Teaching & Learning Engineering: a tango

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Why a workshop on course design?

An essential act of our profession as Professors / Course Instructors is to:

A. Design curriculum and learning experiences that meet certain Instructional Objectives

B. Design assessments to:

   1. Determine whether course goals are being achieved
   2. Diagnose student needs to guide our teaching.

What does tango have to do with it?

Why a workshop on course design?

The effectiveness of:

- Our courses: ultimately determined by student achievement of course learning objectives (CLOs).
- Our curricula: ultimately determined by student achievement of Program Outcomes (POs).
- AE Program: ultimately determined by alumni achievement of Program Educational Objectives (PEOs).

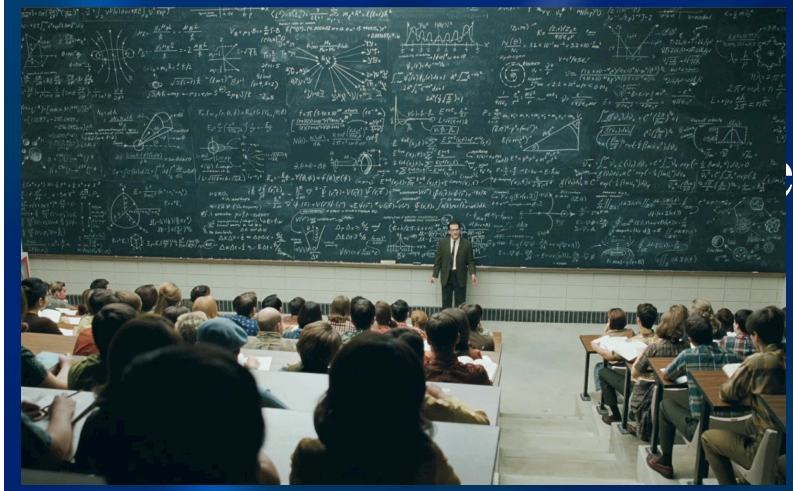
Teaching & learning are correlative or corresponding processes, as much as selling and buying. One might as well say he has sold when no one has bought, as to say that he has taught when no one has learned."

James L. Melsa, Dean Emeritus, Iowa SU, 2007 ASEE President, ASEE Prism, Sep.07

Pedagogy ☹

Major advances understanding how people learn, in past 2 decades from:

University Science &



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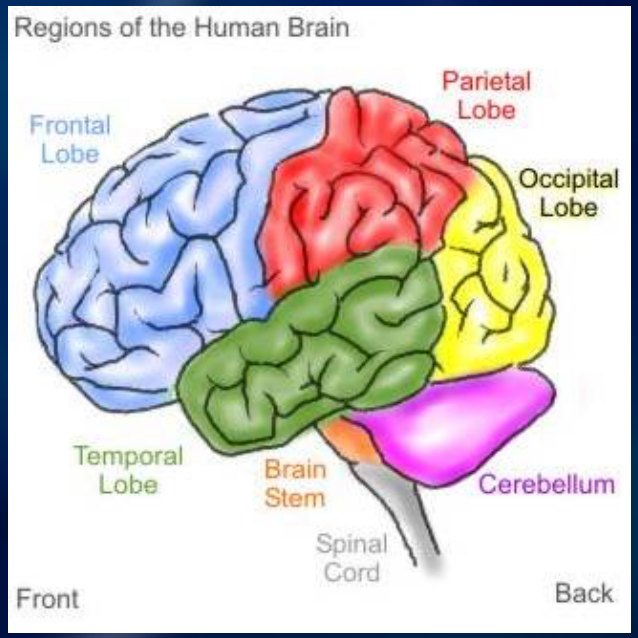


Cognitive Psychology

Brain Research

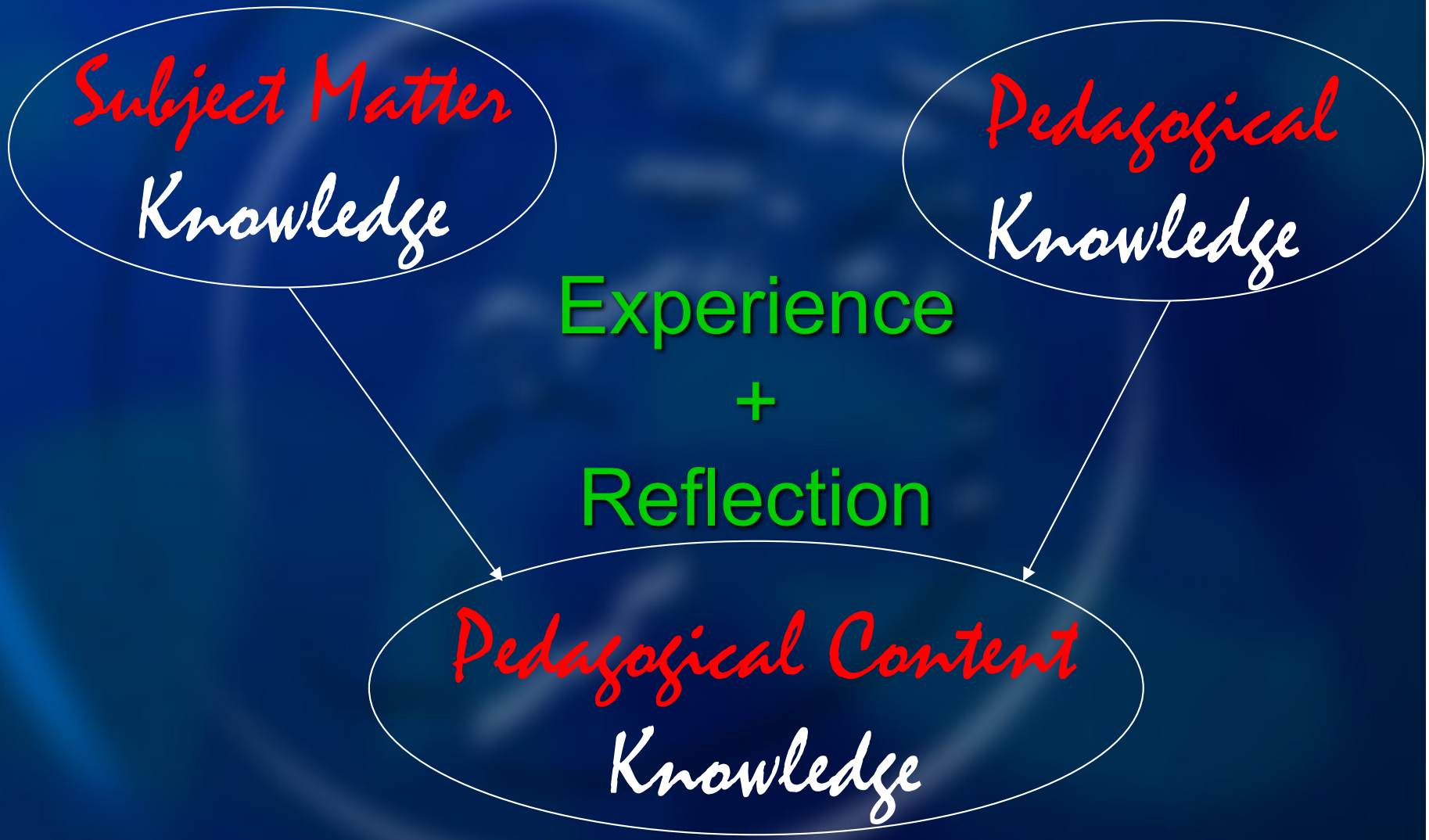
Pedagogy ☹

Despite all this new knowledge, engineering teaching is in a place comparable to where medicine was 150 years ago ☹

- ✓ Standard Treatments: Tradition & Superstition, despite growing scientific knowledge at the time

Carl Wieman, Professor of Physics & Graduate School of Education, Stanford University, 2001 Nobel Prize in Physics

Why a workshop on course design?



Components of Education

- Knowledge: *the data base of a professional*
- Skills: *tools used to manipulate knowledge in order to meet a goal dictated or strongly influenced by…*
- Attitudes & Values

Learning Objectives

(Where do I want to take my students – intellectually, physically, emotionally ?)

Learning Activities

(How do I take them there?)

Assessment

(How will I know they have arrived?)

Learning Objectives

(What should students be able to do at the end of the course?)

Learning Activities

(How do students learn best?)

Assessment

(What is acceptable evidence of learning?)

Taxonomy of Significant Learning

6 Facets of Understanding

Instructor Goals

Program Outcomes

Learning Objectives

(What should the students be able to do at the end of the course?)

Application Model

Bloom's Taxonomy

SL

IBL

PBL

CL

AL

Field Trips

Case Studies

Role Playing

E-portfolio

Surveys

Classroom Assessment

Learning Activities

(How do students learn best?)

Assessment

(What is acceptable evidence of learning?)

Lectures

Labs

IT

Simulation

Debate

Tests

Papers

Reports

Reviews

WORKSHOP OBJECTIVES

1. Introduce the basics of learning theory
   a. Conditions of Learning
   b. Bloom's Taxonomy of Educational Objectives
   c. Teaching & Learning Styles
   d. Active, Cooperative, Problem-Based Learning, Inquiry-Based Learning
2. Apply learning theory to design your course
   a. Define course learning objectives
   b. Design course assessment
   c. Design learning activities
3. Create a Learning Community

Alice Walker,
author of "The Color Purple":

I imagine good teaching
as a circle of earnest people sitting down
to ask each other meaningful questions
I don't see it
as a handing down of answers.