

Designing PBL Problems: Part 2



*Institute for Transforming
Undergraduate Education*

University of Delaware



Problem-Based Learning:
From Ideas to Solutions through Communication
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Getting Started: Course Specifics

Students	Majors/nonmajors
	Novice/mature learners
	Prior experience with PBL, group work
Problem	One-time use vs. one of several
	Length of problem, timing within course
	Structure: staging, guiding questions
	Learning objectives to be addressed
	Student products, assignments, assessment
	Resources available (including peer tutors)

Getting Ideas for Writing Problems

1. Begin with the desired learning objectives.
2. Look for a real-life example or situation that involves those concepts.

1. Begin with a real-life story or example.
2. What content and process objectives might be found in that story?

Problem Sources and Strategies

- News events, articles
- Popular or scholarly press in the discipline
- Authentic tasks, roles, etc. as triggers
- Case studies
- Adaptation of text problems or questions



Source Example: News Event



Trigger: NY Times report of Galapagos oil spill
Problem: Conversation between 2 oil molecules

“Boy, that really frosts me!”

“What are you griping about now?”

“That story about how those islands and their oh-so-precious life forms are in danger again from the nasty oil spill. Every time something like this happens, who’s the bad guy? Us, that’s who. Nobody ever thinks about what it’s like for us - one minute, all snuggled up together, safe and sound, inside a nice dark tanker hold - and then, all of a sudden, thrown out into that disgusting ocean. Does anyone ever care about what we have to go through? No - they just worry about stupid creatures without enough sense to get out of our way. And another thing...”

“Simmer down - if you get any more excited, you’re liable to change state - and where would that get you?”

“Far from here, I hope - I’ve had it with these seals sliding all over me! And think about it - do you still want to be here when those cleanup guys arrive? I’ve heard horror stories about that!”



Source Example: News Event

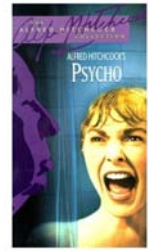


Task: *Be compassionate and try to see this situation from an oil molecule's point of view. Describe yourself; what is your (molecular level) environment like, both before and after the oil spill? Why do you behave as you do? What will the "cleanup guys" bring to this picture?*

Concepts introduced: energetics of solution formation, solubility and intermolecular forces, micelles, surfactants, chemical rationale behind cleanup, environmental issues



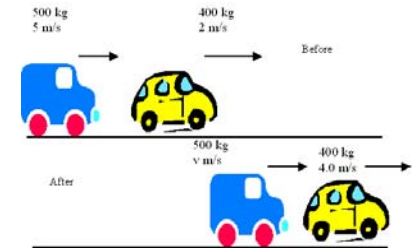
Source Example: Authentic Tasks



- **Trigger:** discussion of National Film Preservation Act
- **Problem:** choose a film to nominate for inclusion in the National Film Registry
- **Task:** prepare a critical analysis of the film and submit a persuasive nomination to the Library of Congress.
- **Concepts introduced:** theories and strategies of film analysis, development of evaluative criteria

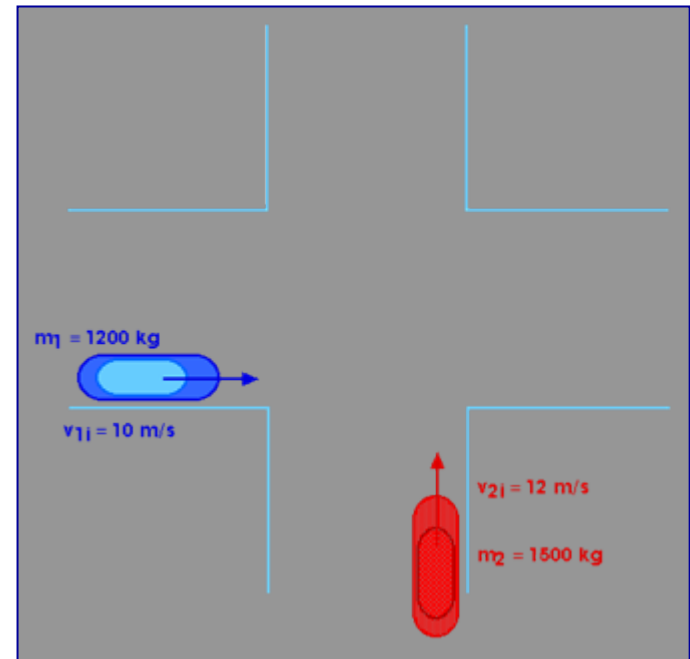
PBL Clearinghouse Problem submitted by Bryan Johnson, Samford University, 2001

Source Example: Textbook Problems



- **Physics concept:** conservation of momentum
- **Text examples:** colliding pool balls, car collisions

A 1200-kg car traveling east with a speed of 10 m/s collides at an intersection with a 1500-kg van traveling north at a speed of 12 m/s. Find the direction and magnitude of the velocity of the wreckage after the collision, assuming that the vehicles undergo a perfectly inelastic collision (ie, they stick together).





Problem Writing Exercise

1. Identify 1-2 major learning objectives that you want to address through a problem - consider both content concepts and process skills.
2. Identify a real-world context or application of those concepts. *(Steps 1 and 2 may be reversed.)*
3. Develop a scenario or story to set the stage.
4. Begin drafting the problem by outlining the first page.
5. Provide a brief synopsis of what the rest of the problem will look like: other stages, products, etc.



Problem Writing: Step One

Identify 1-2 major learning objectives that you want to address through a problem.

Consider both content concepts and process skills.

OR

Identify a real-world context or application of ideas related to your course.

Problem Writing: Step Two

Identify a real-world context or application of those concepts.

Why does a student need to learn this material?

How and where does it appear outside the classroom?

OR

Identify the learning objectives embedded in the example you have chosen.

Problem Writing: Step Three

Develop a scenario or story to set the stage.

- Current events or topical issues help capture interest.
- Consider a “story-telling” voice rather than straight presentation of information.
- Characters, dialogue, humor can help get students’ attention.
- Keep student perspective in mind: “why should I care about this?” Consider situations related to student life, interests, future career plans or roles, etc.

Problem Writing: Step Four

Begin drafting the problem by outlining the first page.

- Multi-page/stage problems often move from general questions (“what’s going on here?”) to more specific tasks. Open-ended initial questions promote group discussion; progressive elaboration of problem and/or disclosure of information helps to keep up interest.
- Resist the urge to provide too much information.
- Problems need not be “real”, but avoid overly contrived situations.

Problem Writing: Step Five

Provide a brief synopsis of what the rest of the problem will look like: other stages, products, etc.

- Ambiguities provide opportunities for students to make assumptions and to see their consequences.
- Elements of controversy and judgment help develop higher order thinking and communication skills.
- There need not be one “right” answer.

Problem Writing: Step Five

There will be time Thursday afternoon and Friday morning to hear some presentations of problem ideas for feedback from the group.