**The Cognitive Challenges of Learning and Resources for Addressing Them**

Tables taken from Stephen L. Chew, “A DIY Guide to Teacher Professional Development,” *The Teaching Professor*, October 16, 2023, <https://www.teachingprofessor.com/topics/professional-growth/a-diy-guide-to-teacher-professional-development>.

Tables 1–4 list the nine cognitive challenges organized by category. Tables 5–8 list resources for addressing each challenge.

*Table 1*. What students believe

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| **Cognitive Challenges** | **Description and Example** |
| Student Mental Mindset | * Students hold attitudes and beliefs about a course, such as how interesting it will be and how hard they expect to work, that influence their motivation and perseverance.
* Stefani hates science but has to take a general education science course, which is going to be a waste of time.
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| Metacognition and Self-regulation | * Students make judgments about their level of mastery of concepts, and struggling students are often highly overconfident.
* Tyson felt confident when he submitted his exam but was stunned when he barely passed it.
 |
| Student Fear and Mistrust | * Students judge whether the teacher is supporting their learning or weeding out students who don’t belong in the class, which influences their motivation and perseverance.
* Parisa made a C on her essay, and she knows it’s the teacher’s way of telling her that she doesn’t have what it takes to succeed in the class.
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*Table 2*. What students know

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| **Cognitive Challenge** | **Description and Example** |
| Insufficient Prior Knowledge | * Some students may start a class with far less prior knowledge than other students, which makes their learning much more difficult.
* Elijah is the only student in his engineering class that didn’t take calculus in high school, because it wasn’t offered there.
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| Misconceptions | * Students often hold faulty or mistaken beliefs at the start of a course.
* Because of videos he’d seen, Alvin thought that some people possessed psychic powers but was surprised to learn there was no scientific evidence for that belief.
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| Transfer of Learning | * Students fail to apply what they learn to new situations.
* Tigran learned to calculate means and standard deviations in his statistics class, but in his research class, he claims he doesn’t know how to compute them.
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*Table 3*. What students can do

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| **Cognitive Challenges** | **Description and Example** |
| Constraints of Selective Attention  | * Students can focus their attention on only a small portion of the environment and miss anything outside that focus.
* Devin constantly texts his friends during class, thinking he can still follow the lecture. Later a classmate asks him about a concept covered in class, and Devin has no recollection of it at all.
 |
| Constraints of Mental Effort and Working Memory | * Students have two major limitations in cognitive processing: the amount of concentration (mental effort) available to them and the capacity to hold information consciously (working memory).
* Emma’s teacher introduces eight new concepts in rapid succession. Emma is overwhelmed and can’t keep the concepts straight. When she asks the teacher to explain the concepts again, he rolls his eyes and simply repeats what he said before.
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*Table 4*. How students develop

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| **Cognitive Challenges** | **Description and Example** |
| Ineffective Learning Strategies | * Students generally prefer the least effective learning strategies for long-term learning.
* Dawn thought that highlighting the key terms in her textbook would help her learn them, but she couldn’t remember them on the exam.
 |
| Metacognition and Self-regulation | * Students need to learn how to use assessment and feedback to make changes in their study habits to be academically successful.
* Isadora failed the first exam but decided it was just a fluke, so she prepared the same way for the second exam and failed again.
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*Table 5*. Resources for what students believe

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| **Cognitive Challenges** | **Resources** |

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| --- | --- |
| Student Mental Mindset | * TLS:[[1]](#footnote-1) “[Student Mental Mindset](https://takinglearningseriously.com/barriers-to-learning/student-mental-mindset/)”
* ASLE:[[2]](#footnote-2) “Helping Students to Get the Most Out of Studying”

(Chew) |
| Metacognition and Self-Regulation | * TLS: “[Metacognition and Self-Regulation](https://takinglearningseriously.com/barriers-to-learning/metacognition-and-self-regulation/)”
* ASLE: “How Accuracy in Students’ Self Perceptions Relates to Success in Learning” (Ehrlinger & Shain)
 |
| Student Fear and Mistrust | * TLS: “[Student Fear and Mistrust](https://takinglearningseriously.com/barriers-to-learning/student-fear-and-mistrust/)”
 |

*Table 6*. Resources for what students know

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| **Cognitive Challenges** | **Resources** |
| Lack of Prior Knowledge | * TLS: “[Prior Knowledge](https://takinglearningseriously.com/barriers-to-learning/prior-knowledge/)”
* ASLE: “Prior Knowledge Is More Than Content: Skills and Beliefs Also Impact Learning” (Ambrose & Lovett)
 |
| Misconceptions | * TLS: “[Misconceptions](https://takinglearningseriously.com/barriers-to-learning/misconceptions/)”
* ASLE: “Student Misconceptions: Where Do They Come From and What Can We Do?” (Taylor & Kowalski)
 |
| Transfer of Learning | * TLS: “[Transfer of Learning](https://takinglearningseriously.com/barriers-to-learning/transfer-of-learning/)”
* ITOW:[[3]](#footnote-3) “Different Goals Imply Different Methods: A Guide to Adapting Instructional Methods to Your Context” (Koedinger, Rau, & McLaughlin)
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*Table 7*. Resources for what students can do

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| **Cognitive Challenges** | **Resources** |
| Constraints of Selective Attention  | * TLS: “[Constraints on Selective Attention](https://takinglearningseriously.com/barriers-to-learning/constraints-on-selective-attention/)”
 |
| Constraints of Mental Effort and Working Memory | * TLS: [Constraints on Mental Effort and Working Memory](https://takinglearningseriously.com/barriers-to-learning/constraints-on-mental-effort-and-working-memory/)
* ITOW: “What Every Teacher Should Know about Cognitive Load Theory and the Importance of Cognitive Load to Instruction” (Ashman & Sweller)
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*Table 8*. Resources for how students develop

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| **Cognitive Challenges** | **Resources** |
| Ineffective Learning Strategies | * TLS: “[Ineffective Learning Strategies](https://takinglearningseriously.com/barriers-to-learning/ineffective-learning-strategies/)”
* ASLE: “Test-Enhanced Learning” (Pyc, Agarwal, & Roediger)
* ASLE: “Supporting Self-Explanation in the Classroom”

Chiu & Chi)* ASLE: “Spacing and Interleaving of Study and Practice” (Carpenter)
* ASLE: “When and Why Introducing Difficulties and Errors Can Enhance Instruction” (Clark & Bjork)
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| Metacognition and Self-Regulation | * TLS: “[Metacognition and Self-Regulation](https://takinglearningseriously.com/barriers-to-learning/metacognition-and-self-regulation/)”
* ITOW: “How to Teach Powerful Strategies So That Students Self-Regulate Their Use: The KBCP Framework” (McDaniel & Einstein)
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1. TLS = [TakingLearningSeriously.com](https://takinglearningseriously.com/) [↑](#footnote-ref-1)
2. ASLE = [*Applying Science of Learning in Education*](https://teachpsych.org/ebooks/asle2014/index.php) (Benassi et al., 2014) [↑](#footnote-ref-2)
3. ITOW = [*In Their Own Words: What Scholars and Teachers Want You to Know about Why and How to Apply the Science of Learning in Your Academic Setting*](https://teachpsych.org/ebooks/itow) (Overson et al., 2023) [↑](#footnote-ref-3)