Expert Insights

Derek Bruff, PhD, Director, Center for Learning, Senior Lecturer, Department of Mathematics, Vanderbilt University [00:00:00] Our brains are wired to, to work verbally and visually, and in fact, when those two input streams are working together, we learn better. And so we are all visual learners. It's the point of, you know, concept maps and visual tools. We may not think of ourselves as visual learners. We may have to work a little harder to develop some of our visual learning skills and vocabulary, but this is actually a way to reach all students.

Narrator [00:00:30] As experts, we can connect our knowledge like the pieces of a jigsaw puzzle, linking different ideas together into a complete picture of our fields right up to the border, where new insights will in time click into place. By comparison, many students may feel as if they're putting together the puzzle without all the pieces, as there's a lot that they don't yet know, and even without the picture on the box to give a guiding vision of the whole. To be successful learners, students need to organize their knowledge, make connections, and see the relationships between different facts and ideas. Concept maps and other visualization tools help students make these connections and deepen their understanding.

Derek Bruff, PhD [00:01:17] Our students often come in as novices in our field and don't have that, don't have that kind of set of connections among all the ideas and examples that are inherent to our disciplines. It's important for us to help them develop those connections, to see the big picture, to see what's related to what and what's an example of what. When they start to develop that, they'll be able to then apply that knowledge in lots of different contexts, right. And this is really what we'd like them to do, is to leave our course and do something useful with what they've learned, right. And so they need to develop these knowledge organizations. And so, as instructors, it's helpful if we can find ways to help our students develop their knowledge organizations, to see those connections, to see the big picture. Concept maps are a really useful tool for doing that.

Narrator [00:02:09] To start, it's useful to incorporate concept maps and other visual tools in your presentation of class material. For example, timelines bring historical information to life, showing chronology of events and a causal sequence, and they can invite discussion of other key moments and rival causes.

Derek Bruff, PhD [00:02:28] So if you want students to sequence things, to get a sense of when things happened in terms of other things, what things happened concurrently, right, in time, a timeline is a really nice structured visual tool for doing that. One way to make a timeline a little bit more interesting is to have, either color-code the entries, or you can even kind of have little bands of entries where, let's say you're looking at some period in time and you want to look at political events or cultural events or religious events, right. You could color-code those three different categories differently. And then you have the opportunity in the visualization to start to see, oh, well, in this time there were several things happening, both political and cultural, that were kind of playing into each other. A timeline can be a really nice way to visualize the relationships among those historical events to find out which ones were kind of concurrent, which ones influenced each other, which ones were more distant.

Narrator [00:03:32] Flowcharts visually portray complex processes, strategies, and theories of change. The charts' branching paths, where different outcomes happen depending on the choice, animate concepts of contingency, probability, and path dependence.

Derek Bruff, PhD [00:03:48] A flowchart can be used to represent a process of some sort. So I worked with a graduate student a couple of years ago who was teaching a earth materials course, and so she was helping students in the lab identify minerals using microscopes and other devices.

And so there was this kind of activity where students would get a mineral and they'd have to decide which of these several different types of microscopes to use to look at it. And based on what they saw, they would then have to decide what to look for next, right. Oh, if we see this property in this microscope then it might be this category of minerals, so now we need to investigate these properties so we use these microscopes. That's a beautiful process to represent as a flowchart.

Narrator [00:04:35] Concept circles illustrate by size the relative importance of different ideas and how ideas relate as if they're far apart, close by, or overlapping. Not only can these visual tools help explain particular content, they can be used at the start of a semester to demonstrate the organization of your entire course by showing connections between learning objectives and course material. Such maps portray how the different, seemingly disparate topics covered each week actually connect. Students should also be encouraged to create their own concept maps as ways to organize their notes, make connections, and start to fill in missing pieces of their mental puzzle. And concept maps can be great assignments. For example, requiring students to prepare timelines assesses mastery of events and chronologies. Assigning a flowchart can determine students' understanding of cause and effect for a scientific process, historical events, or even an alternate history. Concept maps are also a great way for students with developing writing skills to express their knowledge visually and in a brevity of words. Just make sure that the type of concept map assigned aligns with the content it aims to illustrate. Given that such assignments differ from the usual writing a paper, it may be necessary to construct the first one together in class with a familiar topic.

Derek Bruff, PhD [00:05:57] Asking students to create concept maps can be sometimes a little challenging for students if they have not done so before. And so it's often helpful to provide students with an example of the genre first. So you might create your own concept map about something not related to course material, right. So, like, how you think about sandwiches that you make for yourself, right, ingredients and process and place, right. And so you could create a fairly simple concept map that illustrates the idea of concepts as nodes and relationships as connections among those nodes. I think most students, once they see a couple of these, they get the hang of it, it's fairly straightforward. And so giving them an example first or maybe having them do a concept map on something off topic first as a kind of training activity before they tackle the course material as a concept map.

Narrator [00:06:46] Finally, concept maps can be efficient tool for formative assessment. By asking students to draw what they know about a topic at the start of a semester or unit of study, you can identify common gaps in knowledge that you'll need to address and areas that are well understood to which you can connect new ideas.

Derek Bruff, PhD [00:07:06] More frequently I see it as a, as a formative assessment tool, as a way to understand how students are making sense of the course material, to provide students with feedback on their own learning, and to provide an instructor with the kind of information that they can use to teach in a more agile manner, responding to the patterns and trends they see in their students' concept maps and maybe kind of circling back to some concepts that, that aren't as well connected for their students and spending a little more time drawing out some of those connections.

Narrator [00:07:37] In this way, you're creating a dynamic concept map for your very own class that you can add to week by week, as you see your students come to understand the full picture.