Biology Education Research
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Supporting Student Learning

- Undergraduate students need support to learn how to integrate individual concepts into complex biological systems in order to reach robust understanding (Wilson et al., 2006).
- Instructors can support students to engage in self-regulation to monitor their own work, generate their own feedback, and use that feedback to improve their understanding (Bell & Cowie, 2001; Nicol & Macfarlane-Dick, 2006; Sadler, 1989; Wood, 2009).
- One approach for instructors to support this process is through the use of various scaffolds within the learning environment.

Scaffolds

- *Scaffold* = structure that supports learners until they can perform a task or a behavior on their own.
- *Scaffolding* = a process whereby different aspects of an activity are structured to help learners until they can act independently (Pea, 2004).
- Examples include rubrics, reflection questions, practice tests, structured assignments, etc.

Self-Regulated Learning and Metacognition

- Self-regulated learning (SRL) consists of students actively controlling aspects of their own learning (Nicol & Milligan, 2006).
- Metacognition is awareness of one's own learning process (Wood, 2009), or "thinking about thinking."
- Asking students to assign intelligibility, plausibility, and wide-applicability to their own ideas can help them change their alternative conceptions into scientifically-accurate conceptions (Grotzer & Mittlefehldt, 2012; Tanner & Allen, 2005). This has been shown to lead to better student performance and learning gains (e.g., Anderson & Nashon, 2006; Baird, 1986)
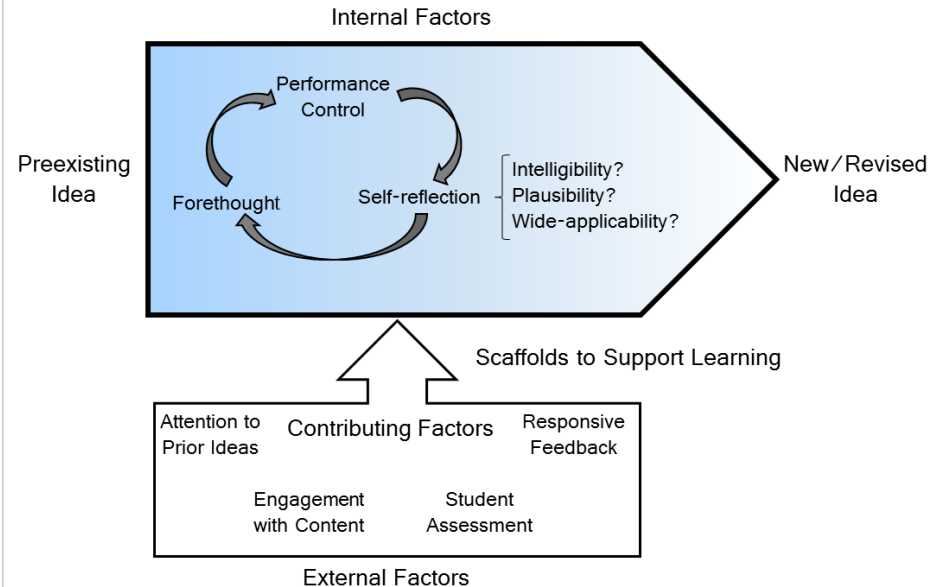

Figure 1. Conceptual Framework. Various scaffolds can support students to bridge factors in the external learning environment with internal factors, such as self-regulated learning and metacognition. These supports can help students progress from a preexisting idea to a new or revised idea. (modified from Sabel, Dauer, & Forbes, in review)