

Prior Knowledge as an Unexpected Obstacle to Learning

Written By: Janet G. Hudson, PhD, Faculty Associate Director for Innovative Teaching at the University of South Carolina Center for Teaching Excellence. Presenter at the 2016 Teaching Professor Conference.

Prior knowledge is essential for learning because it helps us make sense of new ideas and information. But when that prior knowledge is incomplete, confused, or flawed, it can create barriers to learning. Consider the following scenarios.

Novice travelers' experience: Awaiting the city bus in Tokyo, an American couple fumbled through their foreign currency to create various combinations of unfamiliar coins to pay the yet unknown fare. Their *prior knowledge* taught them that city buses require exact change upon entrance; moreover, they were aware that riders and drivers don't patiently tolerate the uninitiated. Why wasn't the fare posted? Were tickets purchased in advance? Their anxiety to discover the mysterious cost of this public transportation adventure rose as the bus approached.

Missing piece of expert local knowledge: Bus fares in Tokyo vary by distance traveled. The fare is paid upon exiting.

Novice student's experience: "I took notes, studied them, and thought I did well on the history test until my professor wrote: 'You misunderstand one of the most basic principles of this historical era. Plantation tobacco slavery was a defining characteristic of the southern Chesapeake colonies (Maryland and Virginia). Plantation slavery was NOT a feature of the northern economy as you indicated.'"

Student's prior knowledge stumbling block: This student came of age in the 21st century, and Maryland is not commonly perceived as a southern state today. So if plantation tobacco slavery existed in Maryland, as her professor indicated, then apparently plantation slavery existed in "the North," a conclusion she drew from unknowingly linking her 21st-century understanding of Maryland's regional identity with the expert's content.

Guiding novice learners

New knowledge builds on existing knowledge, and this strongly agreed-upon principle is imbedded in our education system and culture. For example, algebra builds upon mastery of multiplication, and similarly, at the K-12 level, numerically ordered grades imply that mastery of the third grade precedes entry to fourth grade. Colleges design prerequi-

site courses to scaffold disciplinary expertise.

Pervasive agreement that new knowledge builds upon prior knowledge, however, rests on the unstated assumption that one's prior knowledge is accurate and complete. Yet evidence abounds that this assumption is wildly optimistic if not frequently flawed. As the examples above illustrate, whether you are a novice with the Tokyo bus system or a novice in an introductory history course, your prior knowledge can become an obstacle rather than a conduit for new learning. Even with all the necessary prerequisites met, students commonly begin courses with inadequate prior knowledge or, more problematically, with prior knowledge that is confused and that includes misunderstandings, flawed thinking, and misplaced assumptions.

What's an expert to do?

Step 1: Diagnose

For prior knowledge to accelerate rather than hinder learning, flawed thinking, misunderstandings, confusion, and misplaced assumptions **MUST** be diagnosed. Only when novices recognize their confusion can it be explored and reconsidered. This is easier said than done, however, because:

- Novices are often unaware of their own flawed thinking or misunderstanding.
- Novices who recognize their lack of understanding may be too confused to form questions that experts readily understand.
- Novices who risk expressing their confusion with inarticulate questions that vaguely reference this, that, and the thingamabob are commonly greeted with blank stares, rolled eyes, impatient gestures, or worse—public ridicule.
- Novices frequently bristle at new information or ideas that experts share, especially when these contradict novices' understanding or challenge their worldviews, political identities, or life experiences. This in turn may lead novices, consciously or unconsciously, to resist or reject the ideas.

Step 2: Construct an “anatomy of confusion”

Rather than expecting novices to always take the initiative, lead with their confusion, and willingly make themselves vulnerable, as disciplinary experts we can strategically bring a sense of curiosity to novices' perspectives. We can imagine their misunderstandings, errors, and flawed assumptions as evidence for analyzing and data for constructing our discipline's “anatomy of confusion.”

How do we begin?

Gather data for your anatomy of confusion:

- Reflect on your teaching experiences in search of common misunderstandings.
- Speak with colleagues about patterns of confusion they've noticed.
- Interview advanced students who may recall recent breakthroughs and remember their earlier confusion.
- Brainstorm with novices to increase your insights into their "flawed" understanding of your expertise. (Remember, colleagues in other disciplines, family, and friends may be willing novices ready for experimentation.)

Conduct novice brainstorming exercises:

- Invite novices to brainstorm all the associations they make with a word, phrase, or core concept that is vital to your expertise. Note false associations and omitted ones.
- Invite novices to ask questions regarding a core concept you've identified from your discipline. The questions are your data, so look for imbedded assumptions and note vague references and missing vocabulary.

Classify your data. Common misunderstandings reveal that novices tend to:

- Apply familiar-word meanings when discipline-specific meanings are needed
- Extend analogies too far or too literally
- Apply generalizations erroneously to specific situations
- Assume that rules and forms that fit one context or discipline apply equally in a different context or discipline
- Miss crucial concepts

Finally, with the addition of self-assessments to link particular confusion with particular concepts or levels of mastery, an anatomy of confusion can become a valuable tool for constructing pathways for novices to follow away from arrays of misunderstandings toward improved and increased understanding.

Reference

Ambrose et al. (2010) *How Learning Works: Seven Research-Based Principles for Smart Teaching*. San Francisco, CA: Jossey-Bass.