



5 Tips for Using Concept Maps to Assess Learning

A GUIDE FOR EDUCATORS AND
RESEARCHERS

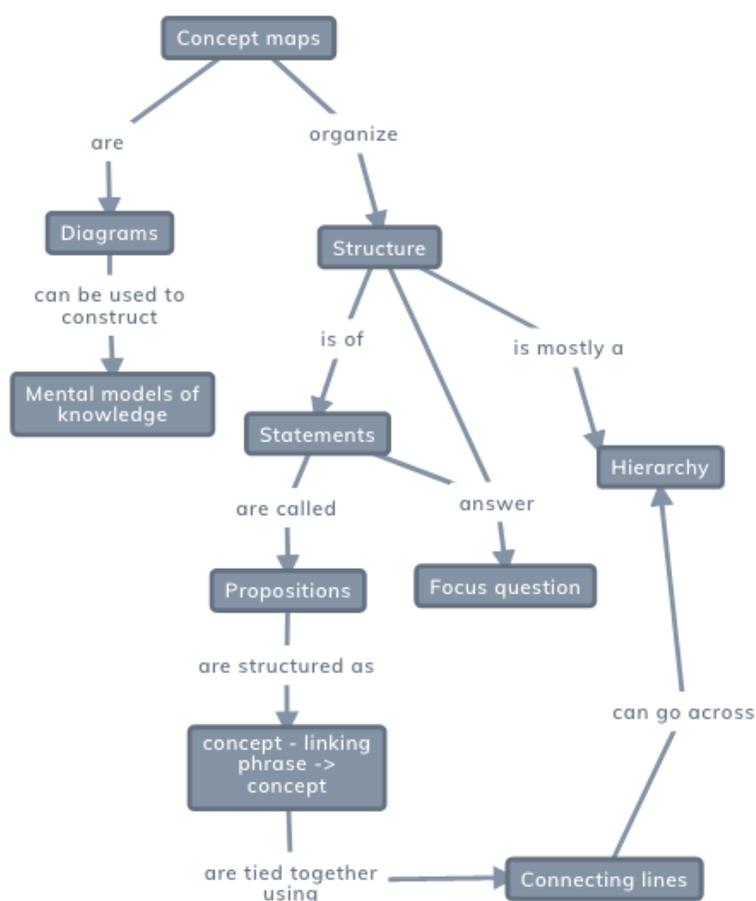
By Sero! Learning Assessments, Inc.

What Are Concept Maps?

Concept maps are diagrams used to construct **mental models** of **knowledge**. They **organize** a structure of statements, or **propositions**, to answer a **focus question**. The structure of each proposition is **concept – linking phrase → concept**, tied together using connecting lines. The structure of the map is mostly **hierarchical**, with **connections** allowed across the hierarchy.

A Proven Approach to Learning

Concept mapping has **proven effective** at **helping learners learn** all over the world for almost **50 years!** There are **many ways** to introduce concept mapping into the **classroom** — check out [this resource](#) from the **founder** of concept mapping for the **pedagogical basics**.



Concept Mapping for Assessment

Because they can **reveal learners' understanding** of the content and structure of knowledge, concept mapping tasks can be especially **useful tools for assessment**. The **National Assessment of Educational Progress** (NAEP) has even pointed to the benefits of using concept mapping for assessment in their [2015 Science Framework](#):

*Concept maps can be used as a **reliable and valid assessment of students' ability to make connections among science principles**. Thus, concept-mapping tasks tap a science ability that is **difficult to measure by other means**.*

**Emphasis added*

Widespread and Well-documented Results

The **advantages of concept mapping tasks** for learning assessment aren't limited to science or even summative assessment. **Hundreds of studies** from around the globe have **demonstrated their utility** for assessment across **almost any subject area**.

Getting Started

Instructors and researchers have developed many ways to use concept mapping in the **classroom** — and for **assessment**. We've captured **best practices** for concept mapping here — and we show how they should be incorporated into assessment. As a bonus, we show you how [Sero!](#) can help you **put them into practice today!**



Best Practice #1 | Develop Skills

Concept mapping is a skill in and of itself. But even preschoolers can learn to create good concept maps. As with any learning technique, concept mapping requires developing skills – including thinking in terms of propositions.

- ✓ **Assessment Tip** | Give learners the basics of concept mapping and the chance to practice with concept mapping about simple topics they are familiar with before using concept mapping tasks for assessment.

Sero! offers a range of simple to complex concept mapping tasks that break down concept mapping into its component steps — adding and selecting content and making connections. And **Sero!** enables learners to create their own concept maps, to put their new skills to work.

Best Practice #2 | Use Focus Questions

Focus questions provide the context for the knowledge to be assessed. Research has shown that different focus questions can inspire different concept map structures, even within the same subject. Consider the differences between the following questions:

1. What are the parts of the solar system?
2. How do parts of the solar system affect life on Earth?

The first is a **static** question will elicit a declarative map with mostly definition-based relationships between concepts. The second question is **dynamic** and more likely to elicit a structure that illustrates the systemic nature of relationships on a holistic level.

- ✓ **Assessment Tip** | **Sero!** requires that every assessment starts with a focus question to set the right stage for the right assessment at the right stage of learning. Use a focus question to shape the assessment to the kind of knowledge you want to assess.

Best Practice #3 | Encourage Precision

Propositions are the building blocks of knowledge and thinking. Concepts can be things and/or events, and linking phrases specify the relationships between them. How a learner thinks about linking phrases and relationships can determine what propositions they create.

Consider the various definitions of the word “has.” It can mean “to own,” “to contain,” “to experience,” or “to consist of.” Now consider it in the partial proposition, “Earth **has** _____”. The variety of interpretations could lead to any number of answers, including: a moon, an atmosphere, four seasons, or a crust. Substituting a more specific linking phrase in the proposition “Earth **is surrounded by** _____” leaves only one logical option in that list: an atmosphere.

Likewise, the direction of the arrowheads on the connecting lines states clearly how a proposition should be read. Consider the proposition **Sun – revolves around – Earth**. Without the arrowhead, the direction of the proposition is unknown; **Sun ← revolves around – Earth** shows the valid reading.

On the topic of valid propositions, research has demonstrated that reviewing concept maps with errors helps learners identify and correct misconceptions in their own mental models.

- ✓ **Assessment Tip** | Introduce concept mapping tasks that both provide and withhold content — i.e., concepts and linking phrases — and requires the learner to make decisions about how to express propositions.

Assessors can use **Sero!** to create assessment tasks that require learners to add, edit, and select content — and even consider ‘distractor’ content and erroneous propositions — to build precise and accurate propositions that express their understanding of the answer to a focus question.

Best Practice #4 | Build Structure

Concept maps help organize knowledge by showing how concepts relate to other concepts and how details fit into the overarching picture. They express the general **hierarchical structure of knowledge**, while helping learners **reason** about the relationships.

- ✓ **Assessment Tip** | Match the assessment task to the level of structure learners should be expected to have and the content they should be expected to be able to assimilate into their structure.

Sero!'s concept mapping activities use structured and unstructured maps that enable learners to build or revise structure, enabling flexibility in assessing structure or content.

Best Practice #5 | Guide Meaningful Learning

Concept mapping was developed to show — quickly and accurately — the state of learners' **mental models**, to help them assimilate new concepts and propositions. They are uniquely effective in identifying both valid and invalid ideas held by learners.

- ✓ **Assessment Tip** | Use concept maps to identify the state of learners' cognitive frameworks before (diagnostic), during (formative), and after (summative) learning events. Then, use insights gleaned to guide instructional content and methods.

Sero!'s analytic and visualization tools help instructors rapidly assess student progress at the individual and group levels. Data insights help identify where learners' conceptions are valid, ready to be extended, and, most importantly, where misconceptions persist and require additional instruction.

