Dead Ideas in Teaching and Learning Podcast Series
Episode 2: Neuromyths in Teaching and Learning with Michelle Miller
Center for Teaching and Learning, Columbia University

- [Catherine Ross] Hello and welcome to "Dead Ideas in Teaching and Learning," a higher education podcast from the Center for Teaching and Learning at Columbia. I'm Catherine Ross, the center's executive director. Let's get started. Note to listeners. This conversation was recorded before the COVID-19 pandemic. Our guest today is Dr. Michelle Miller who joins us live at Columbia University. Dr. Miller is a Professor of Psychological Sciences and the President's Distinguished Teaching Fellow at Northern Arizona University. She's also the author of the book "Minds Online: Teaching Effectively with Technology." She recently worked with a group of colleagues in the Online Learning Consortium on their report "Neuromyths and Evidence-Based Practices in Higher Education." This report came out in 2019. Michelle, we're very excited to have you here.

- [Michelle Miller] Hi Catherine, it's great to be here.

- [Catherine Ross] Can you give us some examples and explain how you see neuromyths in sort of the relationship to this dead ideas framework?

- [Michelle Miller] Oh certainly, so neuromyths quite simply are what we conceive of today in education as misconceptions about the mind, brain, and or learning that might pertain to teaching. And that you know, in and of itself sounds kind of innocuous, right? Oh, a misconception. However, some of these are some of the most notorious, unkillable ideas that are out there. And I'll say that these are things that I know from my background as a psychologist. Back when I was in graduate school, we would kind of kick these things around and kind of laugh and say, "Can you believe that people still believe in this idea?" And so what a shock now, decades later to be teaching and be occasionally running across these ideas. So neuromyths, some examples of these. Probably the most famous one within psychology and cognitive psychology is the notion that we only use 10% of our brains. Now this has never been a plausible idea. And if you'd like to trace the history of this, it is a sort of a fascinating urban legend that goes back a long time. There's lots of ideas about where it came from. However, in today's era of neuroscience where you can literally sit in a brain scanner of different kinds and watch activity happening in the brain, the idea that this that we use 10% of our brains, it's amazing that has longevity. So that's one example. Another which cropped up I think more recently in learning and education is the idea of visual, auditory, kinesthetic learning styles, which again, if you have a background in cognitive psychology or neuroscience, you can look at that and say, "No, that doesn't make any sense." Information has to come in through the eyes for some people or for the ears for some people. Our brains and our minds recode information across sensory modalities quite readily. We do that all the time. But more recently, there's been some very compelling work that really does show that kind of identifying somebody's learning style and matching instruction to it does little to nothing to actually supporting learning. So

those are some examples and ideas. And I do wanna credit here some individuals who I've worked with. Kristen Betts, who's of course the lead author on this neuromyths international report. She came up with the idea. She saw the need. She put the team together. So her leadership here has been amazing. And also one of the coauthors on the study, Tracey Tokuhama-Espinosa, recently came out with an entire book on this topic. So there's a lot to learn from a lotta different individuals in the field.

- [Catherine Ross] So in your book "Minds Online," you show how principles of cognition can inform effective uses of technology for teaching. What dead ideas were you trying to address in that book?

- [Michelle Miller] So I think what I hit on were some of the very same things like thinkers such as Pickett and other leaders in the space have hit upon. One of them has to do with the idea that technology by itself will have this sort of magical effect on learning and support learning in and of itself. And like so many of our other neuromyths and dead ideas it's got this gloss of like, "Ooh, it's new." There's a little bit of wishful thinking that informs that because well, wouldn't that be cool if that were the case? We could buy the iPads, bring 'em in, and everything would just catch fire in our classrooms. And you know, we are in this time of tremendous upheaval and social change and so much of that hinges on technology. And of course it becomes very natural to say "Well, of course learning itself will radically change just as a function of the presence of technology," or similarly that any technology out there if it's popular in a non-learning context, that'll be part of learning too. So I think for example, about social media, which has some upsides and but definite downsides for bringing into the classroom. So similarly, the idea that there are these radical generational differences, again, largely due to technology that impact learning. I see that as a kind of a dead idea as well. And then the idea though that teaching and learning with technology or online or blended learning is a fad that will go away. I don't know if that idea's been around long enough to call it dead, but that's one that I do believe is incorrect. So on the one hand, no, we're not going to see suddenly education gets transformed the way you know, and universities go the way of blockbuster. I think we all saw some of those predictions as well on the other hand. So there have been some radical and deep changes that we're all going to be co-existing with going forward.

- [Catherine Ross] Radical and deep, huh?

- [Michelle Miller] Well, I think one of the themes that will be with us for some time is the idea that learning sciences and learning principles that have been around, again, for a very long time, those principles can be leveraged in different ways. And increasingly I think we are selling our students short if we do not take advantage of those. Probably the most obvious example of this, the most shining example, however you wanna put it is simply retrieval practice. So this is a principle that some of your listeners have probably run into it in one form or another. The idea that when we actively retrieve information, that's not a neutral act for memory is when thinker put it, that just taking quizzes and quiz-like activities about information we're trying to master is very, very powerful for fixing that information in memory. And that may seem like a very lowly thing. I mean, after all, we didn't get into this just to have students memorize

information. However, building a base of knowledge is very important for developing expertise in that area. And now we have this great avenue for making this happen so much more quickly and so much more reliably. Well, just try doing this with pencil and paper and non-digital technologies. I know because I tried. I was that person who was carrying big boxes of quizzes down to my introduction to psychology course, because I had learned in the '80s and '90s, we already knew that those quizzes were going to help students. And also has other wonderful side effects such as giving students feedback. And we even find these days with some of the latest research that when you know more about an area, when you've learned about it in more efficient ways involving retrieval practice, you can actually think better in that area. So this is great stuff and what a wonderful use of technology. So that dovetails so nicely with what technology can do so well. I think that's one of the radical changes that we all need to kind of have on our horizon. Not, "Oh, we gotta bring a box of iPads because the kids are about technology." Everything is wrong with that statement.

- [Catherine Ross] Right.

- [Michelle Miller] But mindfully incorporating applications, techniques, and programs that run so much better on a technology platform, that we need to pay attention to.

- [Catherine Ross] So it's not just because students are digital natives.

- [Michelle Miller] Oh my, yes. And what a phrase that is. And you know, it really did take on life of its own when that phrase was coined not too long ago, but when I sat down to write "Minds Online," that was the current belief that well, you know, here's this metaphor at the center of that. And the metaphor is one's native language that if you grow up speaking technology or not speaking technology, well you know, you can start to use technology or enter that world when you're older. But you'll always kind of struggle, you know? You're never gonna be like somebody who picked it up when they're younger. And so that idea of a divide. It also, you know that metaphor implies that if we're not using technology, oh my gosh, those digital natives are going to be disadvantaged. They're always gonna be translating in some way. And all those assumptions really fall apart. And that one is, well, I mean as many people have observed, me included. The problem here it is a real practical one. And I mean we can kinda giggle about generational differences and whether they exist, but here's the thing. Number one, if you believe in the digital natives myth, I'm just gonna call it a myth. Then you know, students who are not traditional college-aged who are increasingly the norm in higher education, not the exception, you're gonna look at those students say, "Well you know, maybe this online course isn't for you." That might be in the back of your mind and what a disadvantage, what a prejudice to put onto our learners. You will assume that middle-aged individuals are not going to have the technical capabilities and they may. On the flip side, what's also very clear is that you will probably overassume the skills and capabilities of your traditional college-aged students. So your 18-year-old who walks in your classroom, they look like they were born with the earbuds in their ears, they're glued to their phones. Well, that's great. But the likelihood that that student has some technical capabilities over and above what you need just to use social media or game or whatever their preferred recreational activities

are. I mean, they may not have them at all. And that you know, is another lesson that we get right from cognitive psychology that when we learn a thinking skill, it tends to stay in that context. So I may be wonderful at figuring out Instagram and how exactly to edit my photos and post them the way I want. But then when I get in the learning management system, all those skills you know, they evaporate, they're gone. So that one idea I think can lead us down the wrong road in a lot of ways.

- [Catherine Ross] That's interesting. So I think I'd like to move this conversation a little bit deeper into your own practices and your own teaching, how the research, your reporting on neuromyths changed, how you teach with technology. You've already given us a couple examples of them. Can you think of a specific moment when something changed around your sort of aha moment or lightbulb moment when you realized you could do something a different way, a better way?

- [Michelle Miller] So you know, picture me in my very first teaching assignment at Northern Arizona a long time ago. And as all newcomers to the department were, I was assigned to teach introduction to psychology, which I'm teaching again now. And I do love that class, but at the time it was like well, here's this you know, what we thought of as being a really huge class with a 100 people and, oh, no, it's this giant thing. And I was bound and determined to apply what I had learned in school that this very exciting new stuff about retrieval practice and spaced practice as well that you wanna get students engaging with material and break down that pattern of cramming, which tends to be very natural in that type of college course. You know, and our methodology at the time was just to tell students not to cram. And we thought that would work. And I thought I'm gonna do, I'm gonna go about this differently. Yes, exportation. That was the methodology I was raised on. And what do you know, there's better things to do. So I had my big boxes of quizzes and I was you know, just overburdening my poor teaching assistants and the students were getting pretty tired of bringing pencils to class. And so a colleague of mine, Lori Dixon, who now is one of our upper leaders at Northern Arizona. She said, you know, they now have these this sort of software that actually comes with the textbook and you can buy it in this disc, comes in the book and you sorta unglue it out of the book and pop it in. And it's got these quizzes. What do you know? Oh well, they would be taking those quizzes at home. And what about test security? Said, no, it's actually part of the learning practice. Oh wow, we could assign these. That's really great. No more big boxes of paper. And we could put this idea to the test. And she further proposed. She said, look, we have multiple sections of this course running. We could make a scholarship of teaching and learning project and actually set up an experiment, you know, using the tools and the lens of our discipline to attack this. And we did. We actually published a little series of studies on the impact of this at the time, really brand new technology, online quizzes, whoever heard of such a thing. And so really from years back, I started working with that, seeing the power of it, to support students in developing the foundational knowledge they need. Again, not to turn the whole class into an exercise in testing and memorization. But to get them immersed in that material. So they could come to the class. And even in a class of a 100, you can get a good discussion going when we've actually read about PIJ before class, or we know who Ivan Pavlov is and what the deal is with the dog and the bell and we have questions about that. So you

know, that was the context in which I really started to shift this practice and to say yeah, this is stuff that's showed up in journals. We can make it happen in a classroom. And technology is sometimes that missing piece that lets us make that leap from theory to practice.

- [Catherine Ross] So it even had other impacts beyond just improving student learning and performance, say on exams. It changed the nature of your classroom interactions as well it sounds like.

- [Michelle Miller] Yeah, I think so, when you fast forward a few more years, we've redesigned it. It's even larger. And now these online quizzes are built into the class. Another thing that really helps is having some of those assessments, those formative assessments due very early in the semester. And this kinda at the time flew in the face of some conventional wisdom. You want to let the students come in and relax. We had this idea that tests were scary and upsetting for students and you wouldn't want to do that until you know, six weeks in and they're sorta locked into the course. But we started having just a few things be due. Even if they were just surveys or needing to set up an account and then those quizzes would start. And that radically changed the mood of this large foundational course as well. And you know, I think that we had run into an issue with students quite naturally. I'm not blaming them for this, but they would come in, they'd say, "Oh, okay there's a multiple choice test at six weeks in, you know, I have other things going on, I'm in a chemistry course and I'm gonna go study for that instead of this." And it really subtly started to set their expectations kinda artificially low for this course early on. Now of course, introduction to psychology. You know it may look like a piece of cake, but it's got a textbook that's two inches thick and they get some to be some very sophisticated material. So students would really be disadvantaged midway through the semester when they started to realize "Oh wow, I'm really kind of behind. And I didn't even know it." And what an upsetting experience. 97% of the students in that course as well, were first year students. So that was a real bottleneck and a real problem for them. So by having some of these assessments due early, we're starting to take advantage of that learning effect that's straight out of the psychology journals and the research, but also affecting in a way their motivation and their expectations about the course. And I really, I felt a change. I really did. Students would come to class and just have this, "Okay wow, we hit the ground running. This class is for real. I'm not scared or upset or feeling judged. I feel engaged. I feel engaged." There's a lot to engagement. I'm not saying that just having a quiz online is what you need to really light that motivational fire, but it has a surprising amount of impact for the investment.

- [Catherine Ross] Wow, it sounds like it was also helpful for motivating the students to maybe take more ownership of their learning, to see where and how they were doing and to think about that sooner, as you said, not just put it off until the high stakes assessments come along.

- [Michelle Miller] Oh yes and how much we love that phrase, "ownership of learning." Because I mean, as faculty, it's so easy to be focused on that sort of runway right in front of you. So much is coming at us so fast. And we're so focused on the latest 20 emails that came in from students overnight. And we need to step back and say, "What are we really trying to equip students with?" And to me of course, one of the big things we're trying to equip students with

is the ability to regulate and manage and own their own learning, no matter what they try to do. I mean, if you're teaching a course like introduction to psychology, most of the students are not gonna go on to any other psychology courses, let alone a career in psychology. And that's fine with me. I think that's wonderful. We in psychology, we in our discipline have this value of giving psychology away. That's what we're there to do. But we also wanna give students the ability to succeed in that chemistry course, that nursing course, whatever else it is. And I think being a psychologist, I also know that it is easier said than done to give people those metacognitive and learning abilities. It isn't just a matter of saying, "Here's a list of study tips." Students really have to try these for themselves and they have to see them in action. They have to see that, "Oh wow, yeah. This weekly quiz that seemed kind of like a pain for me to have to do on Sunday, now I'm not cramming. Now I can relax." And once students have had that experience, there's some research out there that shows that they can transfer that pretty well, once they've had that very deep experience.

- [Catherine Ross] So that's interesting. Did you make space for students to do any explicit metacognitive reflection? Because sometimes without that, they don't always get rid of their own you know, the neuromyths they have about learning, right? And what metacognition is really about is trying to help students understand how learning works.

- [Michelle Miller] I mean how can you not have a whole course in thinking and memory and so on and not say, "Oh, by the way, here's how you can actually use this"?" And we try to do that. On the other hand, I think that we do need to exploit other opportunities to do this. Again, there's great research out there and I'm doing a little work myself to say that a relatively short intervention where you just say, "Hey, here's an assumption you've probably had about learning, let's examine it. It's probably wrong, what do you think about that?" Those can be very powerful for how students think about learning for their ability to do things like persist when they get a grade that they don't like and adopt better study strategies and so on. On the one hand, these interventions can be powerful. On the other hand, as I think all of us feel like our syllabi and our curricula are getting more and more and more crammed into them just like a suitcase that's ready to burst at the seams, when does it happen?

- [Catherine Ross] I will always remember a student I had in a course I was teaching on adult second language acquisition. And one of the first readings was learning how to learn because I wanted them to understand what we know about learning generally before we get into language learning specifically. And it was a class of mostly seniors who were about to graduate. And the second class, one of the students came in a little early and he walked up to me and said, "How come no one ever told us this before?"

- [Michelle Miller] Oh.

- [Catherine Ross] That's exactly what I said.

- [Michelle Miller] Oh my goodness.

- [Catherine Ross] Yeah, so I think it can be very, very powerful when students discover that we know a lot about how they learn and they would benefit from knowing that as well. I think he found it very empowering. He said, "I wish someone had told me this sooner. I would've changed a lot of things I've done. But fortunately, I'm going to grad school. So I will use this as a graduate student." So yeah.

- [Michelle Miller] Oh yes. I mean, students get information framed as sort of study tips or study skills. But it's very generic though.

- [Catherine Ross] Right.

- [Michelle Miller] And I think what you're reflecting on here, you were in context. You were in the context of this course, this learning and yeah, you and I both know these are principles that apply, some of these principles apply no matter what you're learning, whether it's French verbs, or o-chem, or intro to psychology, it's the same stuff. However, I think there is something very powerful to say, "All right, here's the assessment that's coming up. Here's our goals. And here are some very specific techniques that I'm telling you." You know, you've established your credibility already with that student. They're already looking to you as their leader to say, "What can you tell me to do with this information?"

- [Catherine Ross] Yeah.

- [Michelle Miller] And when you do it that way, it can make a lifelong impact.

- [Catherine Ross] Yeah, for sure. I really appreciate your research and all the publications you have and the ways in which you are helping us try to move people away from the neuromyths surrounding, particularly surrounding technology use, but in general, just the neuromyths around teaching and learning. So thank you so much for being here.

- [Diane Pike] Oh, and thank you for having me. What a great conversation.

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