How People Learn

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We started by discussing a scene from “Fish is Fish” by Leo Lionni. The frog gives a lecture about cows to his student, the fish. Frog says cows have 4 legs, horns, eat grass, and carry pink bags of milk. The student imagines a cow with fins.

If the lesson stopped after this lecture, the student would leave with incorrect knowledge. To help the student learn, the instructor should then ask the student to demonstrate their (novice) understanding. Asking students to describe a cow isn’t sufficient – they’ll repeat cows have 4 legs, horns, eat grass, and carry pink bags of milk.

A better strategy is: the instructor asks students to draw pictures of cows. This way, students get immediate feedback from each other and also, the instructor can witness their level of understanding and react: acknowledging their effort, praising correct knowledge, correcting misconceptions, etc.
Why are we here?

What do you think students are doing in a typical university class?

A) listening
B) absorbing
C) learning
D) note-taking
E) not paying attention
The traditional lecture is based on the transmission model of learning.
Important new number system. Please learn it.

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8 = \[
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9 = \[
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What’s this number?

74157
Transmission model

proven to be less effective than active learning

“the equivalent of blood-letting”
(Wieman, 2014)

We must stop using the “students as empty vessels” model of teaching and learning.
Important new number system: tic-tac-toe code
What number is this?

9
Constructivist model of learning

New learning is based on knowledge you already have.

You store things in your long term memory by building connections with your existing memories.

learning is done by individuals
knowledge and skills in your discipline

being an effective TA

how people learn
How People Learn (NRC, 2000)

Available for free from the National Academies Press
Key Finding #1

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 purposes of a test but revert to their preconceptions outside of the classroom.*
Key Finding #2

To develop competence in an area, students 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 ways that facilitate retrieval and application.
Key Finding #3

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.
Metacognition

thinking about thinking

“I am engaging in metacognition if I notice that I am having more trouble learning A than B.”
(J. Flavel, 1976)
Key Finding #3

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.
Key Findings: Theory → Practice

Please sort your cards into 3 sets of 3:

Match one Implication and one Classroom Environment with each Key Finding
<table>
<thead>
<tr>
<th>Key Findings</th>
<th>Implications for Teaching</th>
<th>Designing Classroom Environments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Students come to the classroom with preconceptions about how the world</td>
<td>1. Teachers must draw out and work with the preexisting understandings that their students</td>
<td>1. Schools and classrooms must be learner centered.</td>
</tr>
<tr>
<td>works, if their initial understanding is not engaged, they may fail to grasp</td>
<td>bring with them.</td>
<td></td>
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<tr>
<td>the new concepts and information that are taught, or they may learn them for</td>
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<tr>
<td>purposes of a test but revert to their preconceptions outside the classroom.</td>
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<tr>
<td>2. To develop competence in an area of inquiry, students must: (a) have a</td>
<td>2. Teachers must teach some subject matter in depth, providing many examples in which the</td>
<td>2. To provide a knowledge-centered classroom environment, attention must be given to what is</td>
</tr>
<tr>
<td>deep foundation of factual knowledge, (b) understand facts and ideas in the</td>
<td>same concept is at work and providing a firm foundation of factual knowledge.</td>
<td>taught (information, subject matter), why it is taught (understanding), and what competence or</td>
</tr>
<tr>
<td>context of a conceptual framework, and (c) organize knowledge in ways that</td>
<td></td>
<td>mastery looks like.</td>
</tr>
<tr>
<td>facilitate retrieval and application.</td>
<td></td>
<td></td>
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<tr>
<td>3. A “metacognitive” approach to instruction can help students learn to take</td>
<td>3. The teaching of metacognitive skills should be integrated into the curriculum in a variety</td>
<td>3. Formative assessments — ongoing assessments designed to make students’ thinking visible to</td>
</tr>
<tr>
<td>control of their own learning by defining learning goals and monitoring their</td>
<td>of subject areas.</td>
<td>both teachers and students — are essential. They permit the teacher to grasp the students’</td>
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<td>progress in achieving them.</td>
<td></td>
<td>preconceptions, understand where the students are in the “developmental corridor” from informal</td>
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<td>to formal thinking, and design instruction accordingly. In the assessment-centered classroom</td>
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<td></td>
<td></td>
<td>environment, formative assessments help both teachers and students monitor progress.</td>
</tr>
<tr>
<td>Source: How People Learn: Brain, Mind, Experience, and School: Washington,</td>
<td>Prepared by: Centre for Teaching and Learning UBC Okanagan clt.ok.ubc.ca</td>
<td>4. Learning is influenced in fundamental ways by the context in which it takes place. A</td>
</tr>
<tr>
<td>DC: The National Academies Press, 2000.</td>
<td></td>
<td>community-centered approach requires the development of norms for the classroom and school, as</td>
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<td>well as connections to the outside world, that support core learning values.</td>
</tr>
</tbody>
</table>
Key Finding #1

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 purposes of a test but revert to their preconceptions outside of the classroom.
Implications for Teaching

*Teachers must *draw out and work with* the preexisting understandings that their students bring with them.*
Implications for Teaching

Teachers must *draw out and work with* the preexisting understandings that their *students bring with them*.

Designing Classroom Environments

*Schools and classrooms must be learner centered.*
Key Finding #2

To develop competence in an area, students 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 ways that facilitate retrieval and application.
Implications for Teaching

*Teachers must teach some subject matter in depth, providing many examples in which the same concept is at work and providing a firm foundation of factual knowledge.*

Designing Classroom Environments

*To provide a knowledge-centered environment, attention must be given to what is taught (information, subject matter), why it is taught (understanding), and what competence or mastery looks like.*
Development of Expertise

Adapted from Sprague & Stewart (2000)
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Development of Expertise

Adapted from Sprague & Stewart (2000)
Development of Expertise

Level of Expertise

Aware

2

3

Unaware

Novice

Expert

Adapted from Sprague & Stewart (2000)
Think about the place you’re living...

How many windows are there?

As you counted the windows, did you see them from inside or outside?
Key Finding #3

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.
Implications for Teaching

The teaching of metacognitive skills should be integrated into the curriculum in a variety of subject areas.

Designing Classroom Environments

Formative assessments — ongoing assessments designed to make students’ thinking visible to both teachers and students — are essential.
“Any questions?”

Why do you think instructors ask, “Any questions?”

“What questions do you have for me?”

A) to signal they’re at the end of a section or concept
B) so the instructor can check if they can continue
C) so the instructor can check if the students understand
D) so the students can check if they’re ready to continue

…and give them enough time to ask a useful question
HOW (YOU CAN HELP) PEOPLE LEARN

1. draw out and build on students’ pre-existing knowledge
2. model expertise (especially framework and retrieval, watch out for “expert blindness”)
3. create opportunities (and time) for students to practice being metacognitive
References


