
  - Balancing gender
  - Distributing special talent - e.g., PhD, EMT, RN
  - Distributing undergraduate experience with regard to institution, major, and MCAT scores
- Teams are maintained over all courses for the entire 1st and 2nd years.

Student Team-Based Training

- During orientation of first year, students were trained in the principles of team-based learning by completing IRAT and GRAT exercises on assigned TBL readings.
  - TBL on TBL (Based on Team Learning writings of Larry K. Michaelsen, The University of Oklahoma)
  - In our experience the discussions have been robust and students have actively debated nuances among the answers. At the conclusion of this training students have an excellent grasp of what to expect from TBL sessions during the year.

Using TBL to Assess IUSM Competencies

- Peer evaluation has always been a recommended component of TBL to discourage "social loafing" and to reward the best team members.
- From the regular use of TBLs, students working in teams get the opportunity to practice 7 of the 9 IUSM competencies.
- A great way to assess progress in these competencies is the use of self/peer evaluation. This is an added bonus of the TBL curriculum.

IUSM Competencies

1. Communicates effectively with patients, colleagues and/or faculty
2. Clinical skills are appropriate to educational level
3. Effectively uses science in diagnosis, management, therapeutics and prevention
4. Demonstrates skills needed for lifelong learning
5. Demonstrates self-awareness
6. Understands and utilizes social and community context in patient care
7. Demonstrates moral and ethical judgment
8. Demonstrates problem solving ability
9. Displays proper professional attitude and behavior toward colleagues and patients

Written Feedback as part of Self/Peer Evaluation

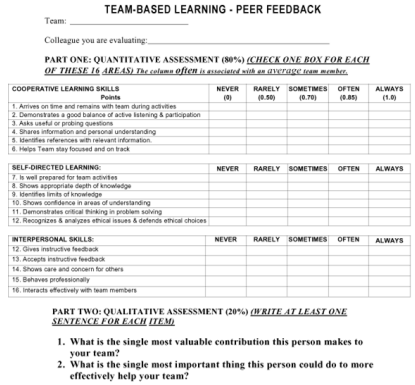
- Giving and receiving feedback is a valuable part of Medical Education and an important component of practicing Medicine.
- Learning to give appropriate feedback requires training and practice.
- The TBL Self/Peer Evaluation provides an excellent opportunity to provide training and practice in giving appropriate feedback by requiring students to provide written feedback for each of their team mates.

Student Team-Based Peer Evaluation Feedback Training

- During orientation students are assigned an article on the role of peer feedback in health care teams and in medical education (1).
- Following the IRAT/GRAT on TBL training, the teams are given an application that contains specific scenarios concerning the performance of a team member. Each team is asked to write a positive statement and an improvement statement for that team member.
- Written feedback statements are shared and the teams choose which they think is best (other than their own) (Gallery walk).
- Teams defend their own statements and describe what they liked about the statements each team thought was best in the context of Ende's guidelines.

[1]J. Ende, Feedback in Clinical Medical Education JAMA 1983;250:777-781

Student Evaluation Instrument



TEAM-BASED LEARNING - PEER FEEDBACK

Team: _____

Colleague you are evaluating:_____

PART ONE: QUANTITATIVE ASSESSMENT (80%) ***(CHECK ONE BOX FOR EACH OF THESE 16 AREAS) The column often is associated with an AVERAGE team member.***

COOPERATIVE LEARNING SKILLS Points	NEVER (0)	RARELY (0.50)	SOMETIMES (0.70)	OFTEN (0.85)	ALWAYS (1.0)
1. Arrives on time and remains with team during activities					
2. Demonstrates a good balance of active listening & participation					
3. Asks useful or probing questions					
4. Shares information and personal understanding					
5. Identifies references with relevant information.					
6. Helps Team stay focused and on track					

SELF-DIRECTED LEARNING:	NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS
7. Is well prepared for team activities					
8. Shows appropriate depth of knowledge					
9. Identifies limits of knowledge					
10. Shows confidence in areas of understanding					
11. Demonstrates critical thinking in problem solving					
12. Recognizes & analyzes ethical issues & defends ethical choices					

INTERPERSONAL SKILLS:	NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS
12. Gives instructive feedback					
13. Accepts instructive feedback					
14. Shows care and concern for others					
15. Behaves professionally					
16. Interacts effectively with team members					

PART TWO: QUALITATIVE ASSESSMENT (20%) ***(WRITE AT LEAST ONE SENTENCE FOR EACH ITEM)***

1. **What is the single most valuable contribution this person makes to your team?**
2. **What is the single most important thing this person could do to more effectively help your team?**

Student Team Based Peer Evaluation and Writing Feedback Training/Practice

- Students do a formative peer evaluation of the other members of their team at the end of the third TBL exercise using the instrument in the slide above. This is done online. Each student receives an instructor's critique on the quality of the feedback comments they wrote and the results of the peer evaluation. This allows for early course correction.
- Students repeat the process above for a summative peer evaluation at the end of the course, and this score is used (modestly) in calculating the TBL grades.

TBL Structure

- Define objectives – What do you want students to be able to do upon completing the TBL exercise?
- Identify and assign content to be learned.
- TBL Session is ~ 2 hours
  - Individual Readiness Assurance Test (IRAT)
    - (~10 questions – 15 minutes)
  - Group Readiness Assurance Test (GRAT)
    - Same test taken as a team. (~15 minutes)
  - Application – The goal of the application questions is to get the students to use the information they have learned to address a particular problem. ~70 minutes

The "Four S's" of TBL*

- Significant problem
- Same Problem
- Single Best Answer
  - Teams must discuss the choices and arrive at a consensus best answer. (Generates good intra-team teaching and discussion.)
- Simultaneous reporting
  - All teams report their answer at the same time. Lettered cards can be used or Audience response systems can be used. A team member must then justify their team's answer. Robust inter-team discussions often follow when teams have selected different answers.

IRAT

- Basic questions to:
  1. Determine individual preparedness
  2. Introduce basic information that must be understood for the application
  3. Provide assessment that basic information is understood.
- IRATs/GRATs are usually fairly easy questions to write.
- Typically 10 multiple choice questions (15 minutes). Our students take the IRAT online.
  1. 10 TBLs (2007) Range = 73-88% Mean 77.8 ± 6.2 %
  2. 11 TBLs (2008) Range = 62-98 Mean = 85.0 ± 8.5%
  3. 13 TBLs (2009) Range = 75-96 Mean = 87.4 ± 8.2%

GRAT

- Students take the IRAT as a team.
- This exercise is usually fairly easy for the class. (15 minutes).
- Good opportunity to use IF AT cards. Teams answer all of the questions at one time.
- Discussion focuses **only** on questions that were difficult as assessed by item analysis of IRAT scores and a scan of IF -AT cards. (http://www.epsteineducation.com/home/order/default.aspx)

  Range (2007) = 93.1-100% (2008-2009)= 98-100%

Application

- Questions should address objectives.
- Questions must be challenging, but there should be a clear best answer.
- Question should generate good team discussion.
- The application must be perceived as productive. Students should feel that the exercise helped them learn and apply the material.
- Teams are allowed to challenge questions, but they must document the reasons for their challenge and/or re-write the question to make it better.
- Don't accept weak challenges.
- Range (2008) = 87-96% Mean = 93.2 ± 4.0%

Facilitation

I prefer to do one question at a time followed by simultaneous answer and inter-team discussion.

The facilitator should not indicate the preferred answer until all discussion is concluded. Usually the teams arrive at a consensus answer that is the preferred answer.

The facilitator's role is to provide an environment in which all are encouraged to participate and to recognize when the discussion should be concluded. The facilitator should not take part in the discussion. Let the teams conduct the discussion.

Students Liked It!

TBL Evaluation Form

	Scale: Strongly Disagree = 1; Disagree = 2; Neither Agree nor Disagree = 3; Agree = 4; Strongly Agree = 5	2009 Mean	2009 Std Dev	2008 Mean	2007 Mean	2006 Mean
1.	I can explain the TBL process to others.	4.89	0.46	4.89	4.94	4.5
2.	I can assign fair peer feedback scores to other members of my team.	4.37	1.01	4.37	4.71	4.4
3.	I can write fair evaluative comments to my team members	4.68	0.48	4.68	4.61	
4.	Peer feedback is valuable	4.47	0.61	4.47	4.67	4.1
	Comfort with peer feedback, Means	**4.60**		**4.61**	**4.73**	**4.36**
5.	TBL is a productive way to learn material.	4.83	0.38	4.83	4.78	4.3
6.	TBL is an enjoyable way to learn material.	4.24	0.56	4.24	4.72	4.7
7.	Time for questions and answers was sufficient.	4.58	0.77	4.58	4.67	4.6
8.	TBL helps me keep up with course material.	4.53	0.84	4.53	4.89	4.7
9.	TBL motivates learners to learn on their own.	4.68	0.48	4.68	4.72	4.2
10.	I have found that teams help me learn course material more than if I just studied alone.	4.42	0.84	4.42	4.61	4.3
11.	The TBL IRATs allow me to know whether I am studying the correct information.	4.63	0.6	4.63	4.50	4.5
12.	The TBL applications stimualted "higher order thinking" and "problem solving"	4.84	0.37	4.84	4.89	4.5
	Value of TBL exercises in learning, Means	**4.66**		**4.66**	**4.72**	**4.48**

Integration—basic science and clinical science

- Boonshoft School of Medicine
  - Team Based Learning from day 1 in medical school, and throughout the first 3 years of the curriculum
  - The Mind psychopathology course
    - Dementia—pathologist and geriatric psychiatrist
    - Mood Disorders—pharmacology and psychiatry
    - Substance Abuse Disorders—pharmacology and psychiatry

Integration

- It all starts with a good course design
  - Primary mode of instruction?
  - Use with other learning strategies?
- Start early
  - All stakeholders involved
    - Basic scientists
    - Clinicians
  - Define objectives
    - What are the concepts that you most want the students to know at the completion of the TBL session?

Getting started

- Use a "backwards design"
  - What do you want students to be able to do by the end of this module?
- Develop an application exercise
  - Most time consuming of a TBL module development, but also the most fun!
  - Promote deep thinking and engaged, content focused discussion

Application Exercise

- Does the topic lead to more than just using a written case?
  - Possibilities include
    - Images
      - Works great for pathology integration
    - Video clips
      - Works great for neurology cases
      - Works great for psychiatry cases

Video Clips

- Real patients
  - Great to show as a case and ask 2-3 questions
    - Observation about the case
    - Diagnosis
    - Pathology
    - Treatment
  - Keep recording in your possession—do not post on a web-site
  - Starting to have "actors" portray the real interview so do not need to be concerned about privacy issues

Video Clips

- Educational DVD's
- MedEdPORTAL
- YouTube
  - Can download and save
  - If posting, best to just use the link

Video Clips

- TV shows and movies
  - Many reality shows are great, especially for psychiatry clips
  - Key is to keep the clips short
  - Show the most essential elements to illustrate your case
  - Many programs available for editing
  - Careful about the Fair Use Exemption
    - Less is More favors you!

Putting it all together

- Questions can be multiple choice single best answer or a gallery walk
- Estimate time that the application exercise will need for execution
  - Takes longer than we generally think it should
- Have others review
  - Did questions make sense?

The rest of the TBL module

- Develop a readiness assurance test
  - Create questions from assigned readings or other tutorials, lectures, etc from the advanced preparation requirements
  - 5-10 questions is best
  - Review several times for accuracy
    - Pre-test with a small group of "others" if possible

Clerkship TBL Sessions

- Generally smaller numbers of students, which can be more challenging as far as generating discussions between groups
- Integration with ethics allows for in-depth discussions
- Greater focus on treatment and management of illnesses

Clerkship TBL sessions

- Application Exercises generally cover one specific topic, but RAT's cover more topics
- Example
  - Advanced preparation assignments include the topics of eating disorders, dissociative disorders, somatoform disorders and child and adolescent psychiatry, thus RAT questions cover these topics
  - Application exercise topic is ADHD, as that is a topic all clinicians, regardless of specialty should know

Questions

Resources

- Team-Based Learning: A Transformative Use of Small Groups (2002) L. K. Michaelsen, A. B. Knight, and L. D. Fink, Pareger Publishing, Westport, Ct.
- Team-Based Learning for Health Professions Education Michaelsen, et. al 2008, Stylus Publishing, Sterling VA
- Team Based Learning Collaborative http://teambasedlearning.apsc.ubc.ca/
- MedEdPortal http://services.aamc.org/30/mededportal/servlet/segment/mededportal/login/