PBL Overview

What is PBL?

Problem-based learning is an **instructional strategy** (a curricular framework) that, through student and community interests and motivation, provides an appropriate way to “teach” sophisticated content and high-level process… all while building self-efficacy, confidence, and autonomous learner behaviors.

PBL is

an instructional method that challenges students to "learn to learn," working cooperatively in groups to seek solutions to real world problems.

PBL

- engages students' curiosity and initiates learning the subject matter.
- provides excellent opportunities for students to think critically and analytically, and to find and use appropriate learning resources
- promotes autonomous learning

Research on PBL

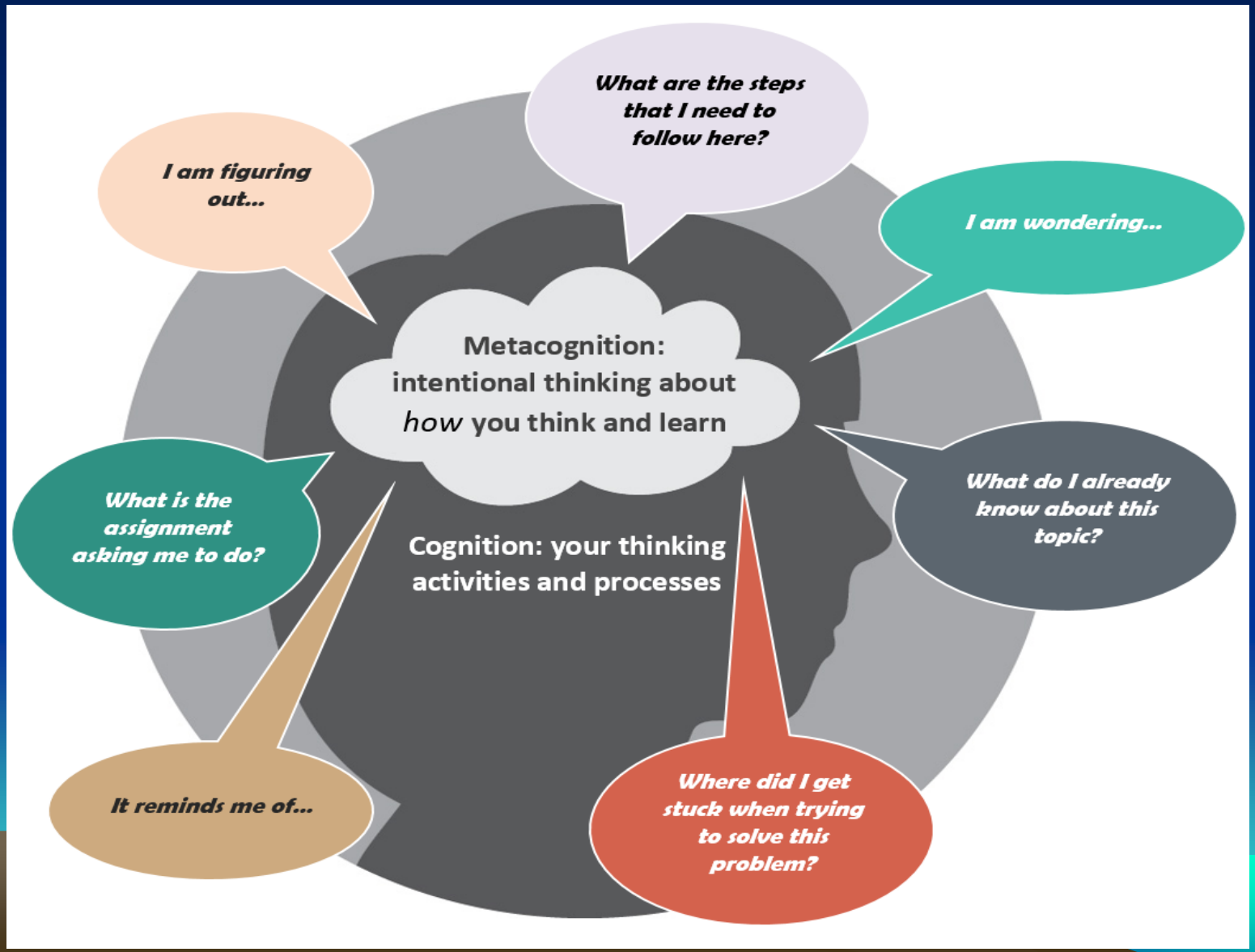
- Students show significant learning gains in experimental design through a PBL approach (VanTassel-Baska, et al. 2000)
- Students show enhanced ‘real world’ skills with no loss in content knowledge as a result of using PBL (Gallagher & Stepein, 1996; Gallagher & Gallagher, 2003)
- Students & teachers are motivated to learn using the PBL approach (VanTassel-Baska, 2000)
- Students show enhanced higher order skill development using PBL over other approaches to teaching science (Dods,1997)

Students should be given problems – at levels appropriate to their maturity – that require them to decide what evidence is relevant and to offer their own interpretations of what the evidence means. This puts a premium, just as science does, on careful observations and thoughtful analysis. Students need guidance, encouragement, and practice in collecting, sorting, and analyzing evidence, and in building arguments based on it. However, if such activities are not to be destructively boring, they must lead to some intellectually satisfying payoff that students care about.

-- from *Science for All Americans, Project 2061*

Characteristics of PBL

- Learner-centered
- Real world problem
- Teacher as tutor or coach
- Emphasis on collaborative teams
- Employs metacognition
- Uses alternative assessment
- Embodies scientific process


What are the steps that I need to follow here?
I am figuring out...
I am wondering...
Metacognition: intentional thinking about *how* you think and learn
What is the assignment asking me to do?
What do I already know about this topic?
Cognition: your thinking activities and processes
It reminds me of...
Where did I get stuck when trying to solve this problem?

Characteristics of PBL

- Students are in charge of learning
- Requires problem finding
- Requires students to make connections & create ‘new’ knowledge
- Requires deep thinking
- There is no single right answer

Characteristics of PBL

Have we considered all possibilities?

What assumptions are we making?

Why is this strategy not working?

PBL Roles

Teacher:

- Present an ill-structured problem
- Act as a metacognitive coach

Student:

- Create a precise problem statement
- Find information to solve the problem
- Evaluate possible solutions
- Create a final product

Scientific Habits of Mind

Cognitive skills, affective skills, and attitudes:

- Curiosity
- Creativity
- Objectivity
- Openness to new ideas
- Skepticism
- Tolerance for ambiguity

Self-Directed Learning… Grasping Metacognition

- Self-monitoring performance with an intent to self-assess
- Recognizing gap in knowledge and set up learning agenda
- Identifying learning resources:
  - print
  - human
  - technology-based
- Identifying skills needed to use resources wisely and well
- Sorting through information to determine needed information
- Questioning appropriateness of personal biases
- Applying information appropriately

Problem Based Learning

- State the problem
- Decide what information you need
- Conduct information quest
- Complete scientific investigations
- Review data & summarize findings
- Communicate problem resolution

What's an "Ill-Structured" Problem?

- More information than initially is presented will be necessary to…
  - understand what's going on.
  - know what caused it to be a problem.
  - know how to fix it.
- There's always more than one right way to figure it out.
  - Fixed formulas won't work.
  - Each problem has unique components.
  - Each problem solver has unique *characteristics, background, experience.*

What's an "Ill-Structured" Problem?

- The definition of the problem shifts or changes as new information is gathered.
- Ambiguity is a part of the environment throughout the process.
  - Data are often incomplete
  - …or in conflict
  - …or unavailable
  - but choices must be made, anyway.

Ill-Structured Problems

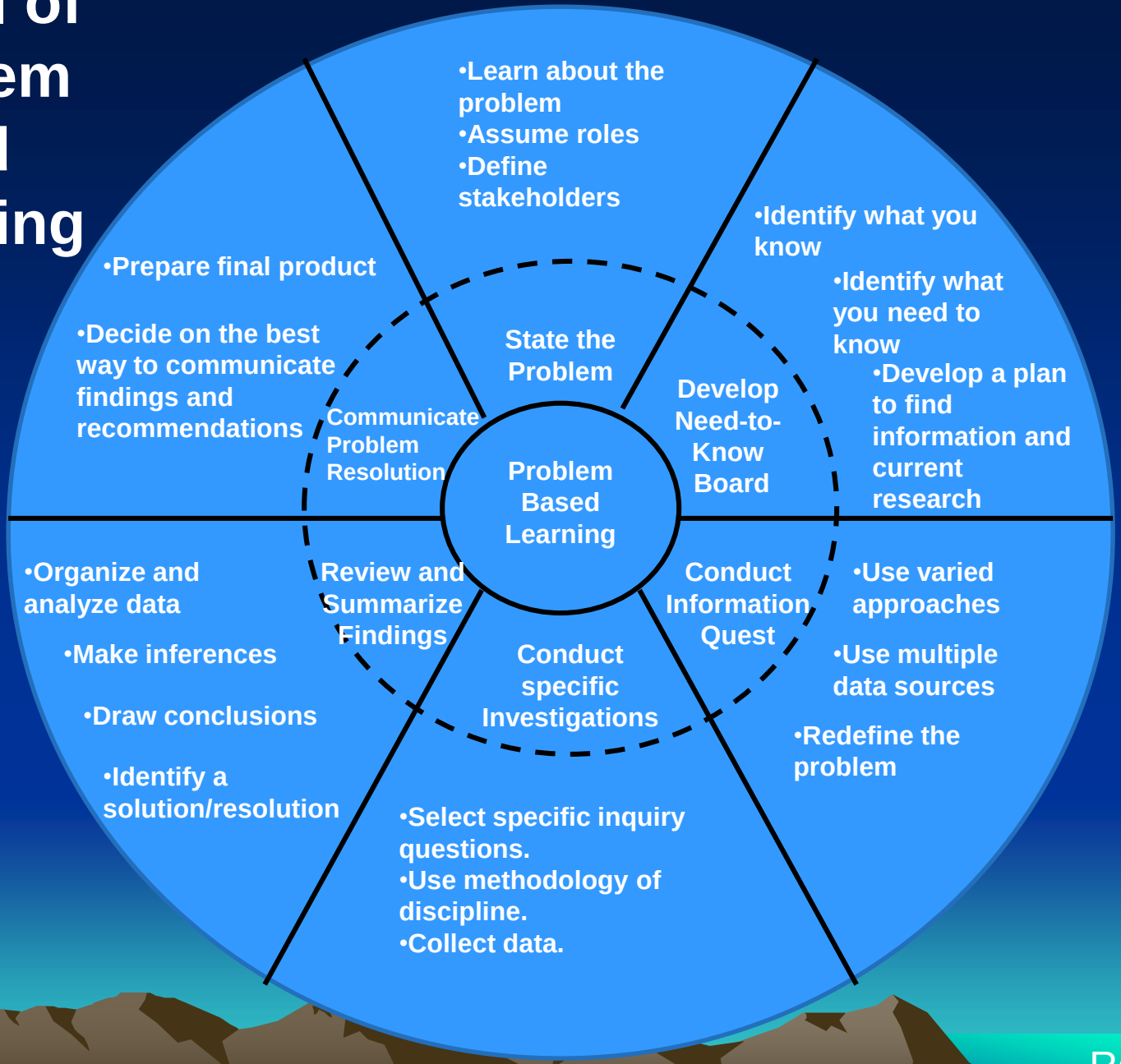
- Ambiguous
- No single “right” answer
- Data is often incomplete
- Definition of problem changes
- Information needs change or grow
- Stakeholders
- Deadline for resolution

Problem Diagnosis and Solution Building

- Ill-structured problem is presented
  - What is going on?
  - What do we know?
  - How can we find out?
  - Where does the information lead us?
  - Do we have enough information?
  - Is the information reliable?
  - What's the problem?
- Problem is represented

Dealing with real-world problems

Wheel of Problem Based Learning



Robbins, 2008

Need to Know Board

What do we know?	*What do we need to know?*	*How can we find out?*