

Introduction to PBL



*Institute for Transforming
Undergraduate Education*



University of Delaware



PBL Contrasted with Subject-Based Learning

START

Given problem to illustrate how to use it

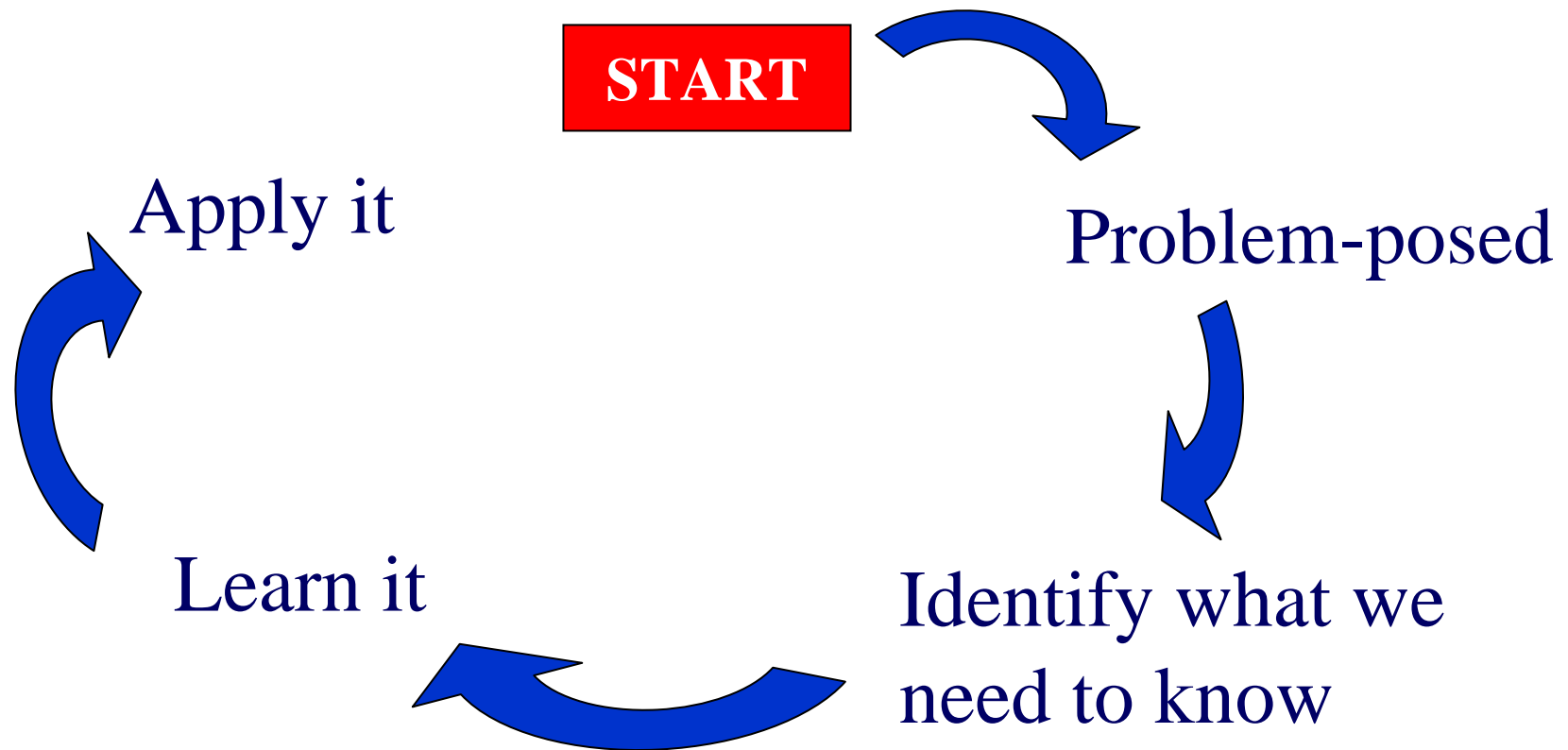
Told what we need to know

Learn it

From Smith et al, 2005. Pedagogies of engagement: Classroom-based practices. J. Engineering Education, January 2005. 87-101.



PBL Contrasted with Subject-Based Learning



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PBL: The Process

Resolution of Problem;
(How did we do?)



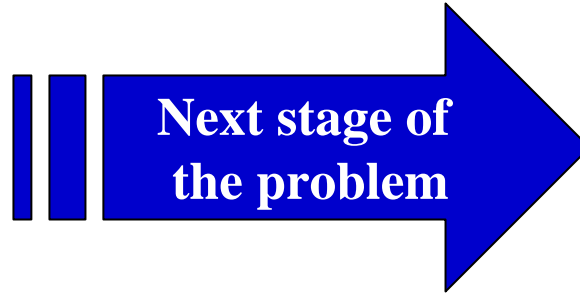
Integrate new
Information;
Refine questions



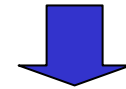
Reconvene, report
on research;



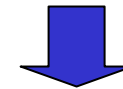
Research questions;
summarize;
analyze findings



Presentation of Problem



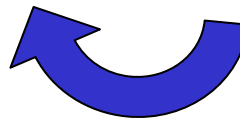
Organize ideas and
prior knowledge
(What do we know?)



Pose questions (What do
we need to know?)



Assign responsibility
for questions; discuss
resources





Types of Learning Objectives

Content-oriented: subject specific

- Basic knowledge and understanding of specific concepts, techniques, etc. in the discipline

Process-oriented: global skills

- Effective communication: oral and written
- Acquiring and evaluating information
- Working effectively with others
- Higher order, critical thinking



Medical School Model

Dedicated faculty tutor

Groups of 8-10

Very student-centered environment

Group discussion is primary class activity

A good choice for:

Highly motivated, experienced learners

Small, upper-level seminar classes



Typical Medical School PBL Problem: High Degree of Authenticity

Patient arrives at hospital, ER, physician's office presenting with symptoms X, Y, Z

What questions should you ask?

What tests should you order?

Physician interviews patient, receives results of tests

Differential diagnosis

Preferred therapy



A Typical Day in an Undergraduate PBL Course





Question for Groups

What challenges to PBL implementation exist for the undergraduate context?

Be prepared to report out in 5 min



“Hybrid” PBL

Non-exclusive use of problem-driven learning in a class

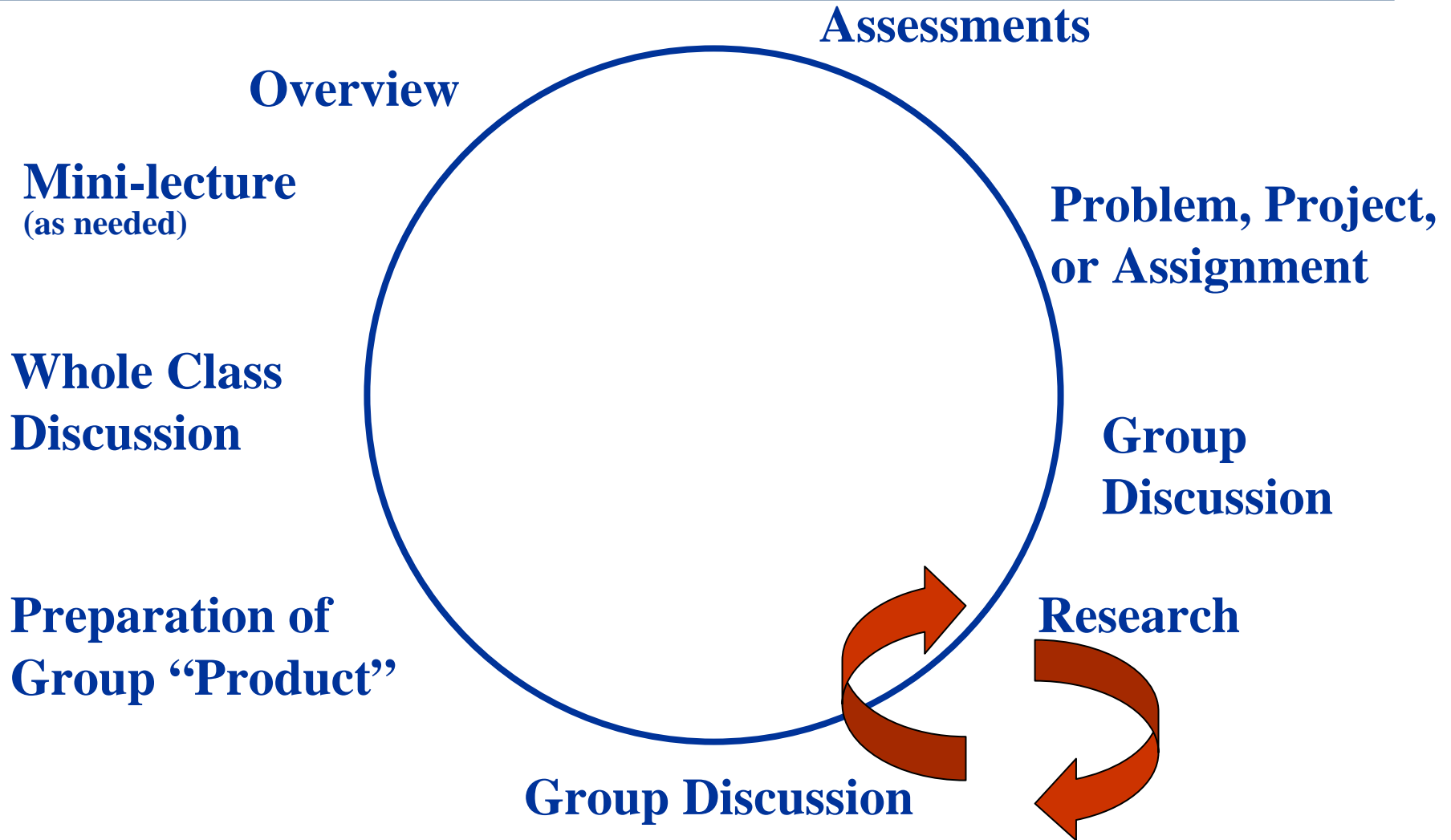
May include separate lecture segments or other active-learning components

Floating or peer facilitator models common

Often used as entry point into PBL in course transformation process



Problem-Based Learning – Hybrid Model





Hybrid Models of PBL

Writing

Debates

Laboratory

Exams & other
formal
assessment

Lecture

PBL

Concept
mapping &
other informal
assessment

Presentations

Discussions



Another Type of Hybrid Model

PBL

Debates

Writing

Lecture

Laboratory

Exams & other
formal
assessment

Presentations

**Concept mapping
& other informal
assessment**

Discussions



Introductory Biology – An Example for Small Enrollment Courses

Course is one section of multi-section 2-semester survey course for science and allied health majors

6-7 PBL problems per semester

Session time ranges from 75 - 120 min.

PBL activities comprise 85-90% of total course time

4-5 student groups of up to 6 students

1 peer facilitator (junior or senior) per group

(same model also used in upper division bio course)



General Chemistry: An Example of a Hybrid Model

Problem-based group work	40%
Lecture/whole-class discussion	50%
Demonstrations	7%
Other (Exam, lab review)	3%

*Source: Susan Groh, Ph. D., Department of Chemistry & Biochemistry,
University of Delaware*



Overview of Additional Models

Biology

4 problems per semester (2 ½ periods each)

2 lecture days, 1 PBL day per week

Criminal Justice

1 two-week problem on important course content

Many courses

PBL activities in discussion, lab



Question for Groups

Reflect on this morning's experience,
or on prior experience with PBL:

What role do instructors play in a
PBL course?

Be prepared to report out in 5-10 min.



PBL Models for Undergraduate Courses

Medical School Model

Small class, one instructor to 8-10 students

Floating Facilitator Model

Small to medium class, one instructor, up to ~75 students

Peer Facilitator Model

Small to large class, one instructor and several peer facilitators

Large Class Models

Floating facilitator and hybrid PBL/other activities



Floating Facilitator Model

Instructor moves from group to group:

- Asks questions, directs discussions, checks understanding

Group size: 4

More structured format:

- Greater degree of instructor input into learning issues and resources

Other class activities:

- Groups report out
- Whole class discussions
- (Mini-)lectures

A good choice for:

- Less experienced learners
- Classes of all sizes



Dealing with Large Classes

Using PBL with large classes (> 100 students) presents special challenges, but can be successful.

Consider hybrid PBL or floating/ peer facilitator models

Peers, TA's help extend instructor's presence

Use a more teacher-centered, structured format

Incorporate guiding questions into problems

Interrupt group activity more often for

- Discussion of learning issues
- Reporting out to whole class

In fixed seating lecture hall, keep some rows unoccupied for better access to all groups.

Group grading (vs. individual) papers/projects can reduce grading burden.

Consider visual (readily graded) assessments (graphs, diagrams, concept maps, etc.)



Peer Facilitator Model

Advanced undergraduates serve as facilitators

Help monitor group progress and dynamics

Serve as role models for novice learners

Capstone experience for facilitator

Instructor's role

Gives orienting lectures

Leads whole class discussions

Works with facilitators behind the scenes



Strategies Typically Used to Teach a PBL Problem

- 1) “Mini” lecture to introduce problem
- 2) Instructor provided input at regular intervals
- 3) Mechanism for groups to compare notes
- 4) Instructor circulated amongst the groups
- 5) Instructor provided some resources
- 6) Problem constructed to allow for 1-5
- 7) Problem constructed to provide learner prompts for PBL novices



Reflections and Questions

