ABSTRACT: This study examines the ways in which teachers provide students with written scaffolds in assessment tasks and the impact of these on students’ abilities to demonstrate a core disciplinary proficiency—constructing evidence-based explanations. Data include 76 assessment tasks designed by 33 science teachers and 707 samples of student work. We found five types of scaffolding embedded in assessments that allowed students to make their reasoning explicit: (a) using contextualized phenomena, (b) rubrics, (c) checklists, (d) sentence frames, and (e) encouraging students to draw explanatory models in combination with written explanation. Analyses showed that all five forms of scaffolding were significantly associated with the quality of student explanation even when controlling for teacher variance and student background. Providing contextualized phenomena had the greatest impact on the quality of student explanations, both by itself and in combination with other scaffolding. The results indicate that strategic combinations of scaffolds can prompt students across all achievement levels to more readily use what they know to produce evidence-based explanations, but that the scaffolding must be of high quality.


Scaffolding by Providing a Checklist (p. 11)

Scaffolding by Providing a Checklist. The third form of scaffolding in the assessment task was providing one or a set of idea checklists to be referenced while constructing the explanation. We found two different kinds of checklists. The first is a “simple check-list” that lists concepts or scientific terms. This was often provided as a word bank in a box. The other was an “explanation checklist” that prompted students to explain multiple aspects of the focal event as well as some relationships among ideas, observations, and key patterns. For example, in a cell membrane assessment (see Figure 2), a teacher asked students to explain how a paramecium survives in pond water, providing the following explanation checklist. This scaffolding was framed by the teacher as an “Answer Checklist”:

Answer Checklist: Be sure to check and make sure your explanation addresses and answers the following concepts:

- Explain how paramecium gets water to survive.
- Explain how paramecium gets oxygen to survive.
- Explain what would happen to paramecium if salt water is added.

The explanation checklist occasionally appeared along with the simple checklist. […]

Scaffolding by Providing a Checklist (p. 26):

Inviting Complex Reasoning With Multiple Relationships. Checklists, in particular an explanation checklist that consisted of statements about important relationships relevant to the focal phenomena, significantly explained the quality of student explanations. We hypothesize that even a simple word checklist reduces the cognitive load for locating
terminology, and refocuses students’ intellectual resources toward synthesizing information, examining relationships, and evaluating evidence. In contrast, more elaborated forms of checklists, such as explanation checklists, highlight particular relationships or dimensions of process that students need to consider. For example, in the cell membrane assessment (see Figure 2), the explanation checklist helped students attend to key relationships that define a system, such as paramecium’s in-take of water in relation to the amount of salt. Also, it invites students to reason about how the relationship fits into a larger activity system (e.g., paramecium’s survival). Without explanation checklists, students were able to produce explanations, but with this form of checklist the task challenged students to consider specific dimensions of the phenomena that they may not have otherwise attended to in written explanations.

Figure 2. Cell membrane assessment: How does the paramecium get everything it needs to survive? (p. 11)