

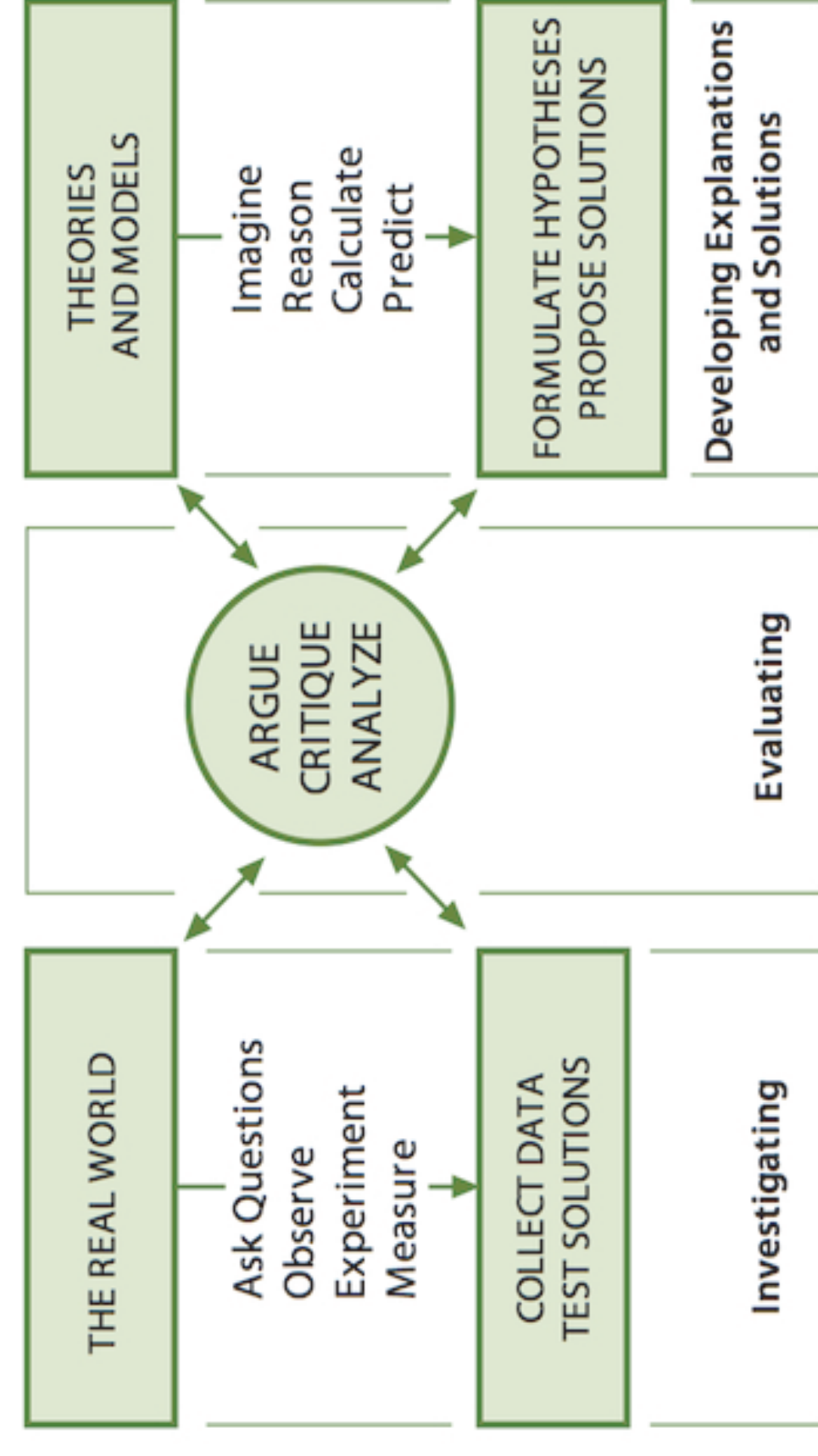
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Abstract

Critique and evaluation are central to the scientific enterprise. A *Framework for K-12 Science Education* identifies critiquing, arguing, and analyzing as evaluative processes that are foundational to science and science learning. However, it can be challenging for students to think critically and scientifically about many socio-science topics, such as availability of freshwater resources. My research team and I have developed instructional scaffolds—one specifically covering the topic of freshwater availability—with the goal of helping students to purposefully evaluate connections between lines of evidence and alternative explanations of socio-scientific phenomena. Our upcoming classroom-based research will examine how students construct deep understanding of this freshwater topic, as well as other socioscientific issues, such as climate change.

## Background

Scientific explanations must be “justified and critiqued on the basis of evidence and... validated by the larger scientific community” (NRC, 2012, p. 251)



The three spheres of activity for scientists and engineers (NRC, 2012, p. 45), with critique and evaluation at the nexus

One judgment that both laypersons (e.g., students, the public) and scientists apply to explanations is **plausibility**.

**Plausibility Gap:** Where individuals find competing—but non-scientific—ideas more plausible than explanations offered by scientists (Lombardi et al., 2013).

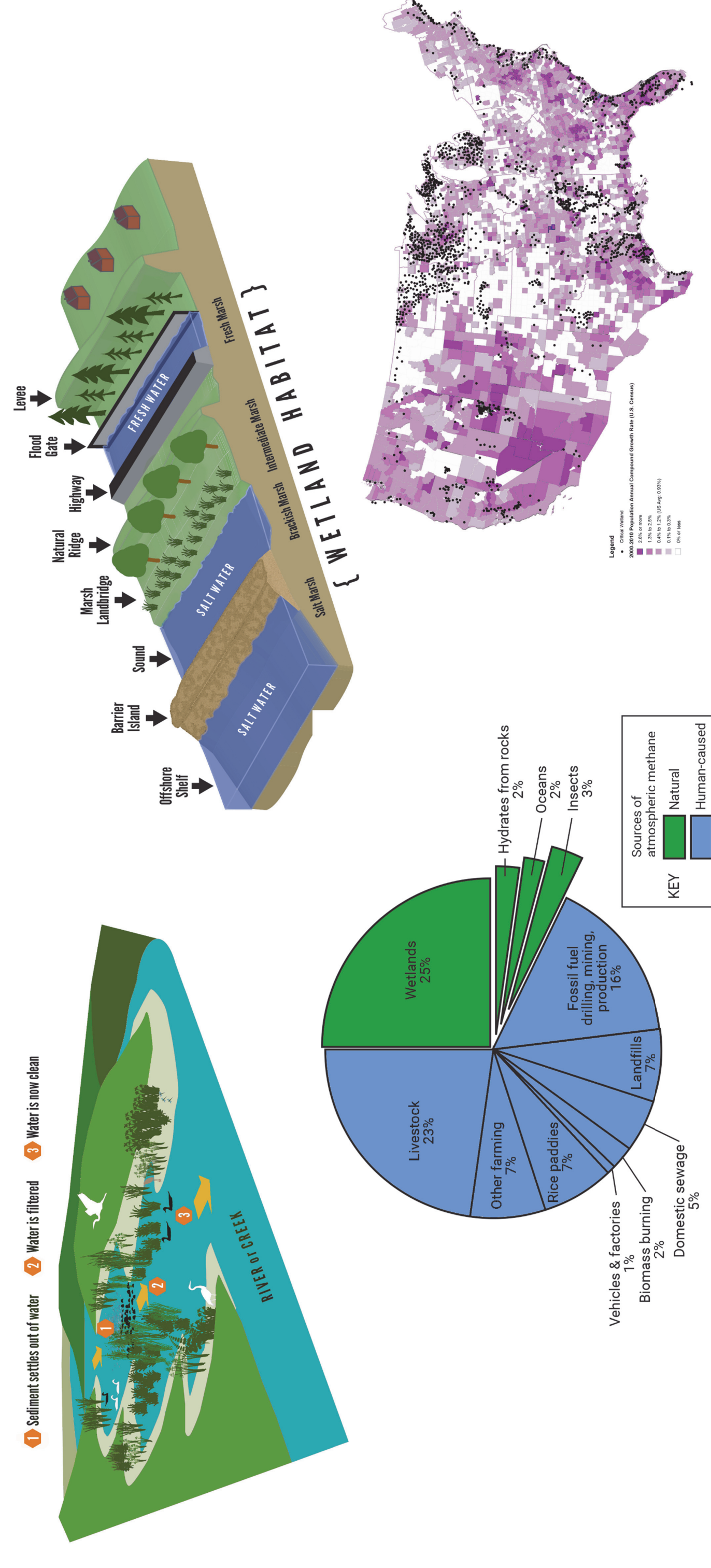
## Model-Evidence Link (MEL) Diagrams

MELs are scaffolds to facilitate students’ evaluations about connections between lines of evidence and alternative explanations about a phenomenon (Chinn & Buckland, 2012)

Pre-constructed MELs shifted students’ plausibility judgment toward a more scientific stance and deepened their knowledge (Lombardi et al., 2018)

However, students’ scientific evaluations do not transfer beyond the task context

Build-a-MELs may promote transfer via students’ conceptual agency (Nussbaum & Asterhan, 2016)

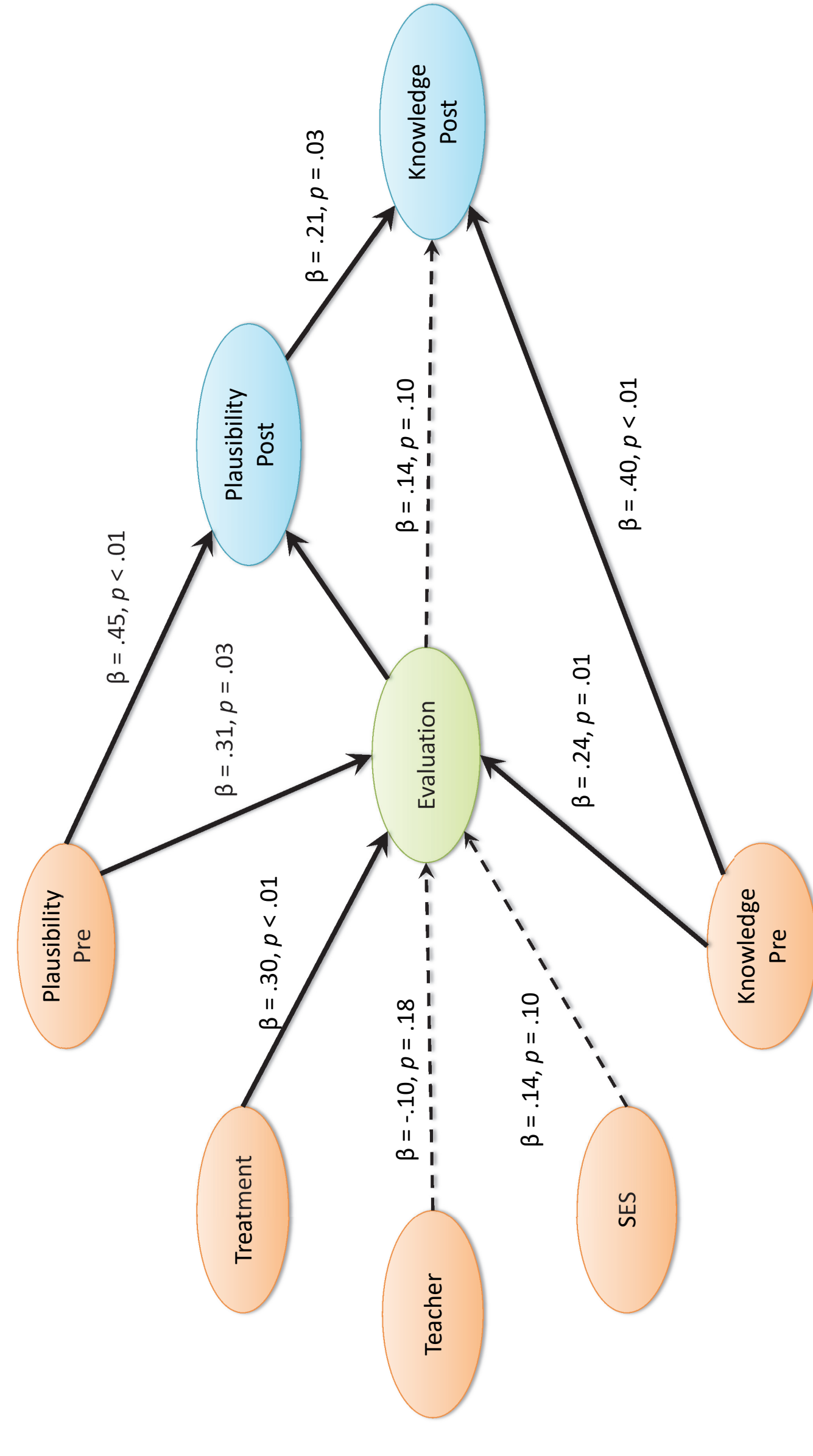


These are examples of figures associated with the evidence texts, which are elaborative sources about each line of evidence

## Freshwater Build-a-MEL

## Research Results

In a quasi-experimental, classroom-based study, we found significant relations between the MEL activities, evaluation, plausibility, and knowledge



These results suggests that MELs can help students think more critically, facilitate their scientific judgments, and deepen students’ knowledge (Lombardi et al., in review)

## Project Website

<https://serc.carleton.edu/mel>

The website contains all the MELs and associated materials for free download.