Some Important Ideas About Learning

That all point to the need for students to actively participate in the learning process.


A new theory of learning is emerging from research in varied disciplines

- cognitive psychology explains how experts organize their knowledge and apply it in new settings
- and how learning changes the physical structure of the brain
- developmental psychology explains how children learn basic principles and how the brain changes
- educators explore their expectations for the places where learning takes place
- scientists in individual disciplines carry out research showing the best ways to teach their subjects

1. Understanding Prior Knowledge

Students come to the classroom with preconceptions about how the world works.

If their initial understanding is not engaged they may fail to grasp the new concepts and information that are taught, or they may learn them for the purpose of a test but revert their preconceptions outside the classroom.

Your teachers may not know your preconceptions.

2. Organize knowledge

To develop competence in an area of inquiry a student must:

a) have a deep foundation of factual knowledge
b) understand facts and ideas in the context of a conceptual framework, and
c) organize knowledge in a way that facilitates retrieval and application.
Transformation of Learners

The most powerful learning occurs when we move away from inert knowledge and towards flexible thinking.

Adapted from John Bransford and the “Center for Learning in Formal and Informal Environments”.

Learn to Learn

Experts versus novices

- Experts acquire new information and organize it differently than novices do.
- Experts may transfer information but not the organization of information. That takes place in your own mind.
- That means that you should think about how you learn and how you organize information.

The process of “study” is largely about organizing information in a way you can access and use it efficiently.

Neurons create networks in our brain

Approximately 100 billion neurons create networks in our brain.

A social network

Stanley Milgram and “six degrees of separation”

“I read somewhere that everybody on this planet is separated by only six other people. Six degrees of separation between us and everyone else on this planet.”

“Everyone is a new door opening into other worlds. Six degrees of separation between us and everyone else on this planet. But, to find the right six people...”

spoken by Ouisa Kittredge in John Guare’s Play “Six Degrees of Separation”

Now about networks

A network is a collection of objects called nodes connected in pairs by links.

Simple to Complex

Two Key Ideas from Network Science

1) small world idea - two kinds of links
   order - randomness
   structure - agency

2) preferential attachment
   the rich get richer - 80 20 rule
3. Metacognition

The ability to monitor one's own current level of understanding and decide when it is adequate.

A metacognitive approach to instruction can help students learn to take control of their own learning by defining learning goals and monitoring their progress in achieving them.

What you think about...

<table>
<thead>
<tr>
<th>Objects of Metacognition</th>
<th>Objectives (reasons to metacognize)</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>To monitor understanding of concepts or track progress in problem solving or formulating plans</td>
<td>Discipline</td>
</tr>
<tr>
<td>Cognition</td>
<td>To achieve the objective of one’s thinking and to sharpen thinking skills</td>
<td>List of types of thinking</td>
</tr>
<tr>
<td>Conduct</td>
<td>To develop the habits of a successful thinker</td>
<td>Habits of Mind</td>
</tr>
</tbody>
</table>

When you think about your own thinking...
I. GENERATING IDEAS
   1. Alternative Possibilities
      A. Multiplicity of Idea
      B. Varied Ideas
      C. New Ideas
      D. Detailed Ideas
   2. Composition
      A. Analogy/Metaphor

II. CLARIFYING IDEAS
   1. Analyzing Ideas
      A. Compare/Contrast
      B. Classification/Definition
      C. Parts/Whole
      D. Sequencing
   2. Analyzing Arguments
      A. Finding Reasons/Conclusions
      B. Uncovering Assumptions

III. ASSESSING THE REASONABILITY OF IDEAS
   1. Assessing Basic Information
      A. Accuracy of Observation
      B. Reliability of Sources
   2. Inference
      A. Use of Evidence
         a. Causal Explanation
         b. Prediction
         c. Generalization
         d. Reasoning by Analogy
      B. Deduction
         a. Conditional Reasoning
         (If ... then ...)
         b. Categorical Reasoning
         (Some ... All ...)

Personal Traits
- Persisting
- Managing impulsivity
- Striving for accuracy
- Finding humor

Acquiring Information
- Gathering data through all senses
- Listening with understanding and empathy
- Questioning and posing problems
- Thinking interdependently

Thinking Tools
- Thinking flexibly
- Thinking and communicating with clarity and precision
- Applying past knowledge to new situations
- Remaining open to continuous learning

Personal Responses to Thought
- Creating, imagining, innovating
- Responding with wonderment and awe
- Thinking about thinking (metacognition)
- Taking responsible risks

Strategies Used by Successful Students
- Identifying similarities and differences (analogies and metaphors)
- Summarizing and note taking
- Nonlinguistic Representations
- Cooperative Learning
- Generating and Testing Hypotheses
- Cues, Questions, and Advance Organizers