Lessons from Cognitive and Learning Sciences

- Students are not *tabula rasa*
  - Prior knowledge can help prepare or "interfere" with new knowledge
- Students are active learners
  - Integrating information from different sources into knowledge *structures*
  - Reconciling conflicting information
- Language and cultural background can influence the thinking and learning process

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Case study: A learning problem

The Earth is round vs.

Assessing knowledge

- “What is the shape of the earth?”
  - ‘Round’ (62%) or ‘circle’ (27%)
- “Can you draw a picture of the earth?”
  - Circle (95%)
- “Now on this drawing, show me where the people live.”

<table>
<thead>
<tr>
<th>2 students</th>
<th>50 students</th>
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<tbody>
<tr>
<td>Example responses</td>
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3rd Grader
E: Can people fall off the end/edge of the earth?
C: No.
E: Why wouldn’t they fall off?
C: Because they are inside the earth.
E: When you say that they live inside the earth, do you mean they live inside the ball?
C: Inside the ball. In the middle of it.

5th Grader
C: The earth is round but when you look at it it is flat.
E: Why is that?
C: Because if you were looking around it would be round.
E: But what is the real shape of the earth?
C: Round, like a thick pancake.

Vosniadou & Brewer (1992)
**The Earth is round**

1. Integrate competing inputs
2. Mental representation
3. Use of representation

E: What if we were standing at the end of the earth, would we fall?
C: No. But we could probably bump into something.

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**Cross-cultural differences**

- **Myths in India**
  
  "The earth itself floats on an ocean that separates it from the nether worlds."

  From Flammarion's *Astronomical Myths* (1877)

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**Indian children’s cosmologies**

Samarapungavan et al. (1996)

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**Several ways language can influence thought**

- **Language as lens**
  - Does language shape how we perceive the world?

- **Language as tool kit**
  - Does language increase our capacity for representation and reasoning?

- **Language as category maker**
  - Does language influence our category distinctions?