

# Prompts for Integrating Crosscutting Concepts Into Assessment and Instruction

The new vision for science education features a three dimensional view of learning that involves: science and engineering practices, crosscutting concepts, and disciplinary core ideas. Many educators already incorporate crosscutting concepts into their teaching, but may still be looking for ways to amplify these concepts or to make them more explicit for their students, including in their classroom assessments.

This set of prompts is intended to help teachers elicit student understanding of crosscutting concepts in the context of investigating phenomena or solving problems.

These prompts should be used as part of a multi-component extended task. They should not be used in isolation, and the blanks provided are intended to be filled using the content of the scenario presented at the beginning of the multi-component task. The prompts can be open-ended, as shown below. They can also be turned into multiple-choice questions. These prompts were developed using the Framework for K-12 Science Education and Appendix G of the Next Generation Science Standards, along with relevant learning sciences research.

These prompts are currently being tested or evaluated in the field. We request you send feedback and information about how you have used the prompt to [william dot penuel at colorado dot edu](mailto:william dot penuel at colorado dot edu).

Please note that some prompts may not be suitable for students in early grades, while others may be low-level for high school students. Designers should consult the learning progressions [in Appendix G of the NGSS](#) to choose a prompt that is appropriate for different grade level bands.

Our team has also created a similar tool to help educators create tasks that incorporate the science and engineering practices into their teaching, found at [stemteachingtools.org/brief/30](http://stemteachingtools.org/brief/30). You can learn how to develop 3D formative assessments here: <http://tinyurl.com/3Dassessmentdevelopment>



## Crosscutting Concept: Structure and Function

[A Framework for K-12 Science Education](#) description of **structure and function**: The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.

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*After presenting students with observational data as part of the scenario:*

- What structures are present in \_\_\_\_\_? What function does each structure have in (scenario)? How do you think each structure behave?
- What is the relationship between the structure and its function?
- Why does the shape of \_\_\_\_\_ matter for its function? What other properties of the structure might allow it to have certain behaviors?

*Ask after presenting students with a model as part of the scenario:*

- What are the substructures shown in the model? For each substructure, how does it behave in the model? What properties does it have? What is its function in the model?
- Describe the organization of substructures and how the spatial relationship matters for behavior and function.
- For the model, describe the behaviors by which the structures accomplish their functions.

*After presenting students with a novel system students have not explored before to investigate:*

- What function do you think [structure] serves in this system? How could we find out?
- This system performs [describe functions]. How do you think the structures support or enable those functions?
- When observing living organisms in an unfamiliar system: This organism engages in [behavior] to [describe function.] How might [structure] help explain how they are able to perform [behavior]?

*After presenting students with a description of a microscopic system:*

- Together, what the parts of the \_\_\_\_\_ (system) do? What do you think the structures look like?
- Based on the overall function of the system, how do each of the individual structures behave? What properties do they have?

*After asking students to design a solution (e.g., a mechanical system):*

- Describe the structures in your solution. Describe the function in your solution. What is important about the relationship between structure and function in your solution that make it a successful design?
- Describe the sub-structures in your solution. Describe the function in your solution. What is important about the relationship between sub-structures and function in your solution that make it a successful design?

*When asking students about **structure and function** in ecosystems:*

- Identify the properties of the environment that constrain behavior of organisms. What about the structures of an organism allow them to survive within the environment? What is the behavior of the organism and the function of the structures it has?
- You find a new animal in an environment it has [structure] it uses to [perform function]. Given what you know about the ecosystem, explain the how [structure] supports its survival in this ecosystem.