Research Summary

Primary Project:

Title: Using the Structure-Behaviors-Functions Framework to assess students' mechanistic reasoning in neuroscience education.

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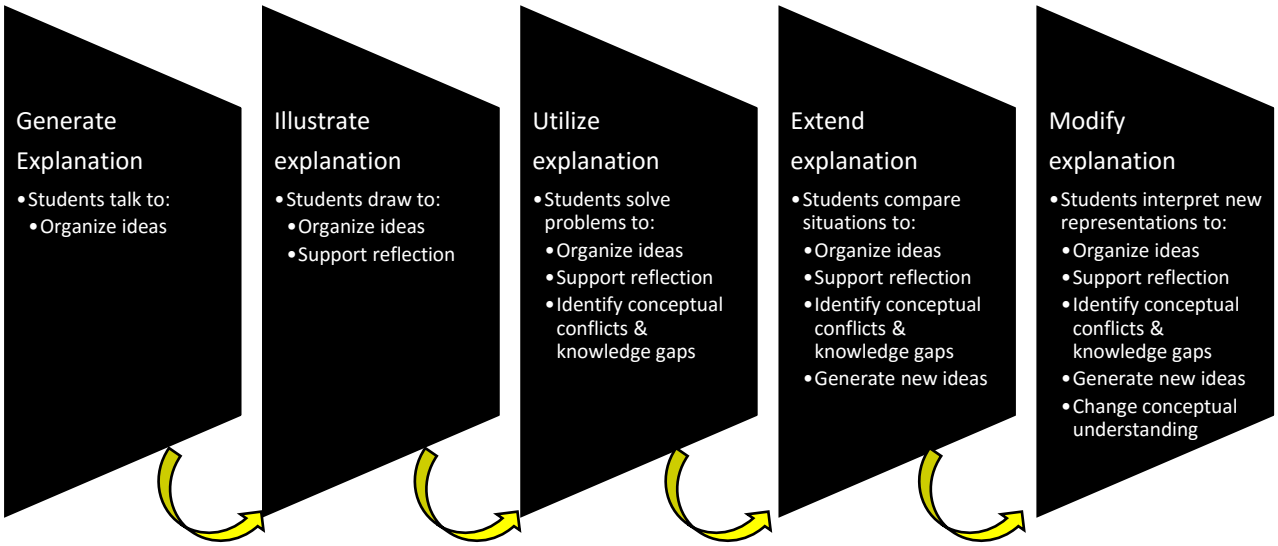
Goals: We aim to accomplish two broad aims: (1) extend the Structure-Behavior-Function (SBF) framework to finer degrees of granularity and (2) identify techniques for embedding scaffolds directly into assessment instruments that measure students' mechanistic reasoning. For the first aim, we are working to sharpen our assessment of how students' understand structures, behaviors, and functions. Second, we are working to develop assessment items crafted in ways that promote more expert-like reasoning.

Methods: At present, we employ the cognitive clinical interview to assess students' mechanistic reasoning. We leverage explanation, prediction, drawing, and inter-species comparison tasks to assess how students differently employ knowledge of structures, behaviors, and functions across tasks.



We designed the (above) protocol's five general tasks to support students in modifying their understanding of structures, behaviors, and functions and relations between these three facets.

Outcomes: We aim to produce (1) an extended taxonomy for assessing students' mechanistic reasoning in biology and (2) an assessment instrument that measures how students integrate knowledge of structures, behaviors, and functions in neuroscience.

Support: NSF; Purdue University

Key References:

Hmelo-Silver, C. E., Marathe, S., & Liu, L. (2007). Fish swim, rocks sit, and lungs breathe: Expert-novice understanding of complex systems. *The Journal of the Learning Sciences*, *16*(3), 307-331.

Mayr, E. (1961). Cause and effect in biology. *Science. 134*(3489), 1501-1506.