The Research Behind Memory: Memory-boosting Strategies to Incorporate into Your Teaching

SPEAKERS
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Tierney King 00:01
This is the Faculty Focus Live podcast sponsored by the Teaching Professor. I'm your host, Tierney King, and I'm here to bring you inspiration, energy, and creative strategies that you can utilize in your everyday teaching. Today is all about the memory, from short term to long term. Do you still remember your childhood phone number? What about your high school fight song? Or the street you live down when you were eight years old? We might remember some of these things, but sometimes we forget what we just read this morning, or what we ate for breakfast two days ago. Don't worry, there are numerous proven ways to manipulate and develop our ability to remember. So what small changes can you integrate to help students remember your content? First, we'll start with the academic research on memory and how you can create a more successful environment so that you can apply cognitive theory in your course. Next, we'll go over strategies that you can incorporate to improve student learning and memory, such as semantic encoding, cueing, peer teaching, and more. Lastly, we'll cover how microactivities are a great way to check in with students and move information closer to long-term memory. To start, James Lang explains some of the research behind memory and five activities to help increase learning in his program, Using Brief Interventions to Maximize Student Learning.

James Lang 01:20
Oftentimes, faculty think about learning as being sort of along Bloom's Taxonomy, and so going from sort of fundamental things like having students learn and remember knowledge up to these higher order skills of synthesis and evaluation. And that's a great and useful way for us to think about learning, but oftentimes, I think faculty think about the first stages of knowledge acquisition and comprehension as being ones that they can skip over very quickly and get to these higher order skills. But what learning scientists seem to be telling us now is that knowledge comprehension and acquisition and memory seem to be important. Anie Murphy Paul, who writes the "Brilliant Blog" wrote recently about this idea of splitting memory into E memory and O memory. E memory being electronic memory and O memory being organic memory. And she wrote about doctors who are able to sort of quickly use their phones or computers to look up symptoms and make quick diagnoses. But when they sort of started looking at that, they recognize that electronic memory can be useful for some things, it can be useful to help sort of remind you about things, it can be useful when you know exactly what you're looking for. But we also need a really strong foundation of organic memory in order to be able to get up to those higher order skills. So I don't want us to think here that lower order thinking skills like memory, acquisition, recall, all

that stuff are things that we should neglect, we want to be able to do both. So what you're going to hear about today are both these kinds of knowledge crystallized knowledge, which is what we normally think about as knowledge that we have learned. And it's sort of solidly in our long term memory. And that might include facts and information, but it also might include procedures and skills. And then we also want to think about fluid knowledge. So that means what we normally think about when we're talking about things like synthesis, and application and evaluation. These are the kinds of higher order skills what do we do with the knowledge once we have obtained it? In our time today, we're going to focus on talking about both of these ideas. How do we help students obtain crystallized knowledge? And then also, how do we help them begin to work with that knowledge through the higher order thinking skills, so we're going to focus on five activities that I think can help generate interesting and brief interventions that will maximize learning in classrooms. The first is predicting, and that is to ask students to make predictions about course content before you have exposed them to it. The second is retrieving and retrieving is just another word for remembering, being able to produce things from your memory when you need them. So how do we help students learn to practice retrieval and be able to retrieve ideas and crystallized knowledge when they need it, generating by that I just mean students generating their own responses to the learning material. So instead of just sort of absorbing what the faculty member says is important, or you know, the meaning or significance of a material, being able to generate their own examples, illustrations, ideas, ways that the course material might connect to things outside the classroom. Four, self-explaining, and self-explaining is self-explanatory. It just means when people sort of talk out loud about what they're learning in the process of learning it. And five is connecting, and this is probably the most sort of complicated higher order thinking skill we'll talk about and that is, how do we help students build up a framework of knowledge in which all the sort of disparate facts and discrete ideas are connected into a larger knowledge network?

Tierney King 04:29
Lang also explains that when you're asked to make a prediction about a subject, you use the resources you have to help you answer the question. So you're activating connected knowledge in your brain that might help you come up with an answer. Now, even if you're wrong, when the answer is presented to you correctly, you have a better chance of remembering that and connecting it to other things.

James Lang 04:50
The more connections that we have between a new piece of information and other things that we already know, the more likely we are to understand it and remember it. So the act of prediction helps sort of, you know activate all these related concepts that are going to make it easier for us to remember the information when we get it. So what are the practical implications of this in terms of making an intervention in our class? We want to think about predictive questions that we can ask our students to make that can be done very quickly at the beginning or the end of the class period. And I think predictive questions are really good ones to ask prior to exposure first, exposure to content and the beginning and end of a class can be a really great time to do that. I teach English literature, and so oftentimes, we're reading sections of novels. And as we get to the end of a class and we, you know, read the first 100 pages, I might ask them to say, given what we know so far, what you've learned about this character, what do you think's going to happen? Or if you're doing a problem introducing a case or a problem, you might simply pause, as you're, you know, you can give the whole context for the

problem, all the information that they'll need to solve it. But then pause before you present them to the solution, say, What do you think is going to happen here?

Tierney King 05:55
Lang also explains that Michelle Miller argues that memory researchers believe long-term memories are much larger than we realized. We have the ability to store an immense amount of material in our long-term memory, but the challenge is being able to get it out when you need it.

James Lang 06:10
So what we want to think about here is how can we give students practice in retrieving information that they're going to need in order to succeed in our courses. And I'm gonna make a couple of different suggestions here. First is to try and think about how to do this orally or in writing, again, at the beginning and the end of class. So an easy thing to do is oftentimes faculty members walk into class and say, "Okay, here's what we did in the last class," and then we launch into the new material. Instead of doing that, we might turn that responsibility over to the students to say, "What did we cover in Wednesday's class?" and ask a few people to summarize for us. "What did we do in Monday's class? What did we do last week? Or how does the idea that we're talking about right now connect to something that we talked about last week?" Now another important thing that the learning sciences tell us is that interleaved retrieval is going to be more effective than mast retrieval. Mast retrieval just means essentially cramming, it means you learn all of a material, and then you move on to the next thing, and you learn all of that. And then you move on to the next thing, you can learn things for a short period through sort of mast retrieval or mast learning practices. But for long-term learning, interleaving is much better. And interleaving just means you go through concepts A, B, and C. And in the next unit, you might introduce concepts D. But you also go back and ask them questions about concept B. And in the next unit, you introduce a couple of new things, but now you're going back all the way to concept A so that the students are constantly going back to earlier material and having to try and remember things that they had learned earlier. This is a good argument amongst many good arguments for cumulative exams. If you really want students to be able to learn the material, you need to be continually asking them about it over the course of the semester. One really interesting study that was done with this was a study with athletes and this is described in Make it Stick in which baseball players were given some extra batting practice at the end of every practice they took and some of the students received pitches 15 curveballs, 15 change ups, and 15 fastballs. So they would get those pitches right in a row every day after they had regular practice. And another group also got 45 pitches of those three types, but they were mixed up randomly. Once the season began, they looked at the batting averages, they found that the hitters who had received the interleaved practice had higher batting averages. Now, there's a lot of reasons why this might happen. But the easiest explanation is this is how we normally and naturally learn things and are exposed to things. It's not like we get exposed to something and then forget it and move on with our lives. We typically, when we're trying to learn something, get repeat exposures over time, and we learn something and then we might be going out and doing other things. And then we come back to it. And so this seems to characterize normal human learning experience. And if we want to get that kind of long-term retrieval, we have to help students a little bit with that interleaving. So that tells us that when we're doing this retrieval practice, it is important to go back sometimes and say, "Tell me about something we did two weeks ago" or have that material on the quiz or on the exams.

Tierney King 09:03
In addition to interleaving, there are various other memory-boosting strategies to incorporate into your teaching. In this program, Kristin Roush explains some of these strategies and how she uses them in her own courses.

Kristin L. Roush 09:15
The learning and memory concepts that we will cover are cueing, the testing effect, semantic encoding, peer teaching (using rehearsal) and the spacing effect. Cueing is simply the experience of being briefly exposed to the material before intentionally encoding it later, into long-term storage. Anytime you read the table of contents in a magazine or a book you are cueing yourself for or priming yourself for easier comprehension and retention later. Providing a course overview on the first day of the semester and then a chapter overview at the beginning of the module are great ways to prime your students for comprehension. Encourage your students to cue themselves to the material before you cover it in class. The second learning concept is called the testing effect. It's also called retrieval practice. This emphasizes the value of taking practice tests. When I learned how beneficial this was, I immediately started incorporating it into my classes challenging your memory, to recall the material is way more effective than just restudying it over and over. It seems that well intentioned students are spending way too much time reading and rereading the textbook. They need to spend less time on input, and more time on output. Encourage them to take advantage of the practice tests available at the end of the textbook chapter. And as you know, many book publishers provide the online practice tests as well. Taking practice tests and engaging in this kind of retrieval practice, and then correcting the wrong answers is a valuable learning process. Challenging your memory, and then learning from your mistakes really does work. Let's talk about semantic encoding. Remember that in the basic memory process, we encode, store, and then retrieve information. So we are kind of like a computer, we input the data, save it to a file, and then later go back and retrieve it. Encoding is when we initially take in information. We encode information visually, auditorily, and semantically, according to what the word object looks like, how it sounds, or what it means. The word semantic means, meaning. We have better memory for things we attach meaning to. So we understand easier, and remember better material that we can relate to as meaningful, novel, or personally relevant. When I teach this to my students, I'll say, "Have you ever noticed that when I cover new material, I always try to include real life examples or a funny story?" Well, I say "There is a method to my madness. I do that, because it is a teaching technique based on memory research." How about peer teaching? I tell my students that the gold standard for study strategies is teaching the material to someone else. Don't just sit and internally ruminate about the material, teach it out loud to someone else, as soon after you've learned it as possible. This serves as rehearsal. Determine memory literature, for when you repeat something over and over in order to memorize it, to move it into long term memory storage. maintenance rehearsal results in rote memorization for facts. elaborative rehearsal involves paraphrasing and peer teaching uses this in peer teaching, it is elaborative rehearsal for the sender and auditory rehearsal for the receiver. And finally, the spacing effect. The spacing effect says that material is better retained after distributed practice, rather than mast practice, encourage your students to study in smaller increments across the entire interval between tests, it is not only a more efficient use of their time, it is a more effective way to study. So studying for just 30 minutes at a time, about five times a week, is actually more effective than studying once a week for double that amount of time. I have had so many students

report improved test performance after learning about this. I now cover this concept on the first day of the semester for all of my classes.

Tierney King 14:10
Lastly, Wren Mills explains how the brain processes information and identifies why microactivities are a great method of formative assessment to check in with your students and move that information closer to long term memory in her program, How Can I Use Microactivities to Engage Students and Improve Learning and Retention?

Wren Mills 14:29
When I began talking to people about metacognition and microactivities, I like to refer to a book by Hattie and Yates, and they have a great chapter about how our brain actually learns material, how we move things from that first exposure of short-term activity to our long-term memory where we can recall it whenever we need it. And they talk a lot about how we need to touch information multiple times in multiple ways in order to successfully achieve long-term memory of that information. And that means that we can't just hear it in a lecture or read it in a textbook or even just do one acttivity over it, we need to do all of these things. And we need to do them again and again. To support that they say that we need time, goal orientation, supportive feedback, accumulated successful practice, and frequent review of the material in order to move it to our long-term memory. And microactivities will help with this. They also discuss in the chapter the concepts of concentration spans and distributed practice. Most people have heard before that we have about 15 minutes of attention span before our minds start to drift and wander. And that even happens to the best of us. That's not just the myth. That's actual science. And so we need to consider this when we're structuring our class lessons or recording a video lecture or whatever it might be that we're doing, because our students brains will start to wander, even if they are interested in the topic. It's just the way that the brain works. And so how do you encourage us to have multiple times that we come back to the material within a unit within a class so that we keep seeing linkages between the materials that we're discussing in one day and the stuff from previous days, and even start pointing towards how it's going to link up with information on the next day? The steps from short-term to long-term memory and learning are actually ones that surprised me the most, I think when I read this chapter, for the first time, when we get introduced a new information, we have just five to 20 seconds to get that information and start doing something with it before it starts disappearing into the ether. And while we might be familiar with the mention of it again, we won't be able to do anything with it. So our metacognition on that would be, I think I've heard that term, but I really don't know what it means. And that's okay. It just means that you need to keep remembering that you think you know that term, you don't know what it means, and you need to go back to it again. So as teachers, what this means is that we can't just mention a concept, a term, a theory, a name, and then go on with our lecture, we need to stop and we need to take time to explain it, and keep going over what it means and have our students practice with it. If we don't do this, then it starts disappearing. Again, if we can tie it to a student's prior knowledge, not just the prior knowledge of the class, but their prior experiences as well, we are even more likely to move that material to long-term memory. Another concept that was discussed, that's important to metacognition are the primacy and recency effects. This was new information for me, and I'm gonna bet it's new information for you, too. You probably already know what these effects are, you just didn't know the names for them. We're most likely to remember what we hear at the very beginning of a presentation or lecture and at the very end of a presentation or lecture, but

the stuff in the middle gets kind of muddy. And part of that is because our attention span starts to wane after that 15 minute time slot. With that in mind, Hattie and Yates, and a lot of other people, have recommended that we break up our lectures into probably about 15 to 20 minute chunks at the most to allow more of those primacy and recency memory points. And where microactivities comes in, is that we're going to stick those microactivities in the middle of these lectures where we break it up. And we're not going to ask about the things we talked about first, and we're not going to ask about the things we talked about last, we're going to touch on the things in the middle of the lecture to help our students pull those back into their recent memory and help them move it into long-term memory. There are lots of books in addition to Hattie and Yates book that help us to learn how we should use microactivities and James Lang's Small Teaching is one of them. He broke his book into several chapters, each talking about a different type of activity that we can do with our students that works our memory in different ways to help us move things from short-term to long-term memory and retain and use that information better at later dates. The ones that I like best practices of retrieval, predicting practice, and interleaving, but the entire book is valuable. And the best thing about it is that he does call it "Small Teaching" for a reason. These are small practices, microactivitiesm that we can put into place in our classes in order to break up our lectures and help students get the processing time and activity with the new concepts that they need.

Tierney King 18:43
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