Why don't my students get it? Simple strategies to teach complex course content

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*Wondering why it is difficult for your students to understand course content that is easy and obvious to you? In this vodcast, we will introduce a phenomenon known as the **"curse of knowledge"** that addresses this question, and we will share evidence-informed teaching strategies for minimizing the impact of the curse of knowledge on one's teaching. These strategies require minimal preparation and little or no grading.*

What it the curse of knowledge?

The *curse of knowledge* is a phenomenon also known as the *curse of expertise* or *expert bias* or *expert blind spots*. Research findings from the fields of Cognitive Psychology, Neuroscience and Learning Science explain the curse. Various definitions include:

- Hinds (1999) defines the curse of expertise as a cognitive bias that leads to underestimating the difficulties novices face when performing a task.
- Nickerson (1999) defines it as a phenomenon "when one knows something, and especially if one has known it for a long time, one is likely to take that knowledge for granted and to view it as simpler and more straightforward than it will appear to someone who encounters it for the first time. Overestimation of what other people know may stem, in some instances, from lack of attention to the complexity of one's own knowledge" (p. 752).
- Wieman (2007) describes it as "the idea that when you know something, it is extremely difficult to think about it from the perspective of someone who does not know it" (p. 8).

Why is it important to be aware of this phenomenon?

When designing a course or any learning activity, instructors can avoid the curse by reflecting on what content may be difficult for students to understand and then planning learning activities that take these difficult areas into account .

Why is it useful to understand thinking differences between novices and experts ?

To understand the curse of knowledge, it is important to understand differences between the way **novices** and **experts** organize knowledge because a novice is not "a little expert" (Kirschner & Hendrick 2020). Key findings in the literature describe the difference:

- "While undergraduate students in a course are meeting a given idea for the first time, experts have, over a period of years, revisited, rehearsed, explained, discussed, elaborated and organized that same idea. In short, research on expertise has identified that experts have a large repertoire of knowledge in their discipline, that they have organized this knowledge around core concepts or big ideas, and as a consequence they can fluently recall what they know at the right time" (Bransford et al., 2000, as cited in Tormey et al., 2022).

- Experts have more knowledge, work faster, but most important, they look at problems differently (Chi et al., 1981).

- One important way novices' and experts' knowledge organizations differ is in the number or density of connections among the concepts, facts, and skills they know (Ambrose et al., 2014).

- "The brains of novices in a subject are activated quite differently from experts when confronted with a problem. And as mastery is achieved, the brain literally changes; different links are formed and there are different activation patterns during problem solving" (Wieman, 2007, p. 8).

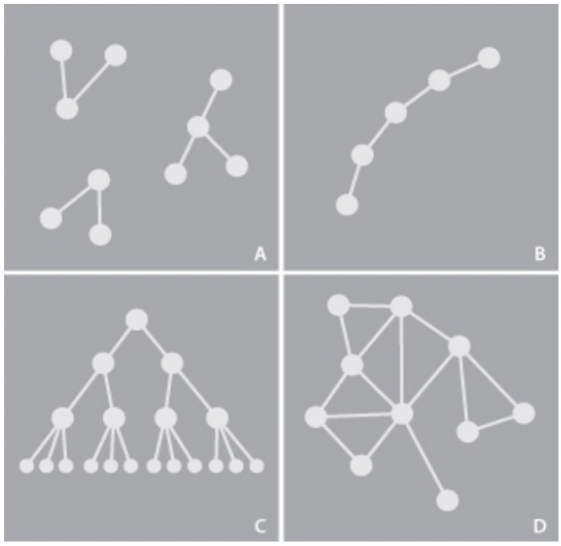
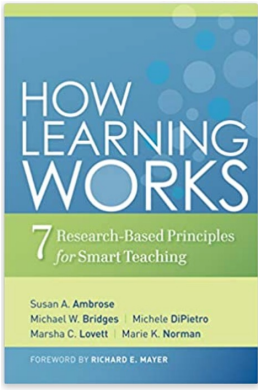


Figure 1. Experts' Versus Novices' Knowledge Organizations: The Density of Connections

The information shared on this page comes from the book "How learning works: 7 Research-Based Principles for Smart Teaching" (Ambrose et al., 2010), a resource we never get tired of recommending.



Panels A and B are typical representations of novices' knowledge organization. Links in Panel A are sparse, indicating students' inability to recognize connections between pieces of knowledge. In the classroom, this inability becomes evident when students can't connect information from one class to the next or when they can't recognize themes across an entire course (p. 50).

Links in Panel B are organized sequentially. A difficulty with this form of knowledge occurs when "one link in the chain is broken, or if some deviation from the specified sequence is required" (p. 50).

Panels C and D represent experts' typical knowledge organization. Knowledge organized hierarchically, as illustrated in Panel C, illustrates experts' ability to understand how different pieces of information connect to each other in a complex structure. Panel D indicates experts' capacity to cross reference knowledge and create links where hierarchies break (p. 51).

How can the impact of the curse of knowledge on student learning be minimized?

The following strategies aim to push past expert blind spots and facilitate knowledge integration and transfer. They require minimal preparation and little or no grading.

During course/class planning:

1. Before explaining complex ideas to your students, break concepts or solutions to problems into chunks or steps. Then, ask a TA or colleague with less expertise to read the concepts or solutions and try explaining them back to you.

2. Diagnose weak or missing skills and provide students with opportunities to practice these skills. Diagnostic exams or assignments early in a course can assess if students have the pre-requisites you expect them to have before teaching new content. You can hold review sessions outside class time for students to brush up on their skills or provide resources for students to practice skills on their own.

Explaining course content and assignments:

3. Narrate your thinking process out loud when solving problems in front of students. Don't assume they understand what goes on in your head.

4. Don't expect students to guess what they're supposed to learn: communicate to them the goals for each learning activity.

Integrating course content:

5. Break down components of a skill or problem and have students practice those components individually before practicing them together. For example, if a final assignment for a course is to write a research paper, have students practice skills such as how to conduct a literature review – how to cite a paper – how to write for an academic audience – how to reference papers- et cetera.

6. Do not assume students will know when or how to apply a skill after learning it. Share examples of real-world applications and make evident when to apply a learned skill.

7. Help students make explicit connections among problems, tasks, cases, and scenarios.

8. In addition to solving problems, have students identify the skills or knowledge they need to do the solving, as well as the contexts in which to apply the skills or knowledge.

9. Help students organize knowledge by continuously integrating content from previous classes with new content.

10. Include “integration” into performance criteria (e.g., make it a criterion in a rubric).

References

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