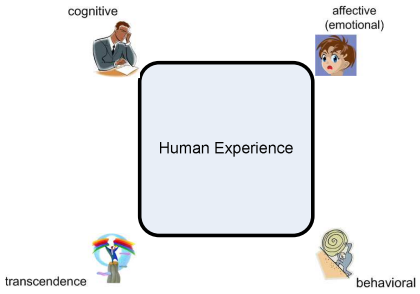
Basic Skills in Introductory Chemistry

CONCEPTUAL & PRACTICAL CONSIDERATIONS

DEVELOPING A SHARED VISION OF LEARNING

- ❑Human Experience
- ❑Learning
  - oMeaningful
  - oRote
- ❑Teaching
- ❑Studying
- ❑Critical Thinking
  - ❑Elements
  - ❑Standards
  - ❑values
- ❑Relationship to Course Structure
- ❑Relationship to Course Content
- ❑Relationship to Grading
- ❑Activities
  - oWhat is an Activity
  - oStructure
  - oManagement
- ❑Course Mottos

HUMAN EXPERIENCE AND LEARNING



A PHILOSOPHY OF LEARNING

Learning Cycle
(Karplus, Piaget)

E — inductive → I — deductive → A

Exploration — Concept Invention

Paradigm

Concepts are constructed from existing knowledge, modified through meaningful, new experiences. (Ausubel, Novak)

Connections

Parallels scientific method, scholarly research, critical thinking, leadership qualities

Implications:

Content – focus is on concept relationships

Process – a specific component of course objectives

Assessment – expands the both the scope and methods

WHAT IS MEANINGFUL LEARNING?

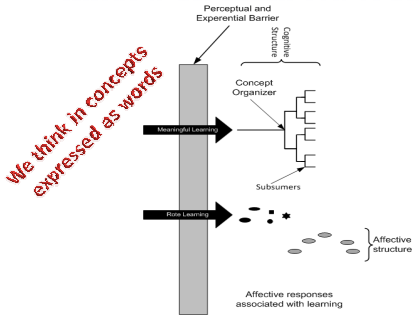
"Meaningful learning" is a process in which new information is related to a relevant aspect of an individual's existing knowledge. The result is a relatively permanent change in one's cognitive structure. This occurs at a cognitive, psychological and somatic level. (Adopted from J.D. Novak)

emotional physical intellectual

As opposed to:

Rote learning occurs when concepts are randomly organized in the learner's brain. This cannot lead to the mastering of a intellectual discipline.

WHAT IS MEANINGFUL LEARNING?



WHAT IS TEACHING?

Teaching is the process of facilitating the learner's acquisition of meaningful learning through the creation of an environment and a process conducive to such learning.

"Conducive" means tending to bring about an intended result.

WHAT IS STUDYING?

Studying consists of things that the learner does in order to incorporate new concepts into their existing cognitive structure.

Good studying = making it your own

Toolkit
Decision Trees
Concept Maps
V-diagrams

COURSE GOAL: IMPROVE CHEMISTRY THINKING

Components of chemical thinking	Application to chemistry thinking
Purpose	To study the most basic elements out of which all material substances are composed and the conditions under which, and the mechanisms by which, substances are altered.
Question at Issue	What are the chemical and physical properties of matter which can be measured, expressed in mathematical formulas, and explained through various chemical theories?
Point of View	The physical world contains basic elements of matter whose structure and behavior can be studied through experimentation and explained through the application of accepted chemical theories.
Assumption	The universe is controlled by physical laws which govern the manner in which matter interacts so as to allow chemists to reasonably predict the outcome of chemical processes.
Information	Physical and chemical properties are measured so as to obtain verifiable data concerning the behavior of matter.
Inferences (hypothesis)	Can be reasonably made concerning chemical and physical properties of matter such that reliable predictions can be made concerning new or novel chemical change or processes.
Implications	Chemistry has led to significant growth in knowledge and human potential. This resulted in clear benefits to all of human kind but, at the same time, has led to social, human health and environmental challenges.

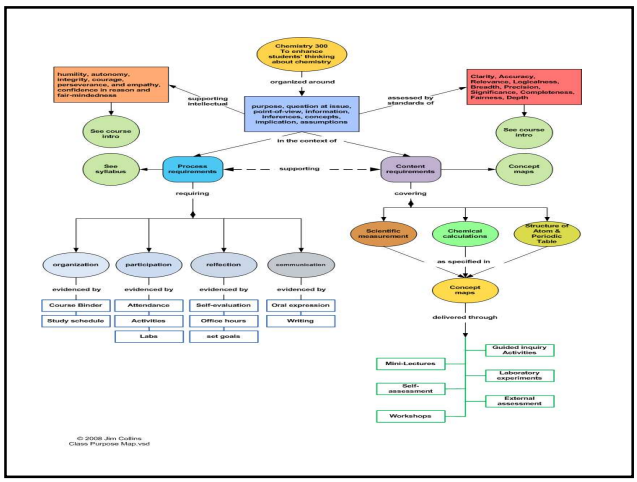
STANDARDS FOR EVALUATING CRITICAL THINKING

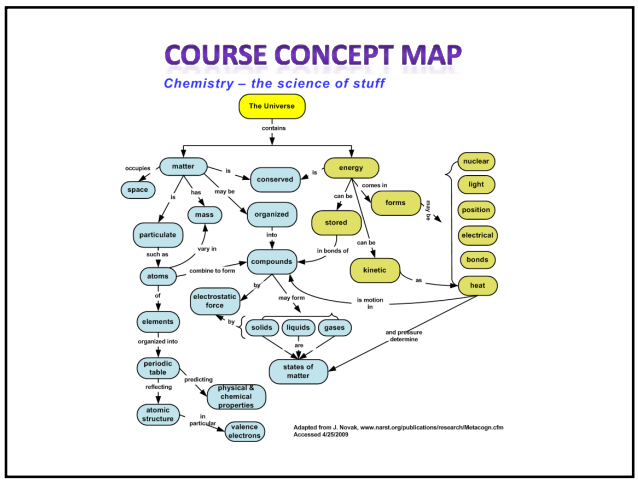
- **Clarity**
- **Accuracy**
- **Precision**
- **Relevance**
- **Logical**
- **Depth**
- **Breadth**

VALUES FOR A CULTURE OF LEARNING

- Intellectual humility
- Intellectual courage
- Intellectual empathy
- Intellectual integrity
- Intellectual perseverance
- Confidence in reason
- Intellectual Autonomy

LEARNING PHILOSOPHY FORMS COURSE STRUCTURE





GRADING

process	Quizzes	150.00	15.00% content
	Homework, Clicker, & Toolkit	50.00	5.00%
	Course Binder	50.00	5.00%
	In-Class Activities	50.00	5.00%
	Lab Exercises	150.00	15.00%
	Term Exams	200.00	20.00% content
	Nomenclature	100.00	10.00%
	Final	250.00	25.00%
		1000.00	100.00%

ANATOMY OF AN ACTIVITY

- Introduction
- Skills
- Model(s)
- Questions
  - Observation
  - Exploration
  - Extension
  - Application
  - Inference

GROUP ROLES

Role Title	Responsibility
Ambassador	(1) interacts on behalf of the group with the instructor or other groups and (2) helps keep the group working on the task at hand
Recorder	completes the Group Report which is handed in at the end of each class
Reporter	(1) reports to the group whenever the group is not on task and (2) speaks for the group when called upon by the instructor
Technician/Editor	(1) completes and/or checks all computations for correctness including significant figures and units, and (2) helps the recorder edit any written responses included in the Group Report

ACTIVITY PROCESS & TIME MANAGEMENT

- ❖Answering & Asking Questions
- ❖Getting the right answers
- ❖Clarifying questions
- ❖Getting help & the two-minute rule
- ❖Three minutes per question
- ❖iClickers & in-class assessment
- ❖In-class tutors

CLASS MOTTOS

❖Learning is an active, reflective process.

❖Being wrong is the first step to being more right.

❖Frustration is that warm feeling we get when we are learning something.

❖Hope is NOT a strategy.