Four Phases to Construct Problem-Based Learning Instructional Materials

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"True learning is based on discovery guided by mentoring rather than the transmission of knowledge."

-- John Dewey

What is PBL?

Problem-based learning (PBL) is an effective tool to cultivate students' ability learning actively, to think critically and to solve problems through an instruction process that focuses on practical problems and encourages students to conduct group discussions (Wu, 2002).

Problem-Based Learning involves the use of complex, "real-world" problems as the stimulus and framework for learning. It is based on the premise that students will be motivated to "want to know" and solve the problem posed because it is presented in a context that simulates real world situations. Acquiring knowledge in the context in which it is meant to be used facilitates recall and application of concepts and skills learned (Gijselaers, 1996).

Why PBL?

PBL is a learning method that caters to the educational needs in a knowledge-based economy because it encourages students to learn collaboratively in small groups, to assimilate, transform and apply knowledge through discussions, analyses and inductions, to develop creative and innovative abilities, and to solve problems.

A Model of Curriculum Shift

Content

Lecturer   Student
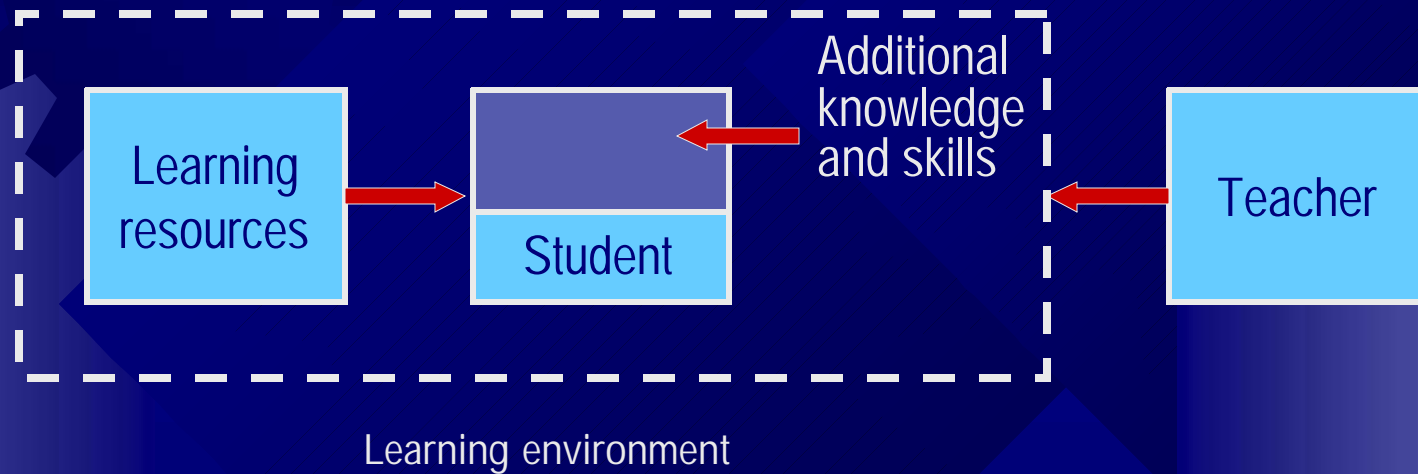
Model A

Problem

Coach   Problem Solving

Model B
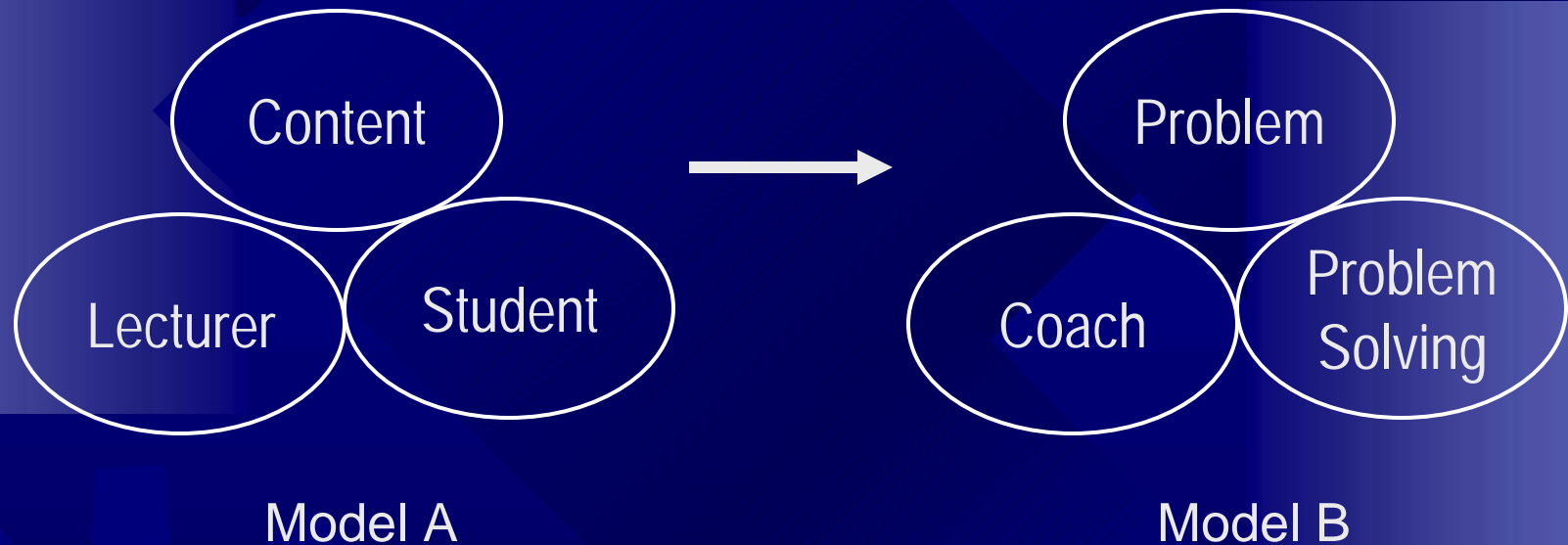
Source: Tan,O.S. 2000, Reflecting on innovating the academic architecture for the 21st century. Educational Development, 1(3). UK:SEDA
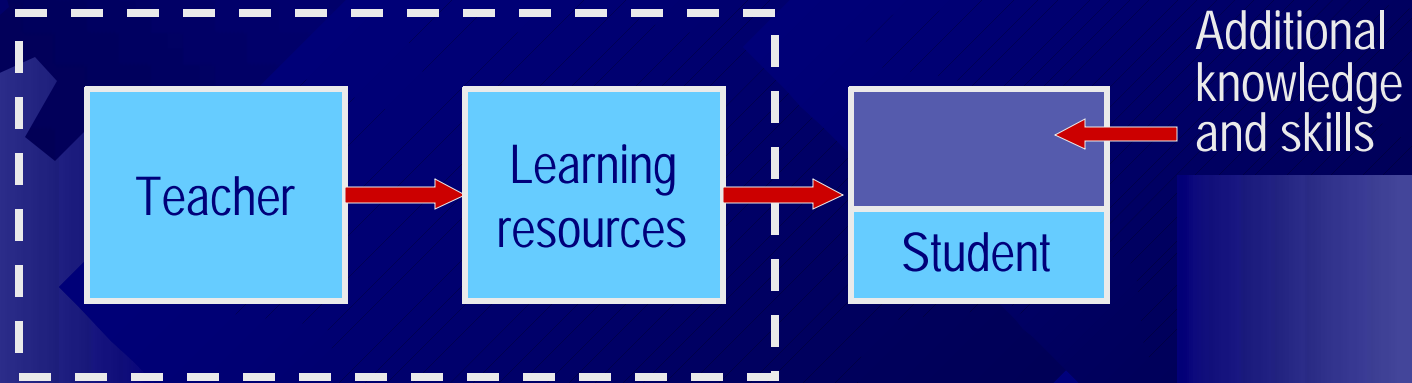
The teacher controls the learning process

Source: Hermann Schmidt, Implications for learning. Presented at the Standards 2000 conference, Tashkent, April 2000.

Learning environment

The teacher facilitates the learning process

Source: Hermann Schmidt, Implications for learning. Presented at the Standards 2000 conference, Tashkent, April 2000.

Objectives of PBL

- Engage the problems they face in life and career with initiative and enthusiasm.

- Problem-solve effectively using an integrated, flexible and usable knowledge base.

- Employ effective self-directed learning skills to continue learning as a lifetime habit.

- Continuously monitor and assess the adequacy of their knowledge, problem-solving and self-directed learning skills.

Advantages of PBL

- Learning and teaching is more enjoyable for students and teachers

- The learning environment is more stimulating

- Self-directed learning skills are enhanced and retained

- Promotes deeper rather than superficial learning

- Increases interaction between students and faculty

- Improves motivation to learn

The Cyclic of Process of PBL
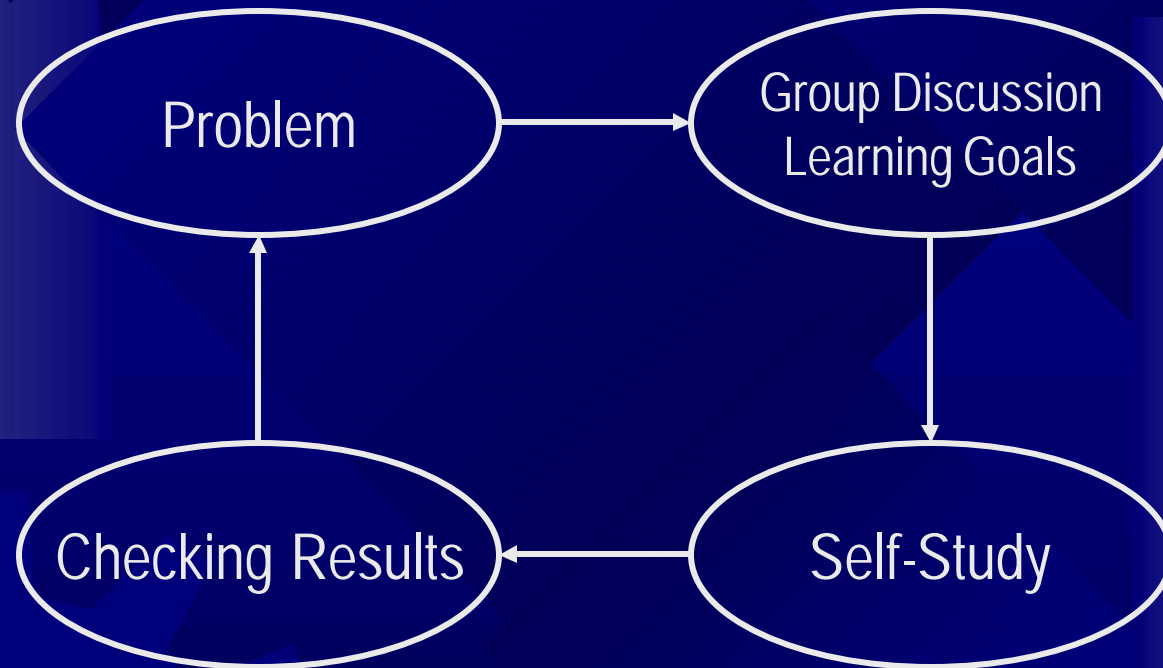
Phases to Construct a Instructional Materials:

Phase 1: Selecting Unit Titles

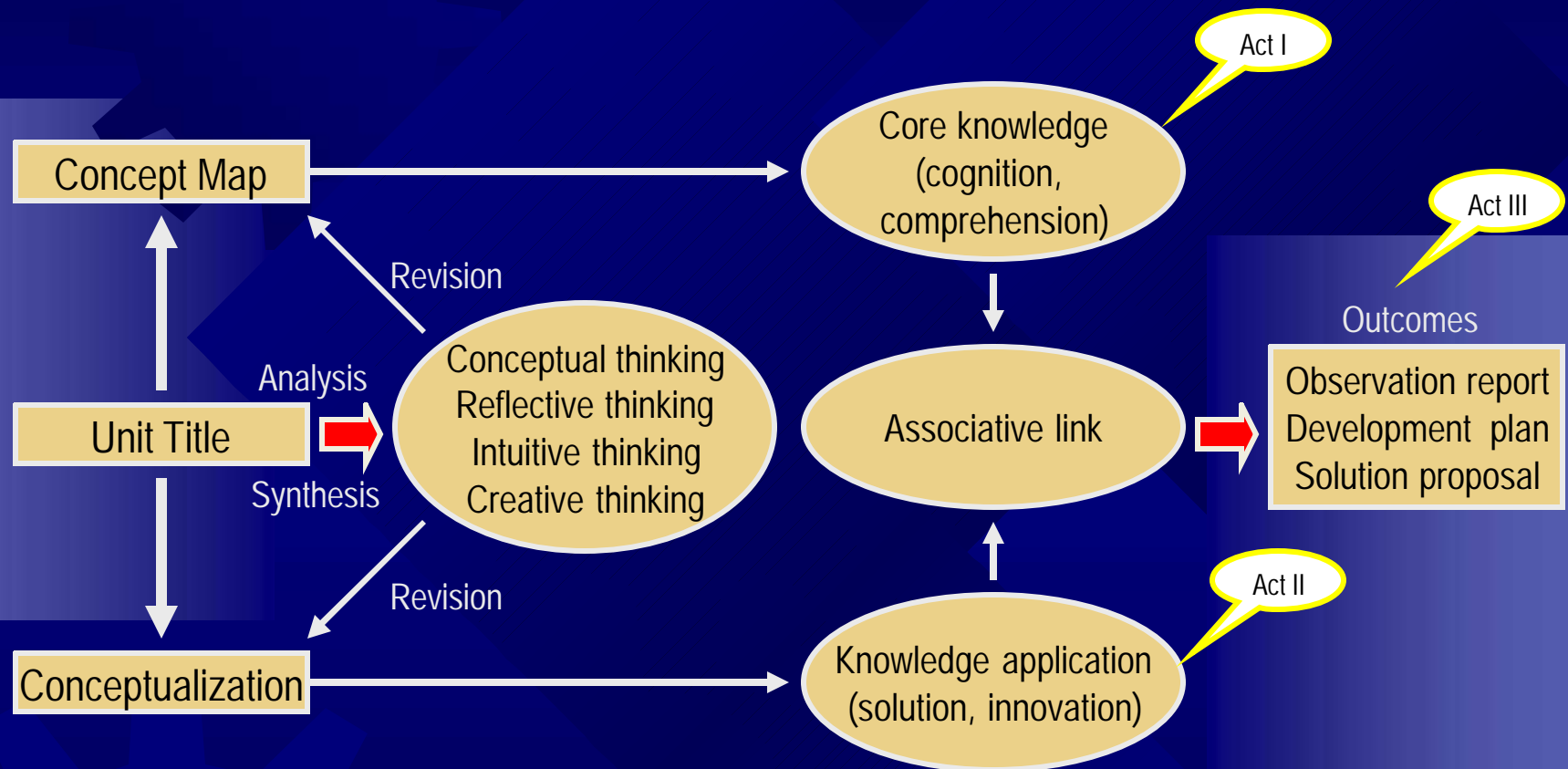Phase 2: Designing Acts

Phase 3: Determining Learning Objectives

Phase 4: Linking Contents

Phase 1: Selecting Unit Titles

Guidence for Selecting Problems and Units:

- Problems in daily life

- Social issues

- Curricular related

- Relevant tasks

Phase 2: Designing Acts

Concept Map	→ Core knowledge (cognition, comprehension) — Act I
	Act III
Revision	Outcomes
Unit Title →	Conceptual thinking / Reflective thinking / Intuitive thinking / Creative thinking → Associative link → Observation report / Development plan / Solution proposal
Analysis	
Synthesis	
Conceptualization →	Knowledge application (solution, innovation) — Act II
Revision	

Thinking Flow for Structuring Modular Curricular

For example:

1.What can we do when food gets mildwed?

- ✓ How do we tell if the food is mildewed and what are the causes of mildew in food?
- ✓ How should we deal with mildewed food?
- ✓ How do we prevent food from mildewing?

2.Why do we need to build water reserviors?

- ✓ How do we tell if a reservoir has stored sufficient amount of water?
- ✓ Can building reservoirs alone meet the household water demand?
- ✓ How can we increase water storage capacity of a reservoir?

3.Why can an electromagnetic stove cook?

- ✓ How does an electromagnetic stove generate heat?
- ✓ Do all types of pots work with electromagnetic stove?
- ✓ How do we select an electromagnetic stove that is beneficial to the human body

Phase 3: Determining Learning Objectives

Levels of Learning Contents

- **must learn** - the core knowledge that students must learn

- **should learn** - content that students should learn

- **nice to learn** - content that it is nice for students to learn

nice to learn

should learn

must learn
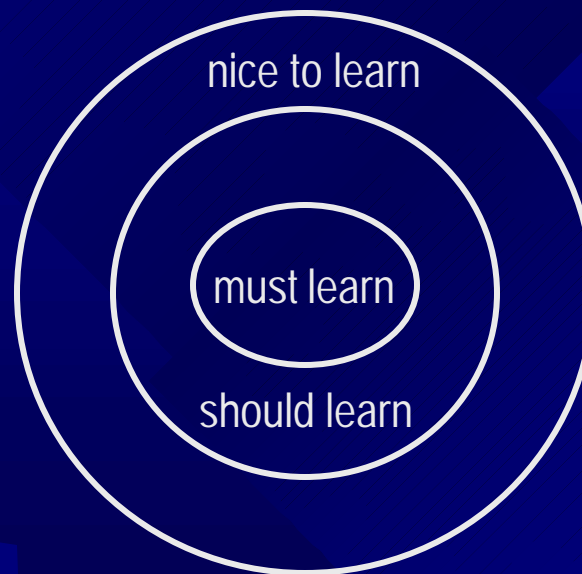
The learning objectives must be specific and include A, B, C, and D four statements to describe the specific behavioral objectives:

- **A (Audience)**—"Who" expected to carry out the behavior? This can be omitted if it's the students who execute the behaviour.

- **B (Behavior)**—"Actual behaviors" needed to achieve the objectives, e.g. to write, to select, to distinguish, to design, to use, etc.

- **C (Condition)**—''Relevant conditions" required to complete or achieve the behavior, e.g. a given circumstance, error messages displayed on the computer screen, etc.

- **D (Degree)**—"Level" or "Standard" successfully achieved by the behavior, e.g. accuracy, deployment and installation plan, problem solution, disassembling operation, etc.

Example 1

Can accurately use proper terms to describe briefly the problem

          D   B   C   B   C

and the damaged component that possibly causes the problem.

                    C

Example 2

Can propose a layout and installation plan for a computer lab that

        B   D   C

has 20 computers, 4 laser printers, 4 ink-jet printers and one color printer

                    C

Specifying Learning Objectives for Acts

Unit	Act Title	Specific Learning Objectives	
What can we do when there is a paper jam in the printer?	How do we judged and analyzed the possible causes of a paper jam?	**Must learn**	1. Can accurately use proper terms to describe briefly the exterior problem and the damaged component . 2. Can identify the possible causes of a paper jam in the printer.
		Should learn	3. Can induce and categorize the possible causes of a paper jam in the printer.
		Nice to learn	4. Can judge the paper size and pound specification.

Phase 4: Linking Contents

Act, Emphasizes core knowledge acquisition – telling of, writing down or drawing out a concept map.

Act, Emphasizes knowledge comprehension and application – proposing problem-solving methods and steps.

Act, Emphasizes knowledge expansion and enhancement – proposing solutions and drawing up a development plan.

"Tomorrow's citizens must be problem solvers, persons able to make good choices, to create solutions on the spot. Effective problem solving is learned by confronting events, defining problems, puzzling with them, experimenting, trying, searching for effective solutions".

-- Combs, A.W.

"What the future demands of education" (1981)

Thank You !