Actively passive: The role of textbook figures in developing visual thinking skills

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Visual Representation: The Heart and Soul of Science

http://science.howstuffworks.com

US Global Change Research Program

Tavares et al. 2011.

Campbell, Biology 8th Edition
What is visual thinking?

- Interpret, create, and use representations

Ainsworth 2006, Rundgren & Tibell 2010, Schönborn & Anderson 2010
How are visual thinking skills developed?

- Visual thinking is, at best, an implicit goal of undergraduate curricula.
- As such, visual thinking is constrained by the visualizations to which students are exposed.

Instructional Visualizations

Explanatory → Authentic
Research Questions

To what degree do textbook visualizations provide a scaffold for the development of visual thinking?

What is the nature of textbook visualizations across the undergraduate curriculum?

How do textbook visualizations compare to expert visualizations?
Visualizations in Introductory Biology Sequence
Disconnect Between Semesters in Introductory Biology Sequence

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Evolution: The Unifying Theme?

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A transect across a curriculum
Lack of scaffolding across the undergraduate curriculum to support development of visual thinking.

There is a disconnect between what students are routinely exposed to and what scientists use.

Paucity of graphs may reinforce perceptions of life science as non-quantitative.

Photographs and other real images are decorative or explanatory rather than representing data.

Schematics seldom used to model or hypothesize.
Implications and Future Work

- Learning environments should be augmented to better scaffold the development of visual thinking—including how we assess our students.

- Students need more opportunities to see and interpret authentic visualizations as well as practice representing data visually.
  - Model-based instruction
  - Authentic laboratory experiences
  - Portfolios of student learning
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Differences due to disciplinary practices?