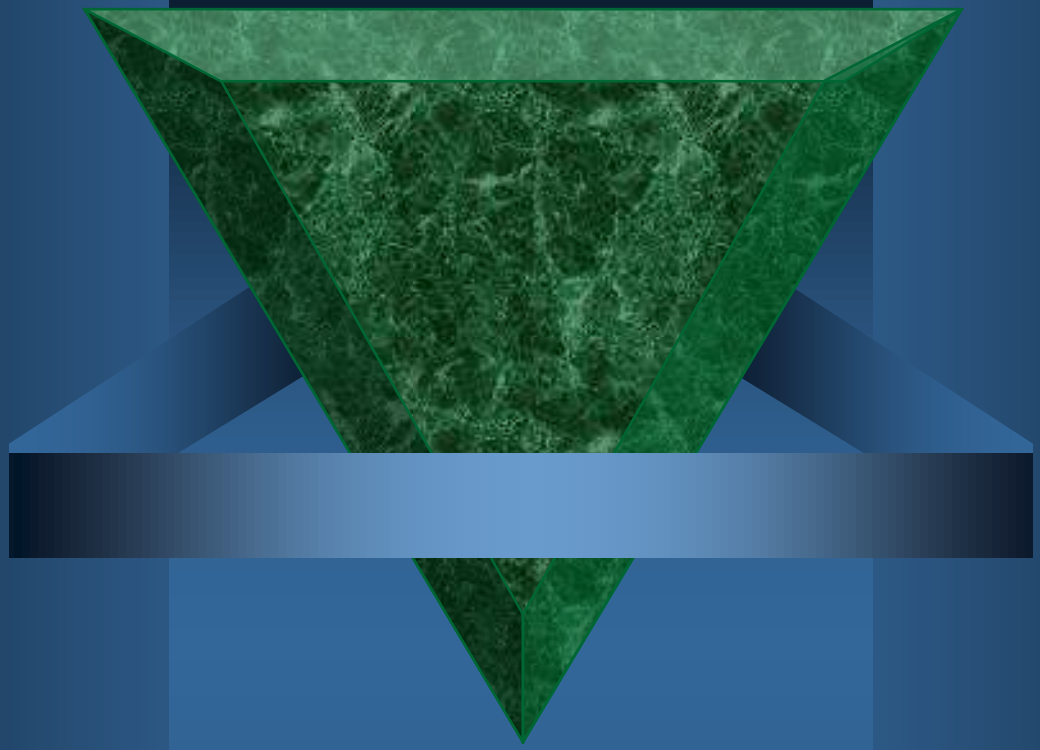
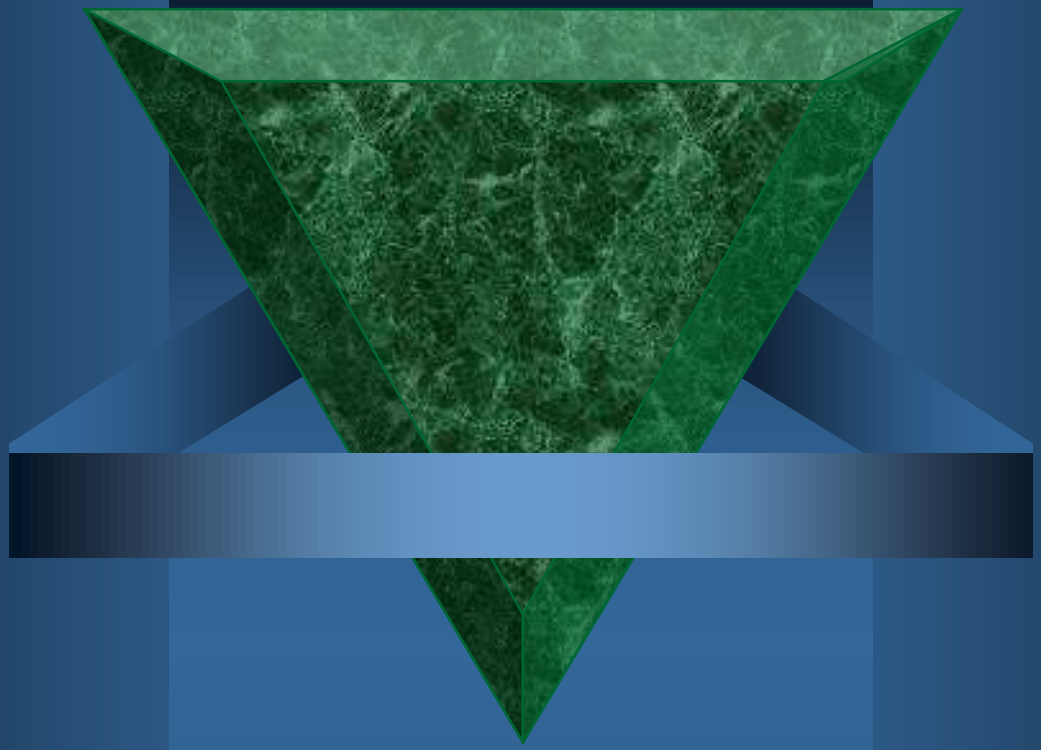


Problem Based Learning



Introduction

Curriculum change - Why?

Too much information - too little time

The need to foster the skills for self-directed life-long learning

Definition

- Problem-based learning (PBL) is a total approach to education began at McMaster University Medical School over 25 years ago.
- Dr. Howard Barrows and Ann Kelson of Southern Illinois University School of Medicine have defined PBL as:

Role Changes

- In problem-based learning, the traditional teacher and student roles change. The students assume increasing responsibility for their learning, giving them more motivation and more feelings of accomplishment, setting the pattern for them to become successful life-long learners. The faculty in turn become resources, tutors, and evaluators, guiding the students in their problem solving efforts.

Problem-solving *v.s.* PBL

- *Problem-based learning* - the process of acquiring new knowledge based on recognition of a need to learn.
- *Problem-solving* - arriving at decisions based on prior knowledge and reasoning

Principles Behind PBL

- Understanding is built through what we experience
- Meaning is created from efforts to answer our own questions and solve our own problems
- We should appeal to students' natural instincts to investigate and create
- Student-centered strategies build critical thinking and reasoning skills and further their creativity and independence

History on PBL

- 1916--John Dewey's progressive movement belief that teachers should teach by appealing to students natural instincts to investigate and create.
- 1980--Howard Burrows, a physician and medical educator, started using this approach to help medical students better diagnose new illnesses
- 1985-High schools and Colleges start using this approach
- 1990-1991, Schools began developing PBL movements to improve student performance in science and other disciplines

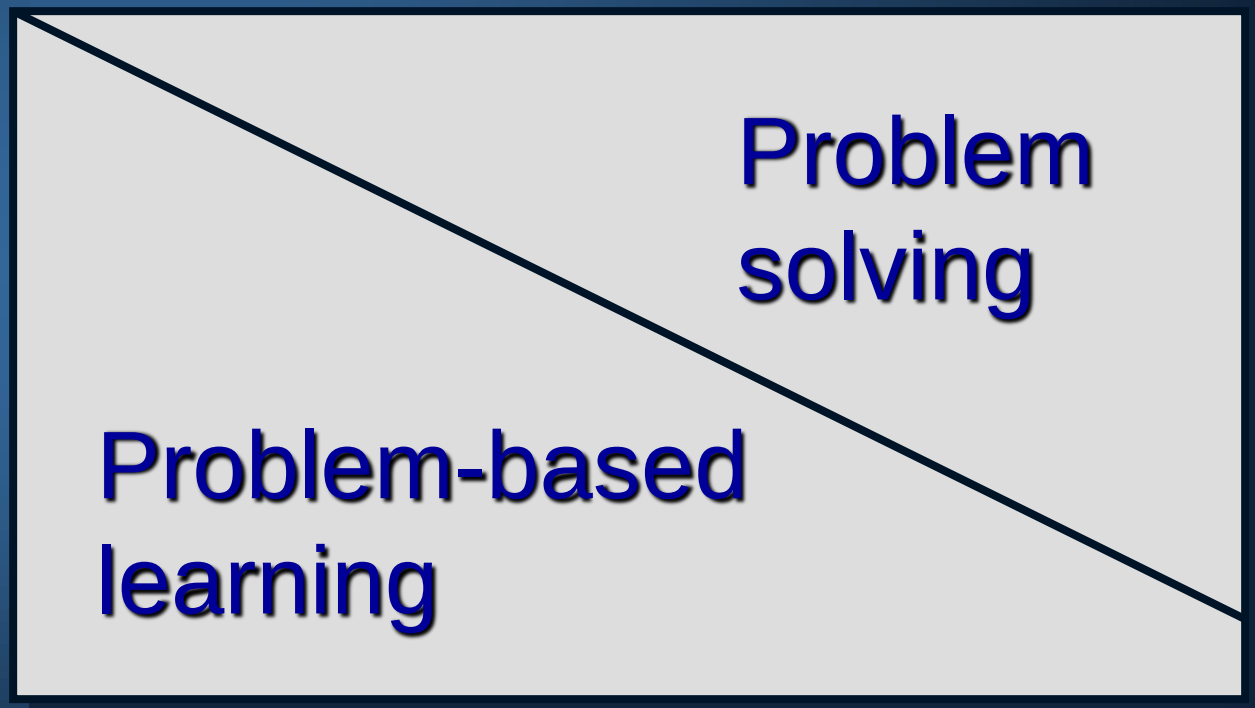
Characteristics of PBL

- Learning is student centered.
- Learning occurs in small student groups.
- Teachers are facilitators or guides.
- Problems form the organizing focus and stimulus for learning.
- Problems are a vehicle for the development of clinical problem-solving skills.
- New information is acquired through self-directed learning.

Characteristics of PBL

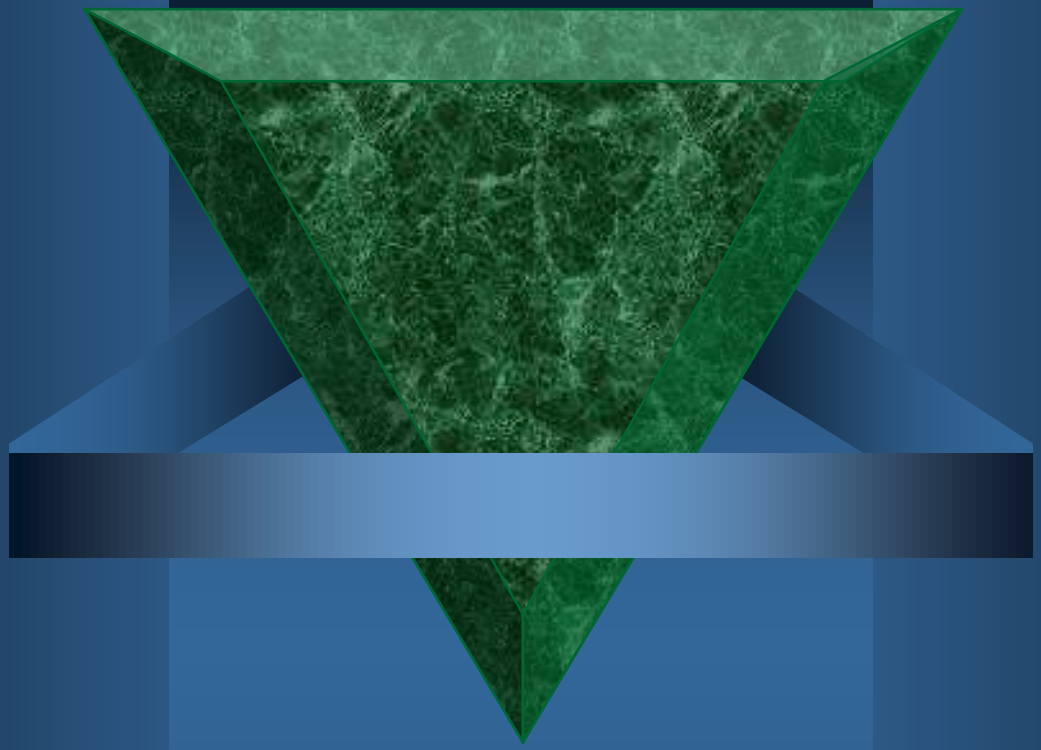
- Shifts away from short, isolated teacher centered lessons
- Creates long term, interdisciplinary student centered Lessons
- Integrates real world issues and practices
- Teaches students to apply what they have learned in university to life-long endeavors

The Relative Proportion



Time in the curriculum

Branda



Objectives

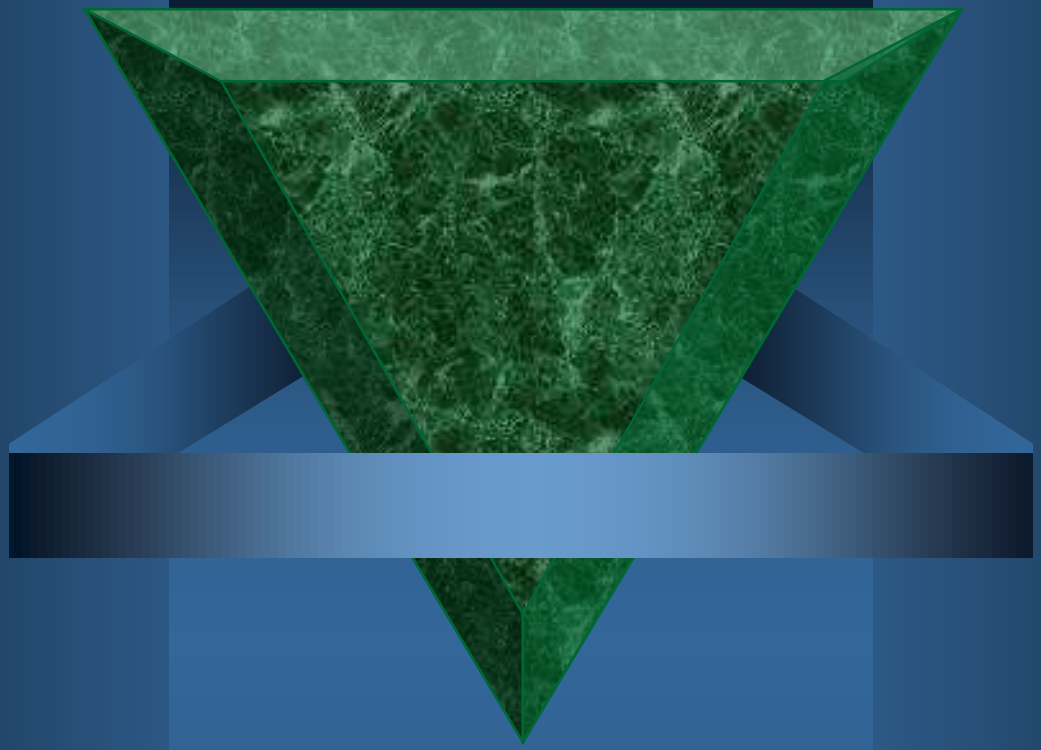
Objectives of the PBL process

To develop:

Knowledge - basic and clinical content in context

Skills - scientific reasoning, critical appraisal, information literacy, the skills of self-directed, life-long learning

Attitudes - value of teamwork, interpersonal skills, the importance of psychosocial issues



Process

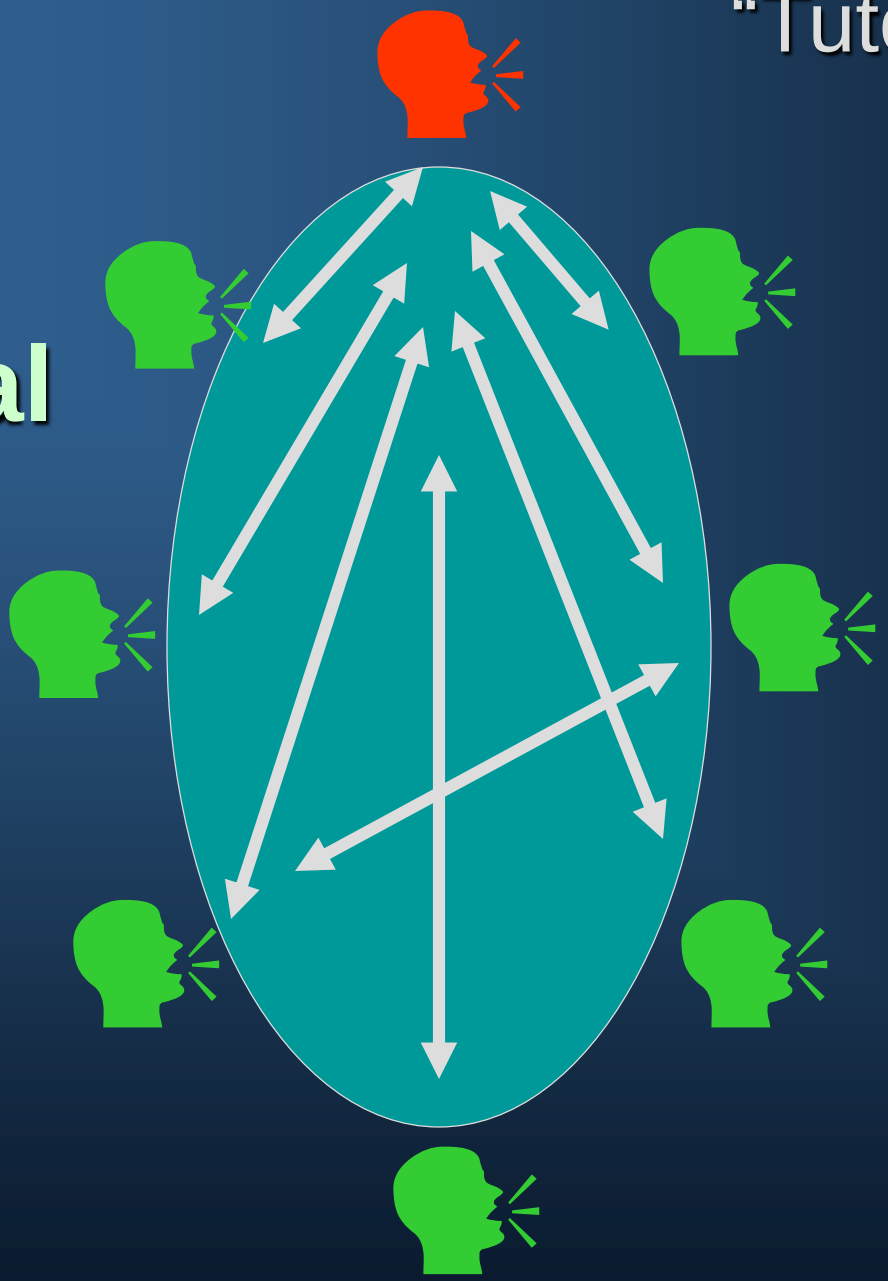
Process of PBL

- Students confront a problem.
- In groups, students organize prior knowledge and attempt to identify the nature of the problem.
- Students pose questions about what they do not understand.
- Students design a plan to solve the problem and identify the resources they need.
- Students begin to gather information as they work to solve the problem.

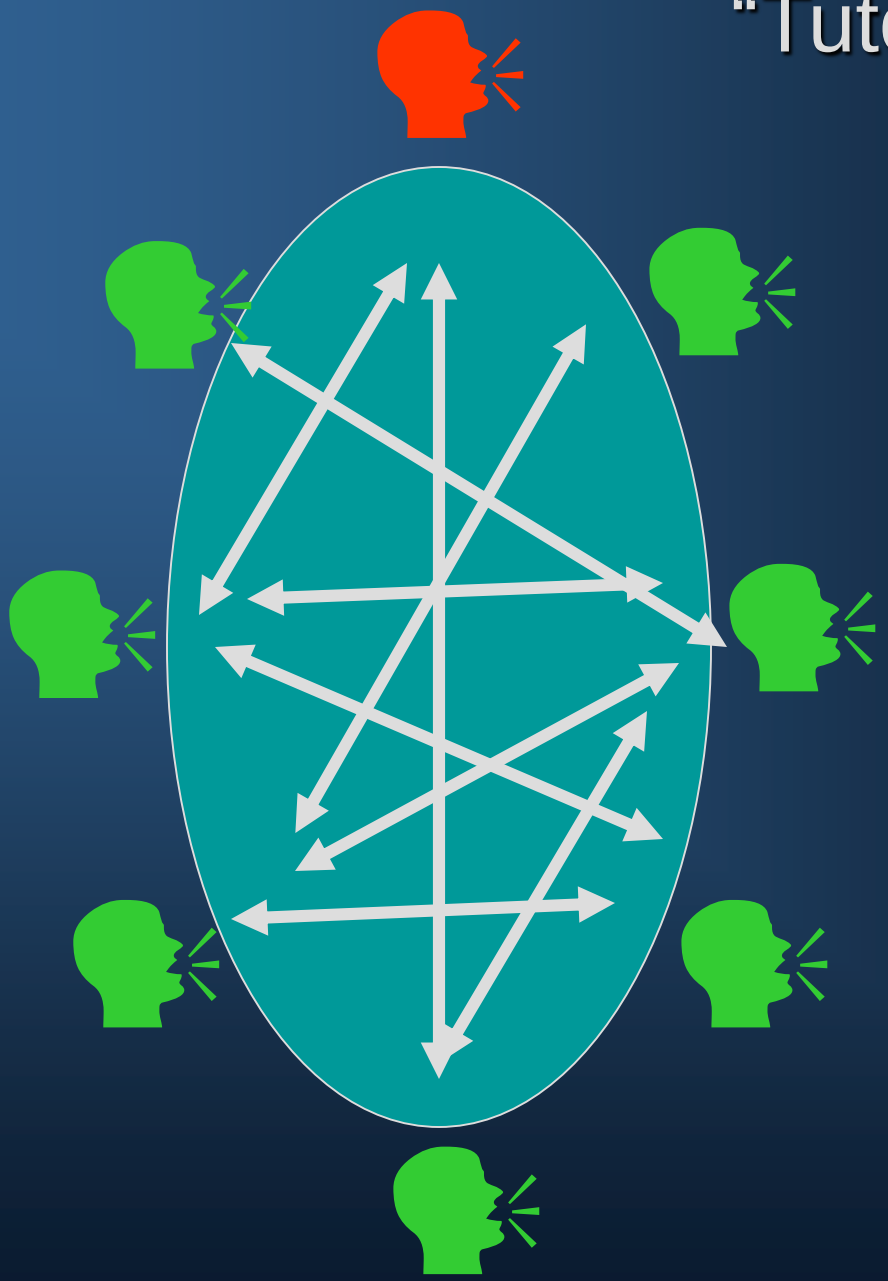
Characteristics of the PBL process

- Usually based on clinical cases, relevant
- Cases are characterized by “progressive disclosure”
- Students come in “cold” to the first tutorial
- Students determine the learning issues
- Sessions are open-ended to allow learning in the interval
- The tutor is a facilitator and not necessarily an “expert”, except in the process

Traditional Tutorial

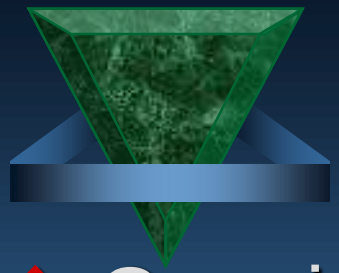


PBL Tutorial



“A Typical Case”

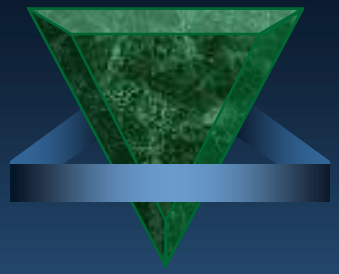
Mrs. Paula Embledon is a 78 year old woman who has come to the emergency room complaining of shortness of breath and pain in her chest. She had been in relatively good health until three weeks previously, when she sprained.....



“A Typical Case”

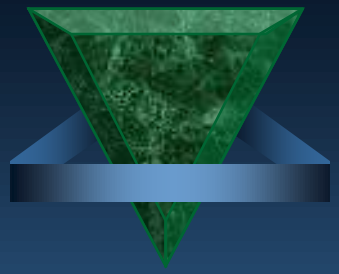
- Opening Scenario
- History of present illness
- Past history, family history, social context
- Physical examination
- Investigations
- Management
- Sequel

Each step may lead back to a previous step, as well as leading to the next step



Characteristics of PBL Cases

1. Relevant, realistic, logical
2. Not too complex
3. Cases are characterized by "progressive disclosure"
4. Story unfolds, step-by-step
5. Narrative provokes discussion leading to next step



Characteristics of PBL Cases

1. Enough issues for in-depth study between sessions
2. Not too many distractors or red herrings
3. Avoid overlap with other sessions
4. Try to introduce unanticipated issues in second session
5. Confine third session to discussion and wrap-up - no new issues

“Progressive Disclosure”

- To allow discussion before leading into the next paragraph, page or session
- Assumes students have knowledge to proceed – if not, make it a learning issue
- May involve “cue” statements
  - “You ask a few more questions…”
  - “You order some investigations.”
  - “She says her sister died young.”

"Progressive Disclosure" -Session Breaks -

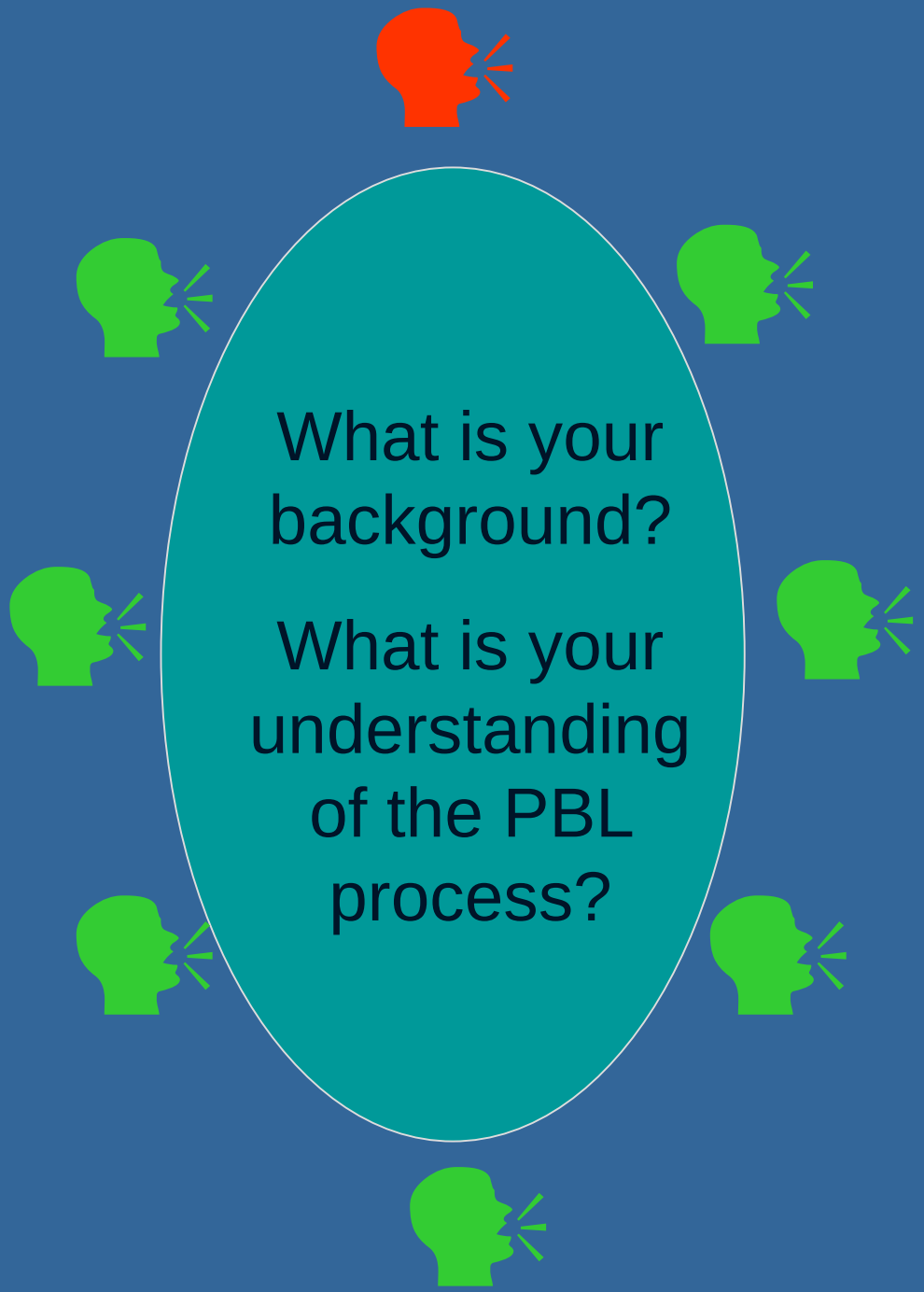
- At the end of the first and the second sessions
- Leaves students with enough to work on - issues essential for all, individual issues
- Reading between sessions should lead naturally to the next - e.g., leading to a differential diagnosis while the next session presents new data

PBL cases are open-ended and the process is iterative

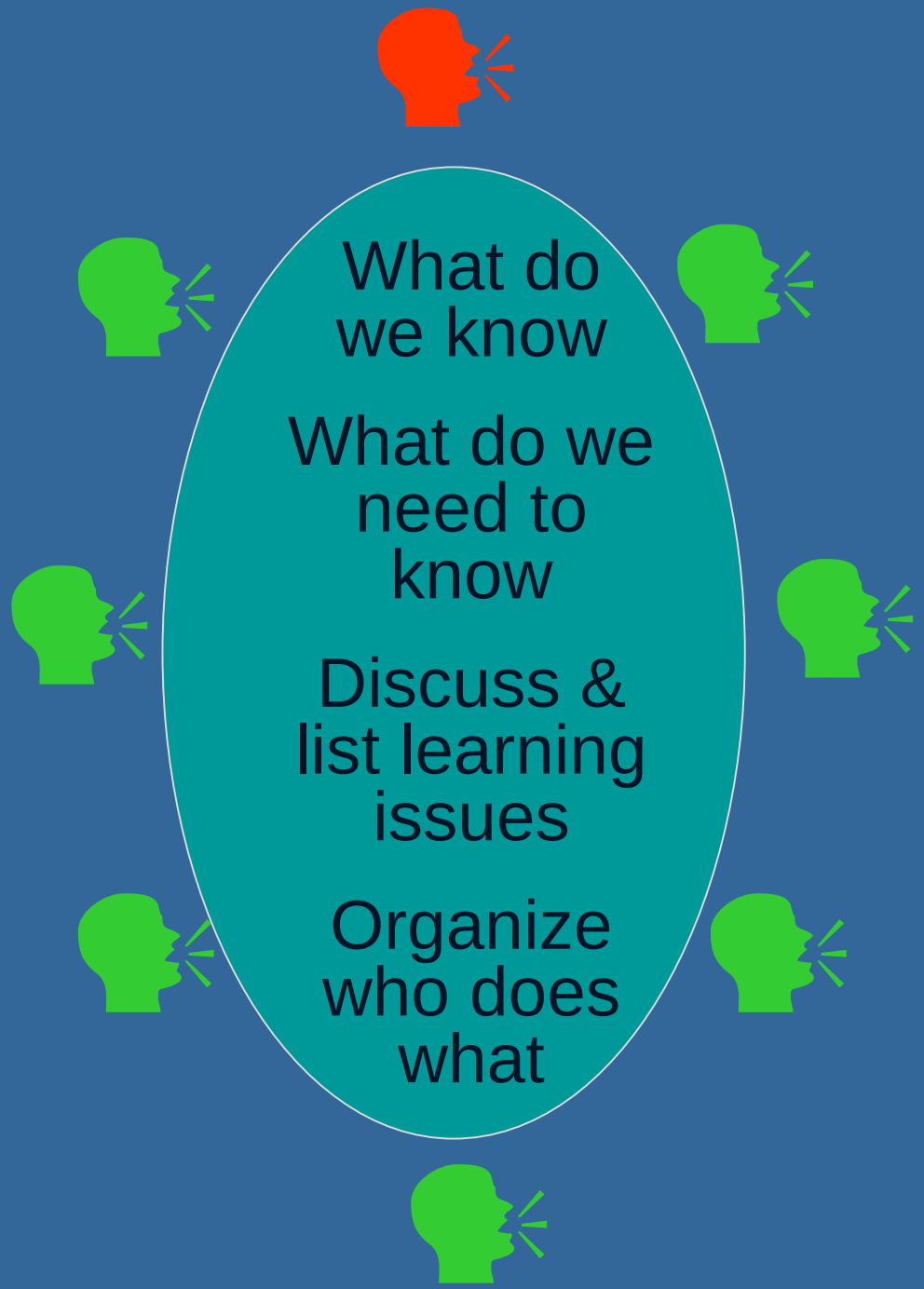
Most programs schedule 1 case over 3 sessions, one or two sessions a week

Some do 2-3 sessions a week - “Case of the Week”

Tutorial 1-1
Introduction to the group and to PBL



Tutorial 1-2
Starting the problem



An important part of PBL is the ***learning*** between sessions

Student PBL Workshop Task (normally 45 minutes)

Read the case

What do you know about this scenario?

What do you need to know?

Discuss & list learning issues

Discuss & list potential sources of information

Organize who (theoretically) will do what

Evaluate how you performed as a group

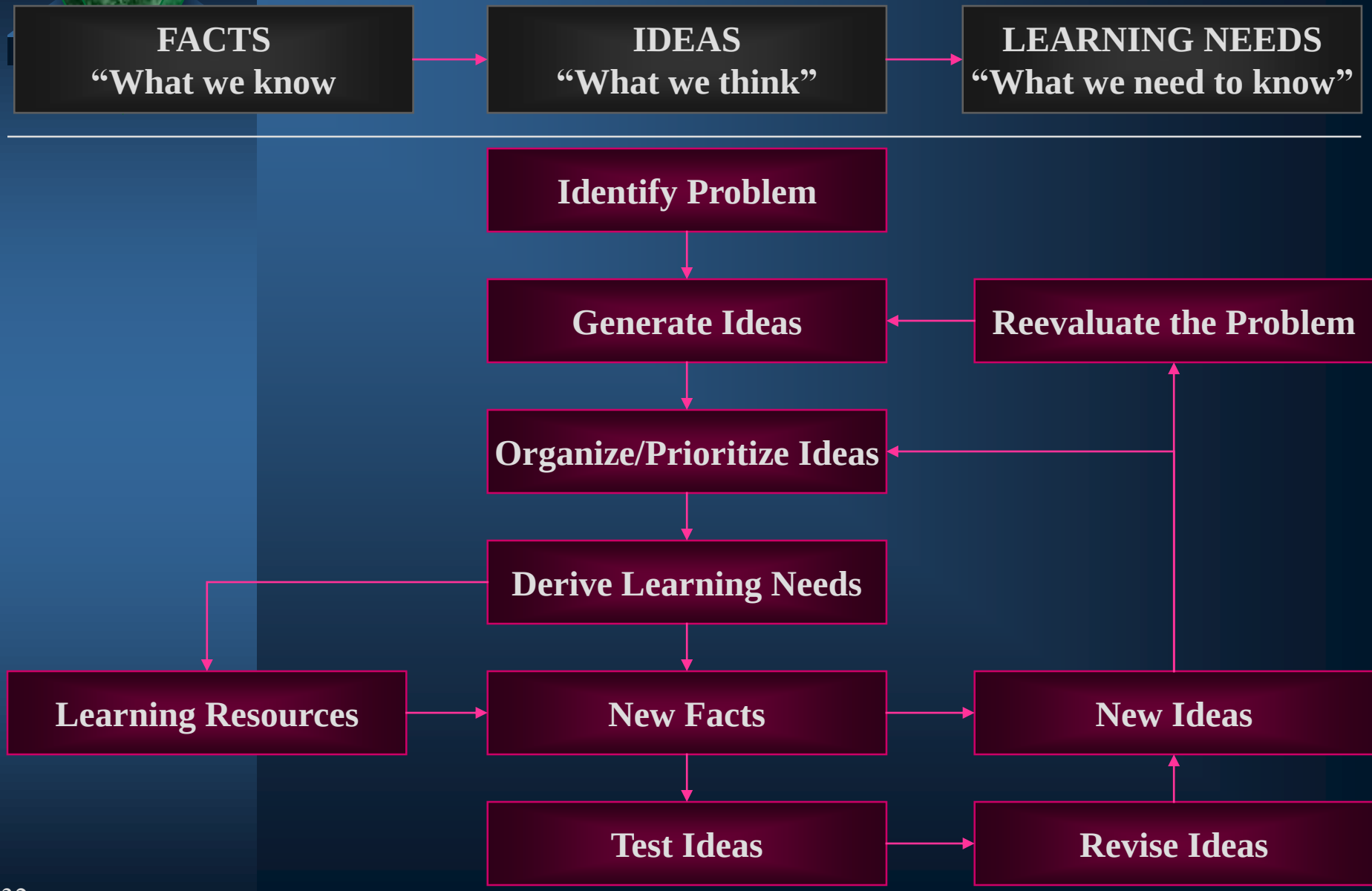
Mr. John Appleseed

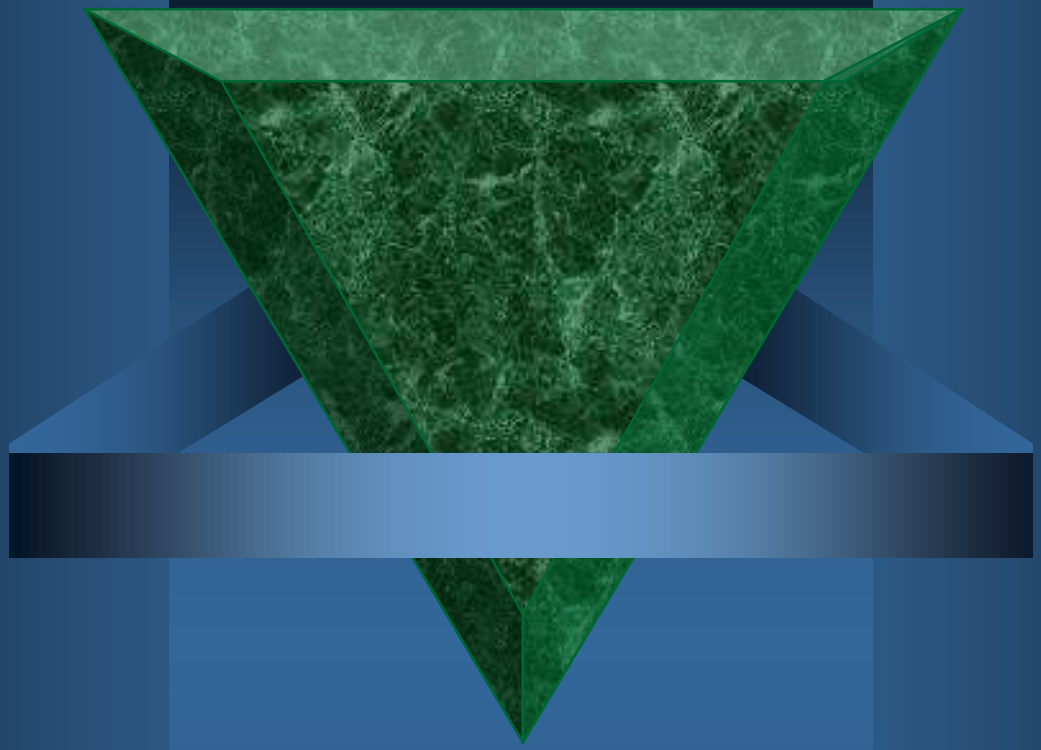
You are a family practitioner in a small town north of Ottawa. Mr. Appleseed is a 38 y.o. white male who comes complaining of a painful swelling in the palm of his right hand. About 4 days ago he was clearing brush behind the barn and pricked his hand on a thorn. The thorn entered about 1 and half inches. There was very little blood and he thought it was OK until yesterday. He tells you he last had a tetanus shot 11 years ago.

You examine his hand. It is red, swollen and inflamed. He is tender along his inner forearm and there is a tender swelling in his axilla.

Otherwise his physical exam is normal.

PBL Process

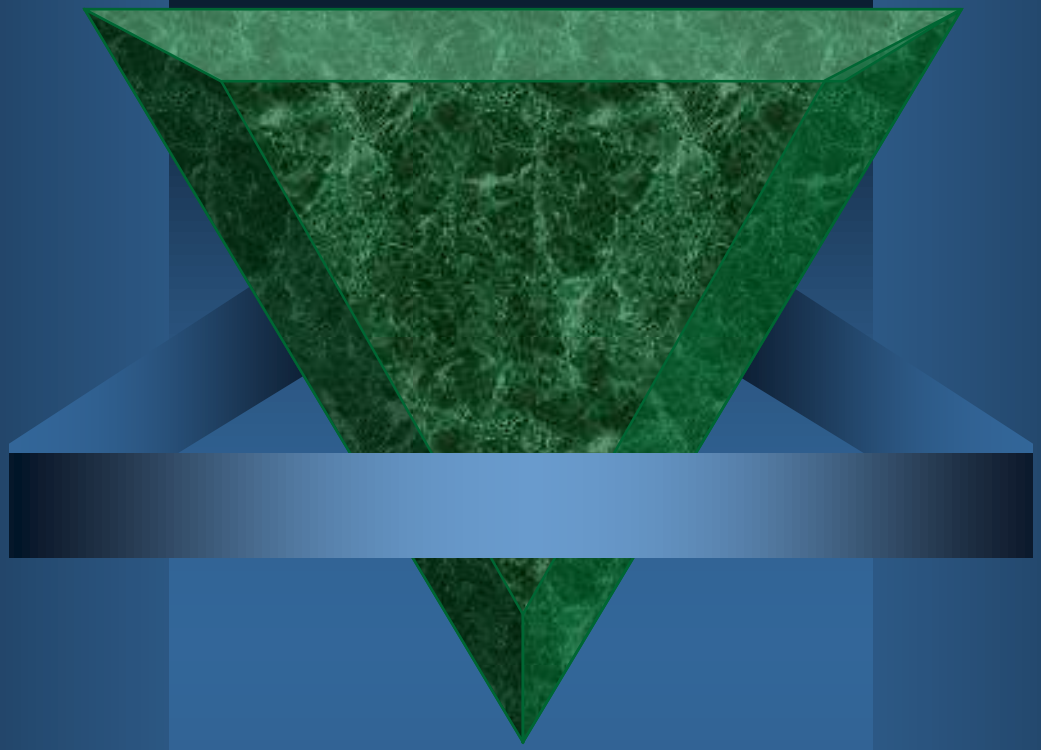

FACTS
"What we know
IDEAS
"What we think"
LEARNING NEEDS
"What we need to know"
Identify Problem
Generate Ideas
Reevaluate the Problem
Organize/Prioritize Ideas
Derive Learning Needs
Learning Resources
New Facts
New Ideas
Test Ideas
Revise Ideas



Evaluation

Evaluation

- Of the group
- Of the student
- Of the tutor
- Of the Content



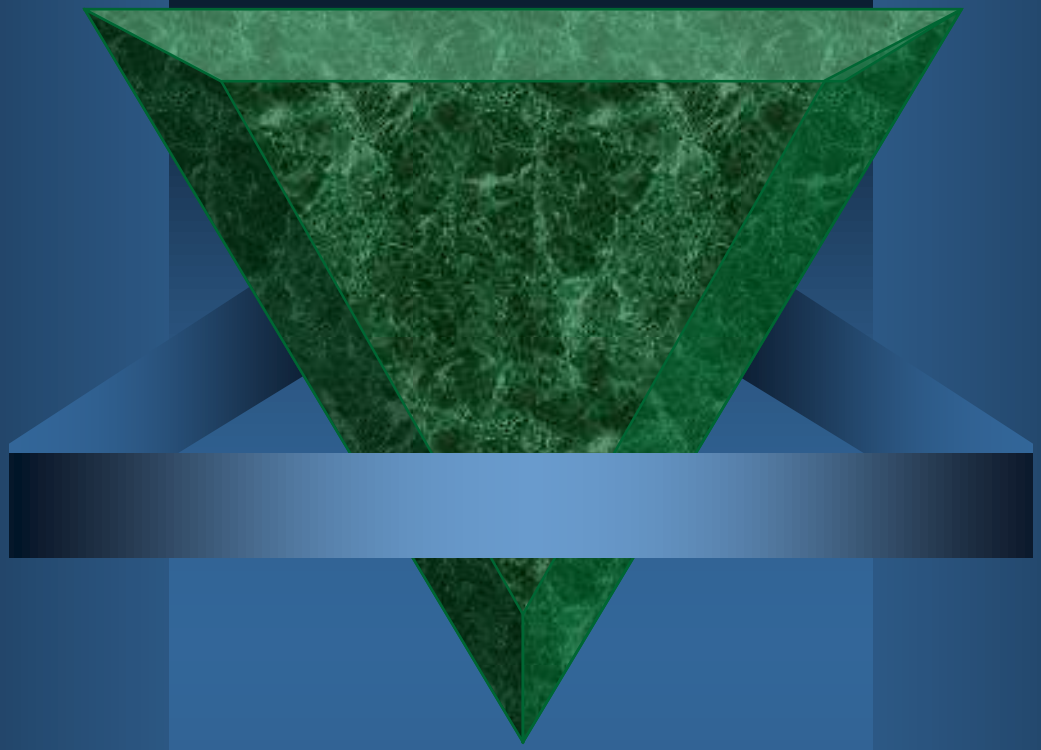
Tutor

Characteristics of a good PBL tutor

- A knowledge of the process of PBL
- Commitment to student-directed learning
- Ability to generate a non-threatening environment while still acting to promote discussion and critical thinking
- Willingness to make constructive evaluation of student and group performance

Characteristics of a good PBL student

- Prompt and present for all sessions
- A knowledge of the process of PBL
- Commitment to self/student-directed learning
- Active participation in discussion and critical thinking while contributing to a friendly, non-intimidating environment
- Willingness to make constructive evaluation of self, group and tutor

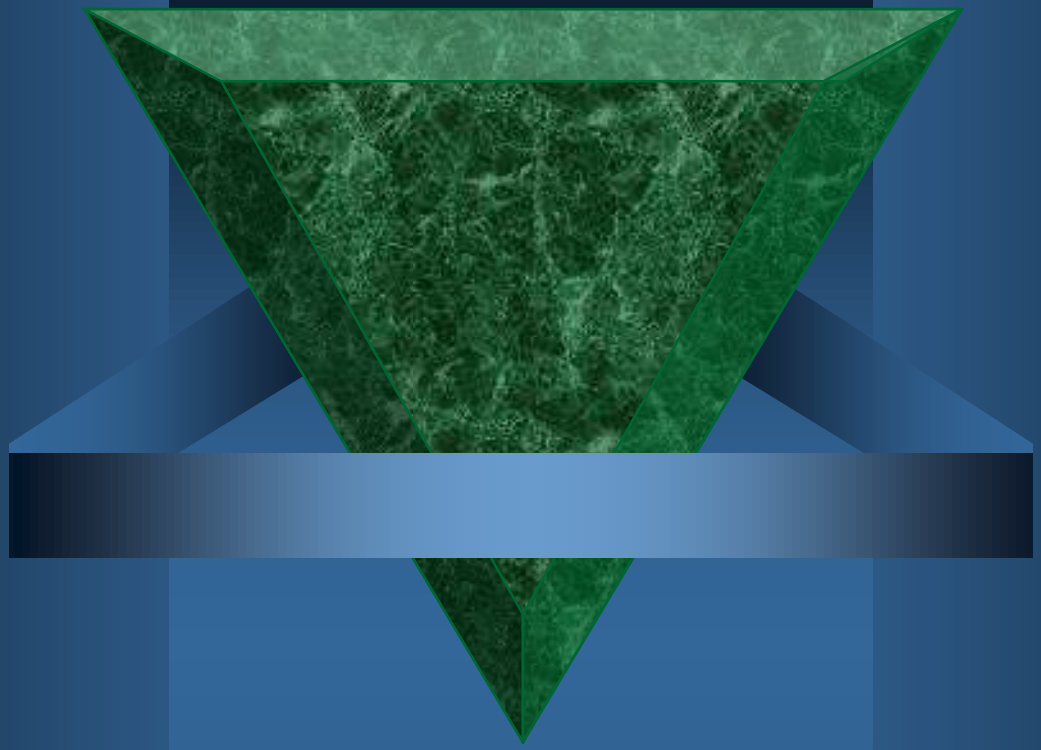


Advantages

The Advantages of PBL

- Emphasis on Meaning, Not Facts
  - By replacing lectures with discussion forums, faculty mentoring, and collaborative research, students become actively engaged in meaningful learning.
- Increased Self Direction
  - As students pursue solutions to their classroom problem, they tend to assume increased responsibility for their learning.
- Higher Comprehension and Better Skill Development
  - Students are able to practice the knowledge and skills in a functional context, thereby to better imagine what it will be like using the knowledge and skills on the job .
- Interpersonal Skills and Teamwork
  - This methodology promotes student interaction and teamwork, thereby enhancing students' interpersonal skills.

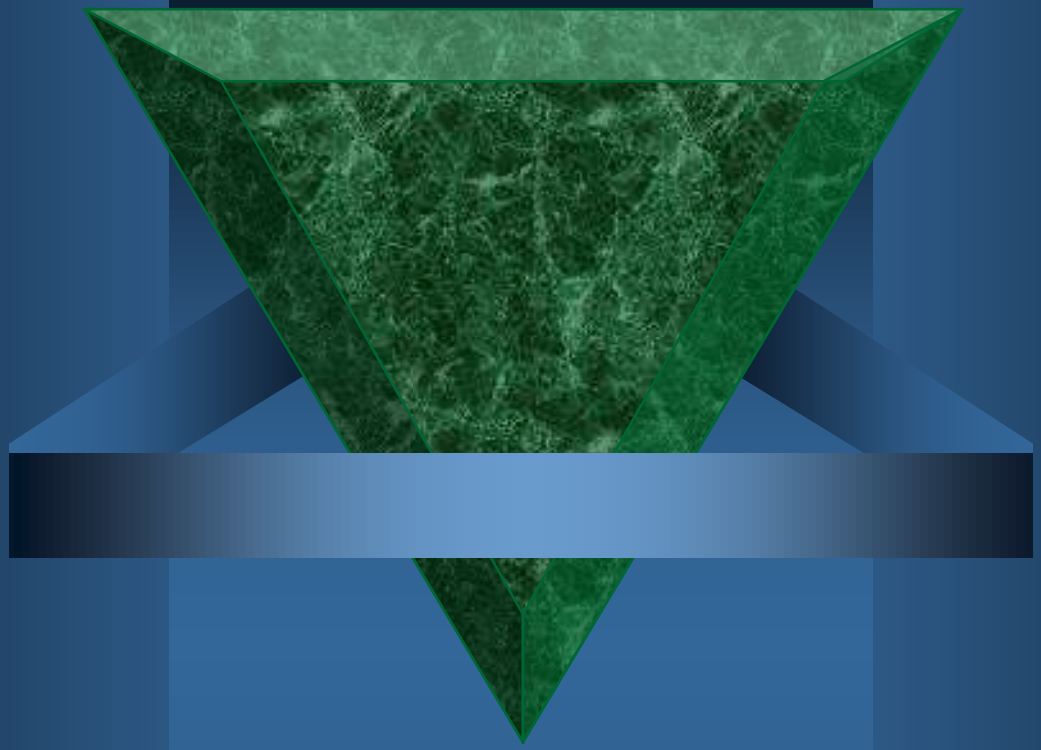
- Self-Motivated Attitude
  - Students think problem based learning is a more interesting, stimulating, and enjoyable learning method, and that it offers a more flexible and nurturing way to learn.
- Facilitator-Student Relationship
  - The aspect faculty liked most is the tutor-student relationship (Vernon, 1995). Faculty also consider problem based learning a more nurturing and enjoyable curriculum, and believe the increased student contact is beneficial to the cognitive growth of the student (Albanese & Mitchell, 1993).
- Level of Learning
  - Problem based learning medical students score better than traditional students with respect to learning skills, problem-solving, self-evaluation techniques, data gathering, behavioral science, and their relation to the social-emotional problems of patients (Albanese & Mitchell, 1993).



Disadvantages

Problems with PBL in hybrid curricula

- Finding enough tutors - 1 for each 6 students
- Faculty busy with “traditional” curriculum
- The range of topics which can be discussed is a limiting factor - quality control is difficult
- Heavy on library, computer resources, support
- Objective evaluation of PBL is difficult
- Inherent conflict with lectures - waste of time



Models

Factors In Choosing a Model

- Class size
- Intellectual maturity of students
- Student motivation
- Course learning objectives
- Instructor’s preferences
- Availability of peer tutors

Medical School Model

- Dedicated faculty tutor
- Groups of 8-10
- Very student-centered
- Group discussion is primary class activity

A Good Choice for

- Highly motivated, experienced learners
- Small, upper-level seminar classes

Floating Facilitator Model

- Instructor moves from group to group:
  - asks questions
  - directs discussions
  - checks understanding
- Group size: 4
- More structured format: instructor input into learning issues and resources

Floating Facilitator Model

- Class activities besides group discussions:
  - groups report out
  - whole class discussions
  - mini-lectures

A Good Choice for

- Less experienced learners
- Small to medium-sized classes

Peer Tutor Model

- Advanced undergraduates serve as tutors
  - help monitor group progress and dynamics
  - serve as role models for novice learners
  - capstone experience for tutor

- Group size: 6-8 (dedicated peer tutor)

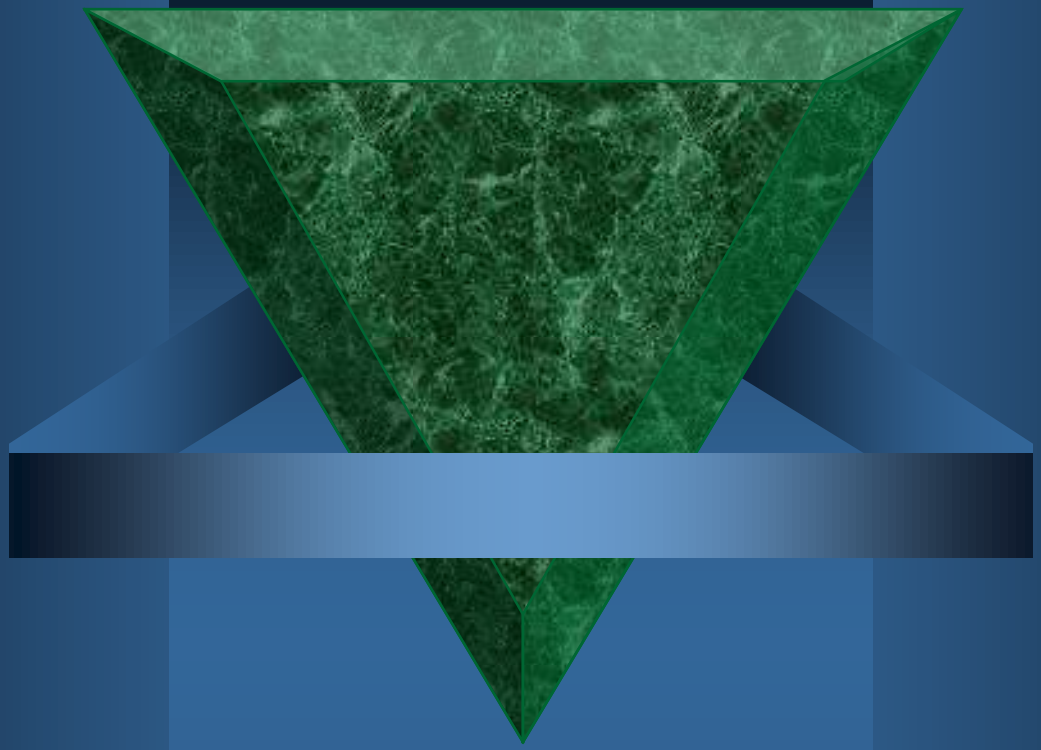
  4 (if tutor rotates among 2-3 groups)

Peer Tutor Model

- Tutor training important
  - Development of questioning skills
  - Group dynamics
  - Resource guide

A Good Choice for

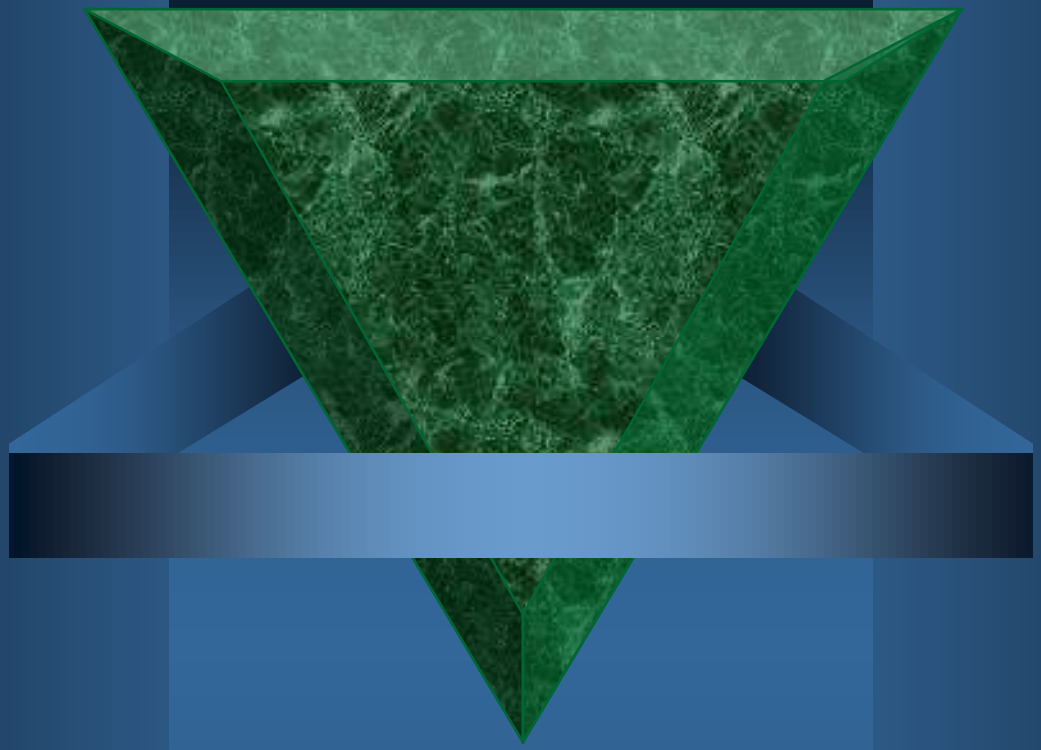
- Classes of all sizes



Large Classes

Large Classes

- Floating facilitator or peer tutor models are the most appropriate
- Requires a more teacher-centered, structured format: instructor directs group activities
- Group size: 4
- Numbers advantage in dealing with group vs. individual papers, projects



Build-A-Case: A New Format for Case-Based Learning

Three core principles of adult learning

- Learners are in control of the learning process.
- Teachers activate learners knowledge scripts and encourage a process of analysis and synthesis.
- Teachers provide a learning context that is as similar as possible to that in which knowledge is eventually applied

Building cases mirrors naturalistic learning

When physicians talk about cases several things happen:

1) A composite case is formed during the discussion

2) These composites are nuanced to practice contexts

3) A diversity of approaches to assessment and intervention emerges

4) Recognition of this diversity between peers creates a learning moment.

5) The moment may facilitate accommodation to more explicit schema

Build-A-Case captures this most natural and contextual process of learning and is a distinct application of PBL.

The Build-A-Case Process

- A learning need is identified
- A Build-A-Case group is convened
- The “typical case” inquiry is initiated
- The case is recorded on flip charts or computer/projector
- A consensus on treatment is developed.
- Using practice guidelines, a gap analysis is facilitated
- Practice gaps are debated

6 Basic Steps to Planning and Implementing PBL

- **Decide on the project/problem**
  - content, scope, major goals of project, TEKS or TAAS objectives
- **Draft time frame**
  - Length, due dates, check points, (allow room for growth and changes in project)
- **Plan for activities**
  - Tie these in with the time frame

- **Plan for Assessment**
  - Rubrics, checklist, etc.
- **Begin project with student**
  - discussion, show possible samples
- **Finish project and reflect**
  - highlights, improvements, personal reflection and things to remember next time

Maastricht "seven jump" sequence for PBL

1. Clarify and agree working definitions and unclear terms and concepts
2. Define the problems; agree which phenomena need explanation
3. Analyze the problem (brainstorm)
4. Arrange possible explanations and working hypotheses
5. Generate and prioritize learning objectives
6. Research the learning objectives
7. Report back, synthesize explanations, and apply newly acquired information to the problem

Words of Wisdom

- Integration is very involved
- Plan well
- Go slow, integrate one piece at a time
- Don’t give up when unsuccessful, learn from the situation and try again
- Remember, it’s not the situation that causes the frustration, it’s your reaction to the situation.
- Try teacher chat rooms, web sites, etc.for ideas

Some Useful References

Argyris, C. (1990) Overcoming Organizational Defenses: Facilitating Organizational learning. N.Y.: Alleyn & Bacon

Barrows, HS & Mitchell, DL (1975) An innovative course in undergraduate, neuroscience: Experiments in problem-based learning with 'problem boxes'. British Journal of Medical Education, 9, 223-230.

Barrow,HS. (1986) A taxonomy of problem based learning methods, Medical Education, 20,(6), 481-6.

Jonassen, D. H. and Marra, R. M. (1994) Concept mapping and other formalisms as tools for representing knowledge. Alt-J. 2(1), 50 -56.

Laurillard, Diana, (1993) Rethinking University Teaching: a framework for the effective use of educational technology, London: New York: Routledge. (P. 37)

Schank, R.C. & Abelson, R. (1977) Scripts, plans, goals , and understanding. Hillsdale, N.J.: Erlbaum

Some Useful References

Schmidt HG, Norman GR, & Boshuizen HPA. (1990) A cognitive perspective on medical expertise: Theory and implications. Academic Medicine, 65(10), 611-621