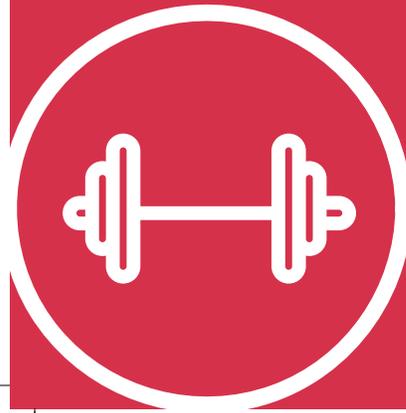


Spacing out learning,  
and interweaving  
different content,  
strengthens learning.



Communicating high  
expectations and  
keeping learners at the  
edge of their mastery  
helps each student reach  
their potential.



Students learn well  
when they feel safe  
and connected.



Students' physical  
well-being, including  
nutrition, sleep, and  
exercise, impacts  
learning.



## Insight

To foster deeper learning, the learning process needs to be productively difficult. Having students work at the edge of their mastery while maintaining high expectations pushes them past their current abilities, engages the brain deeply, and lays the foundation for strong retention.

## In Practice

Be upfront about the frustrations that can come with productive struggle. Teach students how learning works (encoding, consolidation, and retrieval) so they can understand how challenging their brains supports deep learning.

Using language like "I believe you can do this" communicates high expectations and encourages students to persist through challenges. It also reassures them that this is a desirable difficulty and that real learning is happening!

Foster an environment where mistakes and failure are fodder for reflection and positive discussion, so students feel supported and safe to fail forward and fast.



## Insight

The same amount of content taught but spaced over time can dramatically improve learning and retention. Additionally, switching between different content (e.g. different types of math problems) requires increased effort for students and produces more durable learning, in turn allowing students to access what they learn more flexibly in later situations.

## In Practice

Break up the teaching of concepts over multiple classes, revisiting the key concepts during subsequent sessions.

Mix up the order of the content you teach. Reach back to prior concepts when you teach new ones.

Encourage your students to break up their studying of a topic into multiple days or weeks, studying the information more than once and allowing a good amount of time in between study sessions.



## Insight

Learning will be impaired if students' physiological needs are not met. Students with good overall physical well-being benefit from improved cognitive skills. Aerobic exercise can transiently improve the brain's plasticity and can increase hippocampal volume (a key part of the brain involved in learning new information). Sleep is critical for solidifying learning from the day.

## In Practice

Students need plenty of daily movement and exercise, including recess and PE.

Teachers can educate parents about the effects of the blue light from digital screens on children's sleep quality and can recommend putting devices away at least an hour before bed. Students can boost their test performance by putting some sleep between learning and the test!



## Insight

When students feel that they are part of a positive, supportive learning community, this can reduce anxiety so they can focus on learning. Building stable, trusting relationships with students supports their self-worth and promotes their sense of belonging.

## In Practice

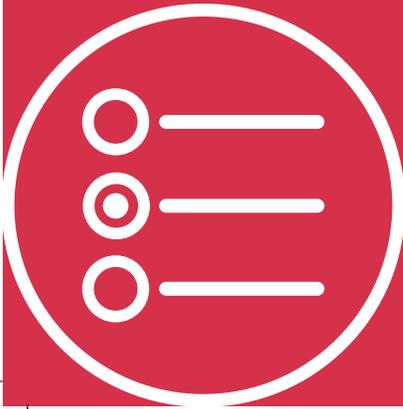
Create a classroom environment that nurtures positive peer relationships. Having well-designed cooperative learning activities and modeling positive, constructive language are ways to foster peer-to-peer interactions.

Explicitly teach social and emotional skills, like empathy and kindness, and help students practice using them in multiple contexts.

Use trauma-informed practices, such as teaching coping skills and building caring relationships between teachers and students. These benefit all students.



Retrieval practice strengthens memory and helps students flexibly apply what they learn.



The entire environment, from space to temperature to lighting, affects learning.



Thinking deeply about the to-be-learned material helps students pay attention, build memories, and make meaning out of what they are learning.



Students are more motivated to learn when they are interested, have a sense of autonomy, and understand the purpose behind what they are learning.



## Insight

Elements of the physical environment can play a role in determining whether the classroom will be conducive for focus and learning. Exposure to sunlight, as well as views of nature from the classroom, has been shown to boost student achievement, well-being, and behavior.

## In Practice

Incorporating flexible furniture -- lightweight or on wheels -- can support your instructional goals and gives students choice in where they work to empower them to take responsibility for their learning.

Try to keep the temperature between 68 and 74 degrees Fahrenheit so students are comfortable and able to focus. No thermostat? Have blankets and small fans for students to use.

If your classroom has less natural light than you'd like, replacing your lighting with blue-enriched bulbs can improve students' cognitive performance.

No windows with views of nature? Take your class for walks outside and have plants in the classroom to get some of the benefits of nature.



## Insight

Retrieval activities, like self-testing and low-stakes quizzing, that ask students to practice remembering the information they've been taught by retrieving it from their long-term memory actually change the nature of memory by strengthening the path to memory and enriching the memory itself. In this way, retrieval practice leads to stronger and more enduring learning.

## In Practice

Encourage students to use self-tests to assess what knowledge is not easily retrieved and to flag for more retrieval practice. Flashcards can be a useful self-testing tool.

Teach students to pause during studying to try to recall key ideas.

Make quizzes low-stakes, predictable (not pop!), simple, and quick. Having students generate questions for quizzes can be doubly beneficial!



## Insight

The level of a student's interest has been shown to be a powerful influence on learning. Additionally, when students have a sense of control over their own learning, and the opportunity to set goals that are not only personally meaningful but also have the potential to benefit the world, their intrinsic motivation improves. As a result, they are more likely to persist longer at academic tasks and learn to process information more deeply.

## In Practice

Support interest and autonomy by providing choice. Allow students to choose their own books to read or to select their preferred format to complete an assignment. Offering a limited number of options (3-5) is often the most motivating.

Invite students to set purposeful, self-focused goals such as, "gain skills I can use in a job to help others," and learn material to "become an educated citizen that can contribute to society." Doing this encourages students to develop an internal drive for learning and find meaning in mundane schoolwork.

Create tasks and projects that challenge students to write and design for authentic audiences and purposes.



## Insight

When students are invited to think deeply about subject matter, they can better build strong memories. Focused attention and deep thinking also allow students the time to make meaningful connections between the material and their own lives and the world around them. When students see how material connects to their lives and interests, they have frameworks for understanding the material more easily and can learn it more deeply.

## In Practice

Introduce strategies, such as see-think-wonder and claim-support-question, to guide students' thought processes and to encourage active engagement with content.

Ask complex questions that require students to build connections between the content you're teaching and their background knowledge or other topics of interest.

When presenting new material, ask students to identify and summarize important points, including their own perspective on the ideas they selected. Invite them to discuss their ideas with a partner.



Learning is a process that involves effort, mistakes, reflection, and refinement of strategies.



Collaboration and social interaction can be powerful learning experiences because they encourage deeper processing and engage the 'social brain.'



## Insight

Students are highly tuned to social dynamics. Working collaboratively towards a common goal can help students achieve a different learning output than what they might produce individually. Teach content with social narratives in mind and utilize the power of reciprocal teaching (even if your students don't end up teaching the material, they will learn it better!).

## In Practice

Promote collaboration and exchange of ideas by structuring projects to require shared learning and co-creating rather than splitting tasks.

Ask students to take the perspective of the people you are teaching to promote deeper learning. Using a social narrative thread for your material can promote this benefit.

Preparing to teach is a powerful way to engage the social brain, whether or not a student ends up teaching the material! Teaching others often benefits the tutor the most, so be sure to give all students the chance to be tutor as well as tutee.



## Insight

Attributing results to controllable aspects, like strategy and effort, fosters students' beliefs in themselves. When students see failure as an opportunity to find out what they do not know and adjust their learning strategies rather than an indication of self-worth, they are more likely to persevere.

## In Practice

Provide feedback that focuses on the process and helps students see both the productive effort and the effective strategies they used. Encourage students to employ a growth mindset by reminding them of their progress while supporting them to work through challenges.

Create a culture that celebrates failure as part of the learning process. Use discussion questions to reframe failure as fodder: Have you ever felt proud of making a mistake? Have you ever discovered something new after making a mistake?

Frame assessments as opportunities for students to show what they know and can do at that given moment versus diagnostic of ability.

