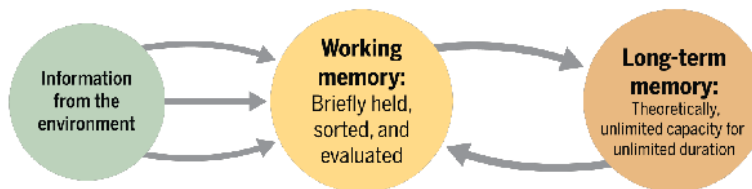


APPENDIX B (Foundational Modules – Science of Learning – Page 6)



This section discusses several of the key conditions for optimizing the learning process.

Attention level



As we saw from the model of working memory, students cannot process everything they experience at once. This leads us to one of our first learning conditions; students will best learn new material when they are paying attention. What percentage of time during a lecture do you think students are paying attention? Observational and student self-report studies suggest that during lectures, college students are paying attention about half of the time.

There are four documented factors that impact whether a learner pays attention:

- **Arousal:** Adequate sleep, good nutrition, and regular exercise all impact arousal levels. These common-sense healthy habits promote optimal learning performance in two ways. First, they promote neuroplasticity and neurogenesis. Second, they keep cortisol and dopamine (stress and happiness hormones, respectively) at appropriate levels. All-night cramming sessions, skipped meals, and skipped exercise can actually reduce the brain's capacity for high academic performance. (This is true for instructors as well as students.)
- **Interest:** Students are more likely to pay attention when the topic is of interest to them. Of course, it's unrealistic to expect that students will find all subject matter equally interesting. However, helping students see connections between what they are learning and what they care about—be it a future job or controversial topics in the news—increases interest in topics that might seem uninteresting.
- **Fluency:** Learning new material can be very difficult. It may be hard to remember when you first began reading. Most likely, in the early months of learning to read, you would have preferred to have the story read to you rather than reading it yourself. The process of sounding out letters and figuring out words and punctuation was most likely frustrating. As reading became easier, you eventually preferred reading to yourself rather than having someone else read to you. At that point, you were a fluent reader. The more fluent we become at a skill or topic, the more enjoyable it is and the more likely it will motivate us and hold our attention. Therefore, when students have low fluency, it is more difficult to be motivated or to pay attention (Johnson & Layng, 1992).
- **Enjoyment:** Humans are inherently curious. The process of learning is enjoyable to very young children but often that enjoyment disappears during the educational process for many students. Engaging students in the learning process can reignite their natural curiosity and make learning more enjoyable.

Faculty Voice

Jon Becker
IUN

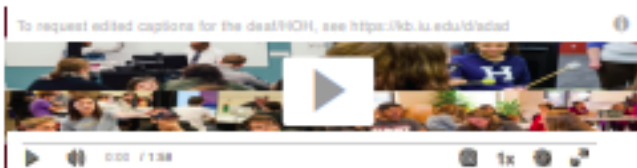
"In a traditional lecture classroom, it can be challenging to keep students engaged. Getting to know the students by name early in the semester has proven effective for heightening student engagement. When I know their names, I can call on them directly. This process has a two-pronged approach:

1. When they know that I care about knowing them personally, they come to respect me as their instructor, and they are more likely to pay attention.
2. When I notice them drifting to their phones (or other attention-stealers), I will call on them to answer a question—bringing their attention back to the class."

BEST PRACTICES in enhancing attention

- Frequent, low-stakes quizzing reduces cramming and increases competency leading to greater fluency.
- Using real-world examples increases interest and motivation. Try starting class with a story, newspaper article, YouTube clip, or research finding that has a direct impact on your community.
- Asking students to apply concepts or principles to their own lives increases enjoyment and interest.

◆ Video | Neuromyths



Meaningful learning context

A **meaningful learning context** provides a link between the processes of encoding and retrieval. This is because retrieval is context-dependent. To reinforce the formation of new memories and their future retrieval, we want students to make as many connections as possible with their existing memories. Also, when the encoding and retrieval contexts are similar, a student's ability to successfully retrieve information increases. In other words, the more contextual cues available, the easier it is to retrieve information (Brown, Roediger, & McDaniel, 2014).

Encoding information and practicing retrieval in multiple contexts is superior for long-term retention and retrieval. For example, frequent, low-stakes quizzes, perhaps some online and some in the classroom, give students multiple opportunities to practice and revisit material. Additionally, we can help prepare students for retrieval by encouraging them to vary the contexts of encoding. For example, encouraging students to find contextually appropriate studying methods and locations can result in more accessible memories. Studying in the library, a coffee shop, or even a dedicated space in your home where there are no disturbances is more effective than studying on your couch while listening to music or watching Netflix.

BEST PRACTICES in developing a meaningful learning context

- Before major exams, schedule a review or study session in the same classroom where students will be taking the exam.
- Provide formative assessments (see Module 2) that are similar in nature or mimic the summative assessment.
- Ask students to create multiple examples of a concept, preferably from personal experience of everyday life.
- Ask students to discuss in small groups how the information connects with their work or everyday life.

Timing and intensity

In a course, information is presented sequentially; it takes time to cover all of the content. If you assess comprehensive knowledge and skills at the end of the course, you are likely to find that students have fairly good mastery of the earliest content presented, less mastery or recall of the intermediate content, and greatest recall or mastery with the most recent content covered. This is known as the serial position effect (Murdock, 1962). When trying to remember a great deal of information, what is presented first has time to be processed into long-term memory and information recently presented remains in working or short-term memory. Information presented in the middle can be lost. For the instructor, this argues for several interspersed summaries or feedback sessions and more frequent assessment.

Intensity can refer to both the delivery of the material and the activity level of the students. A lecture delivered with enthusiasm that engages students will lead to greater learning than the same content in a lecture delivered in a monotone voice. In addition, a student will learn more from actively participating in a learning assignment than simply observing it passively. For example, a student will recall more of a play by acting in it than by watching it.

BEST PRACTICES in enhancing timing and intensity

- Sequence your presentation of material so critical information is summarized at the end of each unit.
- Consider active learning approaches (see the Active Learning Path) such as *Reacting to the Past* or having students act out a process such as neuronal transmission.
- If you use PowerPoints, eliminate the majority of the text, and instead substitute an image that conveys your point. Reading text-heavy PowerPoints to students is a soporific.

