Learning Styles/Teaching Styles

How Students Learn and What We Can Do to Help

Thomas Edgar, P.E., Ph.D., F.ASCE

Formerly Department of Civil and Architectural Engineering
Theoretical Underpinnings to Learning Theory and Its Application to Use in the Engineering Classroom

- Learning Theory has been a matter of speculation from the Ancient Greeks to the Present Day. Plato, famed for his ability to think through a situation and make incorrect conclusions about it, believed that learning was achieved by a transmittal of sound through a physical vapor to the ear, which received the sound like an echo in a cave and entered the head where it could be processed through a logical process of processing each individual sound and adding those sounds up into intelligible phrases that the mind, ever open to receiving those vaporous noises, can contemplate and store into boxes arranged throughout the head where the information could be retrieved and reprocessed in a spontaneous and liquid manner to convey the information to pupils.

- Can you hear me now?
Let’s Look at Some Terms and What They Mean

The Professor
You Aid, but the student has to do the Work to make that Knowledge Useful...

Knowledge

The Student
Gain and Synthesize Knowledge, i.e., Learn

Teaches to Aid the Student to...

Intellectual Curiosity
Teaching Tools

- Teachers have a lot of options to Aid Learning
- Lectures
- Laboratory
- Reading
  - Textbooks
  - Internet
    - Google
    - Lifelong Learning
    - Intellectual Curiosity
      - Shaw and Southwell
      - Hardy Cross
- Homework
- Projects (esp. Group)
- Site Visits
- Coding
  - “Gray Box”
    - White out pieces of code for students to fill in. Works for C and Excel.
- Sketching/Drawing beyond FBD
  - Visual Problem Solving
- Lots of Others!
How Do You Learn?

- This is a question that is often asked and certainly fits with the topic…. but
- This is NOT a Rhetorical Question!!!
- How Do **YOU** Learn?
  - Pick a Topic – A Hobby, An Investment, Something Technical (not your research).....
  - What are all the ways you can learn about it???
  - Group the list of ways they learn....
What do We Gather from That?

<table>
<thead>
<tr>
<th>Read and Watch</th>
<th>Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attempt / Trial and Error</td>
<td>Contemplate and Analyze/Improve</td>
</tr>
</tbody>
</table>
What do We Gather from That?

<table>
<thead>
<tr>
<th>Read and Watch</th>
<th>Attempt / Trial and Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do</td>
<td>Contemplate and Analyze/Improve</td>
</tr>
</tbody>
</table>
What do We Gather from That?

<table>
<thead>
<tr>
<th>Read and Watch</th>
<th>Attempt / Trial and Error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Do</td>
</tr>
<tr>
<td></td>
<td>Contemplate and Analyze/Improve</td>
</tr>
</tbody>
</table>
What do We Gather from That?

<table>
<thead>
<tr>
<th>Read and Watch</th>
<th>Attempt / Trial and Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do</td>
<td>Contemplate and Analyze/Improve</td>
</tr>
</tbody>
</table>
What do We Gather from That?

<table>
<thead>
<tr>
<th>Read and Watch</th>
<th>Attempt / Trial and Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do</td>
<td>Contemplate and Analyze/Improve</td>
</tr>
</tbody>
</table>
What do We Gather from That?

Read and Watch

Do

Attempt / Trial and Error

Contemplate and Analyze/Improve
<table>
<thead>
<tr>
<th>Read and Watch</th>
<th>Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attempt / Trial and Error</td>
<td>Contemplate and Analyze/Improve</td>
</tr>
</tbody>
</table>

What do We Gather from That?
What do We Gather from That?

Read and Watch

Attempt / Trial and Error

Do

Contemplate and Analyze/Improve
What do We Gather from That?

- Read and Watch
  - Passive
  - Mental
  - Intuitive

- Attempt / Trial and Error
  - Active
  - Physical
  - Sensing

- Do
  - Active
  - Physical
  - Sensing

- Contemplate and Analyze/Improve
  - Passive
  - Mental
  - Intuitive

PASSIVE MENTAL INTUITIVE

ACTIVE PHYSICAL SENSING
Hobbies and Preferences

- I like talking about hobbies because a hobby is selected through personal preference.
- Preferences are developed from infancy on.
  - Nature vs. Nurture
- Our Preferences define our Personality
Karl Jung - Psychological Types (1924)

- Two Primary (Conscious) Functions –
  - Perceiving (Learning)
    - Sensing
    - Intuition
  - Judging (Synthesizing or Evaluating)
    - Thinking
    - Feeling

- Attitude
  - Orientation (Relationship to the World)
    - Extrovert
    - Introvert
Isabel Myers and Katherine Myers Briggs
Myers-Briggs Type Indicator (MBTI)

- **Attitude**
  - Extrovert (E) vs. Introvert (I)

- **Perceiving**
  - Sensing (S) vs. Intuition (N)

- **Judging**
  - Thinking (T) vs. Feeling (F)

- **Lifestyle** (Myers-Briggs)
  - Judging (J) vs. Perceiving (P)
MBTI - Perceiving

- Sensing
  - See
  - Feel
  - Taste
  - Hear
  - Smell
  - Practical
  - Labs
  - Physical Projects
  - Manipulatives
  - Sequential
  - Trees
  - Deductive Learning

- Intuition
  - Concept
  - Hunch
  - Overview
  - Global
  - Mental/Head
  - Reading
  - Theoretical
  - Watching
  - Reflection
  - Contemplation
  - Forest
  - Inductive Learning
MBTI - Judging

- **Thinking**
  - Logical
  - Factual
  - Cause and Effect
  - Either/Or
  - If/Then/Else
  - (Visualize to me)
    - Black and White with Shades of Gray
  - “Object Oriented”
  - Types of Jobs?

- **Feeling (Not Emotional)**
  - Subjective
  - Personal
  - Use C/E, Logic, Facts but final decision is with effect on people
  - (Visualize to me)
    - Black and White with Shades of Color
  - “People Oriented”
  - Types of Jobs?
What do We Gather from That?

<table>
<thead>
<tr>
<th><strong>Intuitive</strong></th>
<th><strong>Sensing</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Read and Watch</td>
<td>Trial and Error</td>
</tr>
</tbody>
</table>

- Passive
- Introverted?

- Active
- Extroverted?

<table>
<thead>
<tr>
<th><strong>Do</strong></th>
<th><strong>Contemplate and Analyze/Improve</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensing</strong></td>
<td><strong>Intuitive</strong></td>
</tr>
</tbody>
</table>
My Experience with Mainly Civil/Architectural Students

- Typically (n > 1300)
  - 59% Sensing, 41% Intuitive
  - 67% Thinking, 33% Feeling
  - 49% Extroverted, 51% Introverted
  - 43% Judging, 57% Perceiving

- Somewhat different ratios for other disciplines
  - University Faculty 25% - INTJ (n-150)
  - Engineering Faculty 50%+ - INTJ (n-10, exp.)
Consequences of Teaching/Learning

- We typically select favorite teachers because they teach to our preference.
- We often teach like our favorite teachers.
- Therefore, The Students that Learn Best from Us are those Most Like Us.
  - (Easy to shoot lots of holes in that statement, but I believe that the underlying truth is correct.)
- The Students that are Least Like Us are the ones that Do the Worst.
  - (A weaker statement but reflectively true.)
- However, people of all types are successful engineers.
- Diversity of thought produces the most creative solutions.
  - (Really important concept!!!)
Other Learning Style/Teaching Style Models

- Bernice McCarthy - 4MAT (www.aboutlearning.com)
- Soloman/Felder - Index of Learning Style Inventory (http://www.engr.ncsu.edu/learningstyles/ilsweb.html)
- Jean Piaget - Genetic Epistemology
- Carl Rogers – Experiential Learning
- B.F. Skinner – Operant Conditioning
- Howard Gardner – Multiple Intelligences

http://www.instructionaldesign.org/about.html
VAK Learning Style

- Three Types of Learners
  - Verbal
  - Auditory
  - Tactile/Kinesthetic
Howard Gardner’s
Multiple Intelligences

- Stanford-Binet IQ Test
  - Verbal/Linguistic
  - Math/Logic

- Multiple Intelligences
  - Spatial
  - Musical
  - Body Kinesthetic
  - Interpersonal
  - Intrapersonal
  - (Naturalist)

(http://www.institute4learning.com/multiple_intelligences.php)
Bernice McCarthy’s
4MAT System

https://aboutlearning.com/about-us/
Bernice McCarthy’s 4MAT System

Left Brain/Right Brain

https://aboutlearning.com/about-us/
In Summary

- Teaching is Nothing More than:
  - Adapting your Teaching Style
  - To a variety of Learning Styles
  - Without letting your own over-ride.

- Now, go home, get plenty of sleep and hit the road running. They’ll be chasing you!!!