How Learning Works Part I
Workshop goals for participants:

• To develop awareness of the cognitive psychology concepts of prior knowledge and knowledge organization and how they impact student learning

• To experience firsthand a few teaching techniques that address prior knowledge and knowledge organization

• To brainstorm and share additional teaching techniques applicable to one’s own courses
Prior Knowledge
Please indicate your familiarity with the concept of "prior knowledge." (Check all that apply)

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I've heard of it</td>
<td>43%</td>
</tr>
<tr>
<td>2</td>
<td>I can define it</td>
<td>43%</td>
</tr>
<tr>
<td>3</td>
<td>I can explain it to someone else</td>
<td>36%</td>
</tr>
<tr>
<td>4</td>
<td>I can identify at least three ways it can help or hinder learning</td>
<td>43%</td>
</tr>
<tr>
<td>5</td>
<td>I can apply the concept to improve student learning</td>
<td>14%</td>
</tr>
</tbody>
</table>
“Felix gained strength overnight with wind speeds of 100 miles per hour. Forecasters predict the eye will hit the already battered coast of Belize tomorrow.”
It is not necessary to consider students' prior knowledge when they are brand new to the subject area.
## Prior Knowledge

<table>
<thead>
<tr>
<th>Helps Learning</th>
<th>Hinders Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activated</td>
<td>Inactive</td>
</tr>
<tr>
<td>Sufficient</td>
<td>Insufficient</td>
</tr>
<tr>
<td>Appropriate</td>
<td>Inappropriate</td>
</tr>
<tr>
<td>Accurate</td>
<td>Inaccurate</td>
</tr>
</tbody>
</table>
Once individuals have some prior knowledge of a topic, they are ready to apply it to new concepts.
Small Groups
Prior knowledge...

• Can hinder learning
• Lies inert most of the time
• Must be activated to be useful

What we can do...

• Value and engage what students bring to the table
• Actively confront and challenge misconceptions
Knowledge Organization
Your comments: An expert...

- has extensive experience with the subject area
- has a significant grasp of the concepts and is able to apply, evaluate, critique and assess them
- can easily, effortlessly solve problems...and make connections to other types of related problems
- is able to understand and apply discipline knowledge to form new ideas or create improvements
Knowledge Organization

**Experts**
- Rich
- Meaningful knowledge structures

**Novices**
- Sparse
- Superficial knowledge structures
Concept Maps

A visual means of representing relationships between ideas, concepts, images, or words

Focus question: What is the structure of the Universe?

The Universe
contains

Matter

Energy

transformed
where \( E=mc^2 \)

Particulate

Deployed

Mass

Usually
Conserved

Organized

is

has

may be

is used to
make things

is

can be

Stored

Different
Forms

comes in
Seasons
are determined by
Amount of Sunlight
results in Seasonal Temperature Variations
is determined by
Length of Day
is longer in Summer
is higher in 23.5 Degrees Tilt of Axis in summer points toward Sun
is determined by Height of Sun above Horizon
is shorter in Position in Orbit axis points towards or away from
is lower in Winter

Negligible Effect has slight variation in distance to Sun
Small Groups
Experts...

• Have a higher density of connections
• Have structures that rely on deep underlying principles
• Have more flexible structures

What we can do...

• Help students organize their knowledge in productive ways
• Actively monitor students’ construction of knowledge