The eLearning Coach Podcast #36
Strategies for Effective Online Instruction
with Michelle D. Miller

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Hello, learning people. Welcome to episode 36. Does learning with technology rewire our brains? What are the best ways to leverage technology to improve attention and memory? These and other questions about online learning are answered by Michelle D. Miller, PhD and author of *Minds Online: Teaching Effectively with Technology*. Michelle is also the director of the First-Year Learning Initiative at Northern Arizona University and a professor of Psychological Sciences. Michelle's current work focuses on using psychological principles to help instructors create more effective and engaging learning experiences. You can find the show notes with links to resources at http://theelearningcoach.com/podcasts/36. Now here's the interview.

Connie: Hi, Michelle. Welcome to the eLearning Coach podcast. It's good to have you here.

Michelle: Thank you. It's great to be here.

Connie: I really enjoyed your book *Minds Online*; it has a lot of strategies on how to teach using technology. I know you focus on teaching in college, but I thought many of the strategies are very relevant to adult learning in the workplace, too. What was your main purpose in writing the book? What kind of gap are you filling? What do you see missing in the field?

Michelle: Well, that is such a great question. It kind of almost throws me back to the state of mind I was in when I was just looking at this incredible opportunity to write the book and what a challenge that was—how intimidated I felt. You know these days, especially in higher education, the field is just packed with all these really great, inspiring books from all kinds of different perspectives on promoting learning and specialized challenges such as Jim Lang's great work on academic honesty. So I think if anybody really sat down and looked at the whole field first, they would probably just say, "Forget about it, there's so much out there."

What I was trying to, and what I had the opportunity to address, was the idea of really pulling out in a very selective way and parsing the best that my field has to offer, specifically for teachers and people who care about learning in general. I mean, higher

education's not just run by and led by people in traditional faculty role—there's instructional designers, there are people who specialize in course redesign, and so forth. So, I wanted to have a broad audience but a very selective focus on what can we take out of cognitive psychology that is most directly applicable to teaching and learning in the contemporary scene, and of course that means technology as well. So, crossing those two and trying to come up with a unique perspective with those is what I was most attempting to do.

Connie: Well, you do a great job.

Michelle: Thank you!

Connie: I noticed you had some kind of comparison between face-to-face instruction and learning via online instruction. Can you just summarize what the research shows?

Michelle: Right. Well, it's very easy and tempting for me to fall back on the scientists' all-time favorite answer which is "it depends." So, is online learning effective and what can you accomplish with it and for whom? Well, it depends.

What I try to have fun with in that section of the book where I really talk about comparing those, is trying to get people attuned to thinking outside of that very simplistic and straightforward box like "Does this online thing actually work?"

Well, get people thinking more about the "how". What sorts of strategies? What sorts of comparison? What sorts of comparative advantages are there? I think that's also a very interesting thing, and I think those of us who are insiders in the field we've known this for a while but this is becoming a little bit more mainstream.

The idea that it's not just about "Let's hope online sort of catches up with this wonderful gold standard of face-to-face," but looking at how online can actually produce advantages in some realms particularly when it comes to engaging students in discussion and critical thinking. We know that the student who is maybe more thoughtful and not as quick on the draw in a face-to-face verbal discussion could be more engaged online.

When I think of things like really skilled practice, an online learning tool has the ability to present problems over and over and over and it can do it in the middle of the night, it never gets bored—that is a mechanism by which learners can start to acquire the practice and the intensive effortful practice that we know is really important for achieving skill in a field. So, those are some of the nuances that I kind of wanted to shake people up when we look at this, you know.

I guess in a more straightforward topic, one of the lines of research that I think is the most compelling has to do with direct comparisons of blended learning strategies with traditional face-to-face programs. There's some good work out there, for example, on student's learning statistics—pretty challenging topic for most students—that it's demonstrated in a nutshell, that students who get a blended approach where they do have a very good quality online course that teaches and helps them practice in this. If that is coupled with a very focused face-to-face experience that maximizes what face-to-face can do, those students do achieve more than the students who get one or the other.

So, I think that those are the sorts of things that we should be thinking about when we do take an approach to that eternal question of what can online do relative to face-to-face.

Connie: You're right, we tend to think of face-to-face as the golden standard and can it be as good as or as... We have no idea if that's the golden standard. But in terms of blended, it's really interesting what you said because we're also finding—I don't know of any research—but we're also finding a lot of success with blended in the workplace. For example, an online program that later allows you to ask questions of an expert or have discussions about tough problems that are coming up. So, social mixed in with online does seem to be working well.

Now as far as the impact of computers on thinking and learning. There's so many myths in the popular culture about it from learning styles to digital natives to brains getting rewired, and I was smiling as I was reading your chapter about that. You know you have a very measured perspective if you don't say, "Oh my God this is completely ridiculous." But in general, the myth that our brains get rewired from using modern technologies—can you talk a little bit about why that may not be true?

Michelle: Oh, thank you for reflecting that back. I'm glad that my measure didn't come across. As a cognitive psychologist it is very interesting to see our science make it out into the popular discourse, which is what we want after all. It is so funny what gets lost in translation and there are some myths that are really, really persistent. They kind of grab us. Sometimes just because they tell some truth about a situation it just not… It's misaligned with the actual scientific truth.

You know that whole rewiring idea I think is perhaps just a rare inactive way for people to talk about the deep impacts that technology, and the mobile technology revolution in particular, have had in our daily lives. I mean, it certainly feels like we think differently.

As a psychologist though I take the long view on what does it really mean to reconfigure the human brain and we think in terms of hundreds and thousands of years instead of the last ten to fifteen years—so purely it's a matter of perspective. And it also partly matters, something that the great cognitive scientists and writers didn't think or observe, which is that anything you remember rewires the brain. So it may not be technically untrue to say "Wow, when I got this smartphone, it really changed my brain." Well yes, but when you learn to drive your car that changed your brain as well.

I think kind of also benchmarking it or keeping in perspective with other things that… Well, we do have good evidence that this really does create new pathways and deeply alter the way we think.

I think that probably the best comparison is reading. That's an area where we can say, "Yeah, we know physiologically that new connections are forged in the brain and it changes how you think about language in a very deep level." Taken in that perspective having this smartphone or being online, doing your reading online, it seems more like nibbling around the edges. That does, I think, in a way tie into the digital native idea and I think I would call that a myth as well, though there has been a robust debate about digital nativism and what exactly that means.

For those who are familiar with the term, it's a great descriptive term, the core ideas that having grown up from childhood on with the Internet or mobile technology really makes you a different kind of human—almost as if it's a language you speak. Those of us who didn't grow up with that it's almost like we're functioning in a second language—we'll never be quite fluent. It's a really appealing idea and you do see students glued to their phones.

But here's where I think for educators, that wiping out the nuance in this way is actually pretty counter-productive. I think that you really have to think about the diversity among our millennial students and if you talk to many of them as I do as a college professor about their technologies, they are far from homogenous in how they feel about the role of technology. My students tell me all the time… One told me at lab last week, she says, "You know, I really like to read on paper. I don't really like to get a lot of electronic communications." So it can mislead us into thinking that our younger students don't need tech support and a lot of help when they start learning online, and it can maybe lead us to marginalize the less traditional age students, the middle aged people who may be extraordinarily fluent with technology. So it's a simplistic analysis of a very interesting dynamic that's been going on.

Connie: It's interesting because that comes up a lot in workplace learning because there's a lot of chatter going on about how to treat the millennials when they get into the workplace. And I think it's important that, again, we don't assume that they're technologically advanced when it comes to, perhaps, workplace software. They're going to need support and help, too, most likely, or that there will be a range. That they're not automatically fantastic at it simply because they were born when they were, right?

Michelle: Absolutely.

Connie: So those are two great myths busted. Thank you. Your books used to get into the cognitive psychology realm and you talk a lot about attention and how important it is. So what are some strategies for improving a learner's attention to a learning experience particularly in light of technology?

Michelle: Well, I think from the perspective of what teachers can do to design and the idea of holding focus just right from the beginning. One of the most important principles is a really simple one: it is you got to ask people to respond. It's got to be a two way street—a two way conversation between you and the learner.

The human brain or the human mind is really just not wired to remain vigilant or attentive if there's nothing to engage with or respond to. Having that one principle just in the back of your mind… I mean, I felt that helped me a lot in my early forays into designing online learning materials is "Okay, when does the learner respond?" And I think as teachers we can get very hung up on the "Okay, now I have to grade the response. Is it right or wrong?" And I like to kind of push people more into a mindset of saying, "It's about the responding—don't worry so much about kind of micro-managing what they say as getting them to say something." So, that's one very important principle.

Another principle that I worked on actually a lot since writing the book is getting learners on board to really manage and understand the role of distraction and attention in their own learning. So we oftentimes think of "Okay, how do I kind of direct and stage manage student's attention?" This actually is pretty relevant to face-to-face learning activities, too. Say, "Okay, should we take away the cellphone? Should we require them to shut their laptops?" and that's a huge discussion. But you know online you can't go home with them, right? So, we need students to be managing that and aware of that issue on their own.

Lately I worked a lot with my colleagues here at NAU on a project to create an online module to teach students hopefully in a very engaging way—not by throwing a lot of research or books at them. So you probably have less ability to attend to multiple inputs

than you think you do and it really hampers your learning. And we give them some more efficient study strategies. We also give them what are essentially well-powered tips for when it really gets tempting to run that video on the side while you're in that online learning experience or pull out your phone when class gets slow. So that's a sort of the spectrum of ways that we can drill down into this really important issue.

Connie: You know one thing I've read and personally found to be true is that when you come upon a difficult problem to solve, that's often the time that you go and look for a distraction. Does that show up in the research at all that you've done?

Michelle: I have not seen that in the literature, but that definitely has a ring of truth to me, and… Well, there's an idea for a research project right there. It'd be really interesting to observe students in these real environments, or you could even set them up in a laboratory with the option to check Facebook or check out some videos and you could pinpoint that. So that is a marvelous idea and maybe that's one we should also start talking about with our learners—to say, "You know I feel it to, it's not just the younger generation. We all have this going on in our lives." And what can we do about it? And to me, it's not about telling them "Get rid of your tech" and "Your tech is terrible." I mean, to use a little phrase, it's about getting them to own their technology instead of the other way around.

Connie: Nice. To be the master.

Michelle: To be the master.

Connie: Right. Let's talk a little bit about memory. People used to think about memory kind of as a system and you talk about it as a capacity, which is awesome. So can you talk about how you conceptualize working memory and long-term memory?

Michelle: I'm going to step back here and kind of say with some humility that this is a debate and a discussion that is still going on in the research community and has been for some time. I think that the jury is really still out on exactly how those two aspect of memory inter-relate. I'm sure that we're going to see that mystery continue to unfold in the next years of research.

As you alluded to, I would mostly encourage people to get away from thinking of those as two separate buckets. Here's your working memory and X number of items fits in it, and here's your long term memory and a whole bunch of stuff fits into it and let's see how we can just sort of cram more information into each one.

A working memory on the one hand, is highly intertwined with attention. And as you saw on the book, I'm really taken with this school of thought that says that maybe

working memory really is attention—maybe one is kind of a subset of the other. And what it's all about is maintaining focus on the most relevant items in the moment, at that time that you're using.

Long-term memory, I think—you know some of the most practical issues around long-term memory is that it is very cue driven. Long-term memory is, it's storage capacity is essentially unlimited I think. Technically some may quibble with that idea but for our purposes yeah, you can save as much as you want—the issue is retrieving or reproducing that information at the right point, at the right time and at the right place.

And this becomes relevant for teaching and learning because if we're just thinking of how can we stuff information into student's heads, that information may as well not be there if the students can't retrieve it and actually use it in the right situation.

It creates this situations that I think we've all faced as learners where you have that now-you-see-it-now-you-don't problem. I sat down, I looked at the test and I blanked out. Well, people chuck it up to stress and there's something to that. But there's also the fact that when you're retrieving it—that information—you're doing so in such a situation that really mismatches when you learned it, often times for students.

Maybe you studied in a group and that's how you processed the information originally, that's how you studied. And now you're being tested on a bunch of multiple choice questions. Well, there's nothing wrong with that. It's just that mismatch makes it more challenging to pull out of long term memory. Sometimes students are taking a test on a different time, day, place or room and even those little changes can throw you off in terms of cues. This is not to say that students have to always study in the identical situation as where they want to retrieve the information.

We've known for a very long time from applied memory research, for example, that if you studied across a lot of different situations—very diverse situations—then it's more likely that you won't have that now-you-see-it-now-you-don't effect pop up. It makes your memory more robust in that way. So these are some of the ins and outs that I think that we can be thinking about when we're considering "Hey, is this a working memory issue in teaching and learning, or is this more of a long-term memory issue?"

Connie: That's interesting. So what are some ways that learning experiences can actually overtax memory? Maybe this refers a little bit to cognitive load. What are some things that instructional designers need to avoid and teachers need to avoid?

Michelle: Well I think the cognitive load literature does give us some practical principles such as anytime that learners have to shift to attention, especially visual attention.

Attention is also very tied up with visual focus so even seemingly simplistic things like the instructions for this task are in one file or folder or piece of paper and I need to apply that to a diagram, or a problem that's in a different location.

When that's the case, every time you shift it costs a little bit and those little costs add up. I think it also is a good argument for really scaffolding and pre-scaffolding things like tech schools at the time. So again with that digital nativism issue, students are having trouble even just navigating around an Ed tech tool that comes out of their same resource account of cognitive capacity as what they're needing to use for the learning. So, just kind of looking at it from the learners' perspective of what do I have to shift around, where am I toggling back and forth between different things I'm trying to understand, what else am I trying to do at the same time as I'm learning this important material. Those are the kinds of principles.

With respect to overtaxing memory, remember that the human mind has an astonishing capacity to take in information when it's framed in terms of something we understand and care about. And when we don't have that frame, we can take in virtually nothing at all. So, I think that that's an important thing for us to have as perspective as teachers. For example, if you think back to where you were in the morning of 9-11, think about how much information your brain took in an incredibly short space of time and why that happened. And there's all kind of factors from the emotions to the importance of the day. But dramatic examples like that show us just how much you can learn and just how much your mind and brain can change under the right circumstances.

Connie: That's a great example. What are some ways that we can leverage technology to optimize memory since we're talking about using technology for instruction?

Michelle: I think we're really missing out if we do not use technology's capacity to get students engaged in what can be termed as retrieval practice, self-quizzing, the testing effect, all of those phrases refer back to this idea that it's an incredibly efficient way to fix information memory if you have to answer questions about it.

And the neat thing about it is that it's so robust, it doesn't even matter that much what's the format of the question, where did you do the questions, how many questions did you do. And in fact, I'm a big fan these days of having students draft up their own questions. You can use a technology such as… Quiz Lit is a good example—that's what Quiz Lit does. It lets students test themselves, test each other. Instructors can set up materials as well. So, using that capability to have students be able to answer questions, work out problems, see their results and try it again and again, that's what can really help us with respect to memory and the fact that it can be on the go.

We've known for a very long time in memory research that the spacing or distribution of your engagement with material makes a huge difference as well. And this is a great message for students who are very busy and have jobs, or juggling commitments, and also for other busy working professionals is in that fifteen minutes you spent while you are on hold or at the bus stop flipping through your deck of flash cards or doing a little Q&A with your friends over a text. That time you spent can pay off more than the student who drag themselves to the library and spend the whole day there. It's just a cork of how memory and rehearsal works. So that's something we can also take advantage of—small bites, frequent engagements and diverse kinds of engagements, different question formats, different modalities, different kinds of tests—all those things, strengthen knowledge and skills.

Connie: That's great. And one thing I'd like to mention that you point out in your book, a lot of people think that learning that foundation, knowledge or getting those facts down is rote memory and therefore unimportant. But as you point out you really do need to get that foundation and knowledge understood and memorized in order to be able to do higher level problem solving because someone who's an expert on something has it all.

Michelle: They do, and I think that teachers should ask for it all, too. I really reject the idea of this false choice. If saying, "Well do you want students to have information or do you want them to have critical thinking skills and the ability to use it?" Well I want both. I want it all. And with the technology and with all we know about how learning works there's no reason we can't have both.

Connie: Right. So from a cognitive psychology perspective, we were talking about how information needs to be relevant. So often in workplace learning I'm not sure about this in higher education but courses are just brain dams from subject matter experts to some audience of novices and why is disconnected information harder to learn, why is it a hindrance to learning?

Michelle: There are several ways to approach that question. One that I like is what we can call a functionalist view—an idea that memory works the way it does because of what it's supposed to do for you. In order words, help you survive by bringing out the right information in the right context that you're going to need. So if you look at it that way, and say well, your brain is doing its job well when it selectively pulls out just the information that seems most relevant.

I think where we get into trouble is where the information that is actually going to be relevant in the future say, that compliance law that you needed to memorize that you're

going to need two years from now on your job. It doesn't have that superficial look and feel of "Hey, this is really important" and so I like to kind of drill down and say, "Okay, what kind of tips off your mind and tips off your brain that this is really going to be important?" It isn't just enough to say, "Oh I'm going to need this in the future." Its things like, "Oh, this aroused my emotions," "Oh, this related to an experience I once had."

And there does seem to be something very special as well in the human mind about narrative, about stories and I didn't talk about that much on the book but it's one that I've been thinking about more recently. When something is presented in a narrative form and it grabs our attention we understand stories pretty well and those do tend to be advantaged in memory. So the same exact information that compliance code that's very dry and boring and has this, "Ah you know, don't let that in," quality to it, come alive if it's reframed in a different way. So getting your mind and brain to think that, kind of tricking yourself into saying, "Oh yes, I need this right now," is one key way we can do that.

Connie: That's been a trend in workplace eLearning, is to put everything into scenarios or full-length stories. There's no question that that seems to engage people and make them attentive. Yeah, it's amazing really. Kind of shocking how much we like stories. We just found this out, I don't know, maybe in the last ten years, I'm not sure.

Michelle: Well, a neuropsychologist has even tapped into the question of whether there are physiological differences in how we process stories as opposed to other information. I mean it's kept human beings alive or helped keep us alive for millennia, right? Before we had the smart phones and before we even had books to refer to, stories are how we transmitted wisdom, so falling back on an old strategy using some really new tools.

Connie: Yeah. I know we're just about running out of time, let me get two more questions if you don't mind.

Michelle: Sure.

Connie: Learning transfer is just so important in higher education, certainly in the workplace. The whole purpose for most workplace learning is to be able to transfer on the job. What is some strategies that we can use for online instruction that promotes learning transfer?

Michelle: I concur hardly that this is such a key edge in learning and a very difficult one. I would say at least informally that the teachers impression of transfer, you know, that they're going to get this and transfer this from a couple of example is incredibly out of

whack—one of the easiest things to completely get wrong in our assumptions about what's going to work with our students.

So because thinking is so context bound, one of the most important things of course is to practice and the types, as close to the types of scenarios where you have to apply it as possible, which doesn't mean that you know, eLearning isn't going to work. We say similar scenarios to where they will need to use the information. That doesn't mean "Well, I'm going to need to use this in a deposition that I'm going to be in," it doesn't mean I have to be sitting at a conference table surrounded by attorneys. It means that kind of the underlying demands that places on me. What it requires of me cognitively that has to be the same.

So if we focus on reproducing those deep qualities of what the student's going to have to do, in our eLearning scenarios and problem solving, that's one of the things that can really help transfer. And just like with memory I think taking advantage of that opportunity for repeated practice for lots of problems and challenging problems, it's easy to try to set up things that everybody will get right on the first try because we want to encourage our students.

What students really need and oftentimes really like challenging problems where it's going to take, multiple tries so pushing hard, pushing hard on the right aspects of cognition and doing it far more times that you probably think are going to be necessary those are the keys and those are the things take advantage of what tech can do.

Connie: That's great. I know we do tend to make our courses too easy, I think. And finally, what are some key findings for using multimedia and online learning that you think this audience should know about.

Michelle: Right. One of the other incredible advantages of, you know, learning in this era is multimedia. You know you can have videos that can be played and replayed over and over. You can have very rich diagrams and other visuals that allow students and push them to explore material in a new way through a new modality. And there is a huge body of research that's so exciting that has a lot of information about what kind of diagrams work best and how to use those and how to deploy those. But the big picture is that these kinds of materials are a useful and welcome addition to almost any course of learning.

Now here's the catch and here's where in some of the writing I'm doing right now and something that I've been concerned with and that's this: it's that the quality of it has to be great. So it's not enough to just put a picture into an online course. We know that so called decorative don't help and in some cases may hinder learners by becoming a kind

of a distraction to the central learning process. But quality media is hard to develop. I know I just built an online course last year from the ground up. Multimedia is great. Quality multimedia is rare and I'm really excited and hopeful that in the future years it will start to become more plentiful and available.

Connie: Yes, it's a very tedious process getting high quality multimedia together, but that's what we love about our jobs.

Michelle: Yes. That it's endless, yes. So much to do and so much to explore.

Connie: Well, Michelle I wanted to thank you for clarifying so many of these concepts, for busting a few myths here and there, and just for giving us so many good strategies for online teaching.

Michelle: Well, thank you Connie and I'm hoping that any of your listeners who want to know more, want to connect with me in some other media, they can check out my blog which is minds-online.com you can also find me on twitter and Facebook.

Connie: I will put all of that in the show notes.

I really enjoyed this conversation. I hope you came away with new ideas and strategies for improving learning in your world. Again, you can find the show notes with links to resources at http://www.theelearningcoach.com/podcasts/36. Also, if you have a moment, please rate this show on iTunes. The more ratings, the more it will help others to find it. Take care and I'll talk to you next time.