The eLearning Coach Podcast #7
Leverage How the Brain Works
with Susan Weinschenk

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Connie Malamed: Hi everyone. This is episode seven of the eLearning Coach podcast; this time I'm interviewing Susan Weinschenk, who has a PhD in psychology and specializes in applying psychology to the workplace. Susan is the author of *One Hundred Things Every Presenter Needs to Know About People, One Hundred Things Every Designer Needs to Know About People, Neuro Web Design: What Makes Them Click?,* and her newest book is *How to Get People to Do Stuff.*

In this interview, Susan helps us apply cognitive psychology research to solve real world training problems. Let's go!

Hi Susan, it's great to have you on the podcast.

Susan Weinschenk: Thanks Connie, I'm really glad to be here.

Connie: I've admired your work for so many years. How can I resist someone with a handle of The Brain Lady? In both of your *One Hundred Things* books, you discuss a lot of research that would be of interest to learning professionals; that's what I'd like to focus on today.

Susan: Sounds good.

Connie: Let's start with our cognitive architecture. Can you talk about why they now say working memory can hold closer to four chunks of information rather than Miller's seven plus or minus two?

Susan: This is something – I referred to this in my book as an urban legend; Miller gave up talk in 1956 at the American Psychological Association. It was about his ideas that maybe there was a limit to how much information could be processed in general and how much people could remember. He was really more speculating than providing research from a particular study. That has just stuck so much; the research after Miller's paper, research in the 80s, the 90s, and even in 2000, has really shown that the number is three-to-four things.

For those of your listeners who really like research, there's researchers Battely and Cowen – are two researchers that have shown that there have been many, many studies. The number really is three or four at most – is the amount of information that

people can hold in their short-term memory before it starts to disappear. It's also the number of things that people can deal with at a time; if you're trying to make a decision, or you're trying to compare different things, the research is pretty clear that the number is three to four.

Connie: Isn't that amazing? Think of all the training materials that are based on seven.

Susan: I am as guilty as anyone else; I used to teach in my classes that it was seven plus or minus two. What happened was, when I was writing the book *One Hundred Things Every Designer Needs to Know About People*, in that book I was being very meticulous in getting references for all the research. Obviously, I knew about the Miller paper, I had a copy of the Miller paper; when I went to look for more recent research on it because I thought, hey, 1956, that's a long time ago.

Connie: Right.

Susan: When I went to look for more recent research, that was when I found that actually that number was not right and that the research had now worn it out.

Connie: I kind of went through the same experience; I couldn't find newer research, so I emailed Stephen Kosslyn, the cognitive psychologist who writes a lot about mental imagery, and he said the same thing. He said now it seems like it's closer to three or four bits of information and that blew my mind.

Susan: You have to be careful what's on the Internet, right?

Connie: The other aspect of the research that I think is so fascinating is that working memory varies among individuals. For some people it might even be five or six, but I think they're talking an average here of four.

Susan: Yes and working memory does vary. It's interesting because there's also research that shows that how good your working memory is, is one of the major predictors of how well you will do in school.

Connie: Exactly. I have read that too, that's amazing. Moving on. I think the terms schemata, or schemas, and mental model are often confused. Can you describe the different between the two?

Susan: They do have a lot in common, so I can understand how they could be confused; maybe it's even too fine a nuance to worry about. Here's how I would describe them. A mental model is the expectation; it's the understanding that someone has about a product or an experience. It's what do I expect when I'm going to read a book, I'm going to the movies, I'm going to attend a training course. What are my expectations about that? What does a course mean to me? When I think about attending a course, that

means I go somewhere; I go to a training room, there's other students, there's an instructor, and it takes about three days, right?

We can talk about what is someone's mental model of training. We might be interested in that because perhaps we're going to be doing online training and we want to think about their mental model of this course is really different than what it's actually going to be. The term mental model is, what are my expectations about using that product, using that service.

A schema is more of a cognitive psychology term that has to do with how information is stored, remembered, and processed. We can talk, for instance, about if I say the word "face" to you, what is the schema that makes up a face? Well, let's see, it's probably someone's head, then their eyes, then their nose, and then their mouth. If I use the term "computer programming," what is the schema that you believe makes up what a computer programmer does?

It's more about conceptual understanding of something rather than the idea of an expectation of what an experience is going to be like. It's pretty subtle. Does that make sense?

Connie: Yes, it is subtle but I think that helps. I also think of mental model as how something works. Would you also add that to your category?

Susan: Definitely, definitely. Yes. In the field of user interface design, which I have a lot of background in, we talk about people having a mental model of software product they're about to use and how that's going to fit into the way they work.

Connie: Right. How do you think it can help learning professionals to understand their audience's schemas and mental models? Is there a place for trying to get into the audience's head and understanding what structures and expectations already exist?

Susan: I think it's critical for people who are designing any kind of learning modules to think about mental models and schemas. Here's why; to me, training is all about taking people from where they are now and when you're done with the training, they're somewhere else. You've increased their knowledge, you've increased their skill, you've changed the way they feel about something; it's all about taking people from point a to point b.

Then there's that gap, right? Between A and B; that's what you're doing in training. You're just figuring out how to fill that gap. In order for a training program to be effective, you have to understand what is the starting point for this audience. Ideally, you'd understand what is this particular person know; what particular schema do they already have about the topic at hand; what is their mental model about what it's going

to be like to go through this training. Then you would design to that individual; a lot of times we can't design for a particular individual.

It's certainly important to understand, okay, I'm going to be putting together a training class, or an eLearning module, for this particular audience. This audience is a group of insurance adjusters and here's what they already know about this kind of insurance…understanding the schema of the concepts. What is it that they already know? What have they already put together? For example, if I'm trying to teach someone a procedure, are we at the point where we're teaching them step one, and step two, and step three? Or are we ready to pull all of those steps together into a schema and just call it the insurance adjustment process?

Can they handle that? Are they ready for that? I think it's really important you know where people are at. What's the schema that fits this particular topic area that they already know and already understand and what they haven't put together into a cohesive schema, it's just little bits and pieces of information. Your job in the training is to coalesce that together.

Connie: I think that's one of the reasons analysis and, in that analysis, speaking to audience members is so important, especially for online learning. When you're live, you can say to people, "How do you think such and such works?" You can get a sense of where people are at. If you don't interview some of the audience members, then you're really missing out on understanding how they perceive things and how they think about things.

Susan: Yes, it's so easy to – I mean, this is one of the automatic vices that we fall into consciously to think that we know, or to think that what we understand is what they understand. You've got to assume that unless you are designing, training, for someone who is exactly like you, who has your exact background and level of knowledge, then your assumptions about what they know and what they don't know are probably way off.

Doing research like that is so critical and it's so interesting to me because people sometimes – it's like, Yes, according to our training process, I must now go interview the learners or potential people. They don't realize this is for them; for themselves as the designer. You have to figure out what it is you don't know and what it is you think you know but you really don't know.

Connie: So the message is forget about your assumptions and go get the real data.

Susan: Yes, as much as possible. We always are working from assumptions. As much as your assumptions are tied to actual data, the more the training will hit the mark.

Connie: Yes, good way to summarize it. Let's move on to the learning process. I thought it was interesting, in your book, that since there's been a lot of talk about learning styles and a lot of people saying that there's been no basis for how we always used to think about learning styles, you seem to think there might be some validity to it. Can you share you view on this with us?

Susan: Yes, I struggle with this one, Connie, because I am so research based. I can't find research that I feel really shows the idea that there are visual learners, auditory learners, kinesthetic learners, and that that has an impact on the way they learn and on the training you provide. There's actually not been a lot of, as far as I can tell, not been a lot of research done on this; the research I found, I didn't think was conclusive. I struggle because, in my experience as a learner, my experience as an instructor, then with all the antidotal experience of so many people, it makes a difference.

I don't know what else to say except to know that it does make a difference. I don't understand why we don't have research that shows that. I'm an auditory learner; I know that I process information most naturally and my preference is to process information by hearing it. It's not that I can't learn from visual, I do; visual information can be very helpful but it's not my primary mode.

Kinesthetic, moving – muscle movement, is also useful but it's not my primary mode. What happens when someone has a mode that they prefer, they tend to teach in that mode, right?

Connie: Right.

Susan: You attend one of my courses and if I'm not paying attention, I'll be talking the whole time with very few visuals. I have to stop and realize, okay, that works for me, and people like me, but there are lots of people out there that need to see something in order to really learn it. There are people, a smaller number of people out there, that have to physically move; they have to have muscle movement in order to learn.

My daughter is a kinesthetic learner and I remember when I realized this about her; she was probably about third grade and was struggling with math and arithmetic, which I just couldn't understand because I'm fine with math and her older brother was fine with math. It's like, why is she having so much trouble with this? We were at my office one day and I was trying to help her with her homework; in frustration, I just – I had a bunch of colored pencils out and I took two yellow pencils and three blue pencils. I put them in front of her and said, "Look, there's two yellow and the three blue, so what do you have all together?"

She picked up the pencils and started moving them around and was using the pencils to do subtraction. I was looking at her and all of a sudden I went, "Oh my gosh. She's a kinesthetic learner." She's my own daughter and I knew about learning styles but it

hadn't occurred to me. I felt bad for her, to be honest. Any of the listeners who are kinesthetic learners, I don't mean to be cruel or point anything out but they often have a hard time in school because our classrooms, most of the time, are not set up for kinesthetic learners.

It was actually very important for me to realize that about her; from then on, our whole plan for how to get her to be successful in school, I changed the plan. Again, I can't find the research on it but I knew that if we didn't address this with her, she would have a hard time in school.

Connie: I saw that in the Montessori method where they make everything concrete at first, for as long as the child needs it.

Susan: Yes.

Connie: So the kids are holding and manipulating physical items all the time for math. It's only when they're ready to go abstract, on their own, in their own time that they do go abstract. When I saw that you had said this, I smiled because I have had the same exact experience. I know that there's no basis for the research but my intuition and my experience in life have shown me that, at least, there are learning preferences.

Susan: Yes. Yes and someone just needs to go and do more research. That's my answer.

Connie: You mentioned how important it is for information to be well organized. That's certainly one of the big jobs of the instructional design aspect of our work, is to organize information logically. Why does it help people comprehend and retain it, when it is well organized?

Susan: It's a good question and I don't know that we necessarily know all the reasons why that's true. We know it's true and the research shows that it's true. In fact, my master's thesis was on that very topic and I investigated whether it made a difference who did the organizing. Should the instructor organize it? Can people organize their own information to learn it? Does that work better or not as well?

What I found was it didn't matter who did the organizing, as long as it was organized in a way that made sense. People can organize the stuff themselves and figure out how to learn it or a teacher can organize it for them but somebody's got to organize it. I suspect it has to do with the idea of a memory trace; what we know in the human brain is that when you learn something, literally your brain changes. You can actually observe what's called memory traces.

What happens is, when you're learning something, you make a connection between one idea and another one memory and another. That makes an electrical impulse in your brain. Electrical impulses in the brain have tendencies; there will be a tendency path.

When one nerve fires, that's going to cause another nerve to fire, which causes another nerve to fire. Which nerves fire and in what order is not random.

If you say, "This is Susan Weinschenk, the brain lady." You now connect my name to the brain lady and you tell someone that, that connection literally occurs in their brain electrically. The next time you say Susan Weinschenk, the nerve connection, the electrical connection for the phrase, "the brain lady", will fire.

The more you say that, then the faster it will fire and the more likely it will be that when you say Susan Weinschenk, someone looks at you and goes, "Oh, the brain lady." There are actually these memory traces. What I suspect is that when information is well organized, because you are there for connecting it to things you already know, it allows you to make stronger and quicker memory traces.

I do not have proof for this; this is just my thinking about why is it that organization is so important.

Connie: That's good. It reminds me of things that fire together, get wired together.

Susan: Yes, they do.

Connie: Helps with retrieval too.

Susan: Oh Yes, absolutely. The memory traces are all about retrieval. Someone says something and the first piece fires and comes into memory. Then the other pieces just automatically then get fired from that.

Connie: It is a beautiful system a lot of the time, not all the time. In your research, did you find a few ways that instructional designers and training professionals can help learners retain information? Did a few things bubble to the top that were highly correlated with retention?

Susan: Yes, there's actually a fair amount of research on retention. Some of the things I would say that research shows us about retention – well, first of all, we talked about the three to four things at a time; making sure that you're only giving people three to four things to deal with and remember at a time, then they'll remember it. We also know that if something is – and I don't know if we can always do this or want to do this in a classroom setting – but if something has an emotional connection, it will be remembered longer and in a different way.

The hippocampus, that's the small part in the brain; it's in the middle part of the brain, we call the mid-brain. That's where long-term memory happens. Information goes through the hippocampus and that's why we remember it. If it doesn't go through the hippocampus, we don't remember it long-term. The hippocampus is right next to the

amygdala, which is where emotional information is processed. If something has an emotional content around it, it will be remembered more strongly and for a longer time. That's something to remember.

The other thing is that we also know that twenty minutes is the longest people can go trying to learn something without a break. The reason is that the brain actually, it concentrates – if you concentrate on something for twenty minutes, you've used up all the glucose in the brain.

Connie: Right.

Susan: You just used it up and you need to take a break. Eating something will help but, even without eating, you just need to take a break from all that concentration so that the glucose can then build up again.

Then one more thing I'll say has to do with sleep. The research is now coalescing around the idea that the main reason we sleep, and the main function of sleep, is to consolidate memories and to store in long-term memory the things that we learned that day. If you want people to remember something, you need to give them a little bit and then let them sleep before you give them more.

Connie: Right, and that could be one of the reasons why they're finding that spaced learning is so important and so effective. I think what I'm getting out of what you just said is that after every twenty minutes we should allow learners to eat and sleep, right?

Susan: I don't know that we're going to do that for every twenty minutes but we definitely need a break. People need a break from concentrating.

Connie: They really do and that's where activities can come in, where you're being active.

Susan: Yes, being active, switching topics, letting them try out what they've learned because it's the giving them difficult, abstract information for twenty minutes. With really having to think hard and concentrate, that's what's using up the glucose.

Connie: I was reading a book, *Your Brain At Work*, and they talk about that. Why don't we move on to a question I've been wanting to ask you. There's a trend in the training industry to look for solutions beyond formal training, like, performance support on mobile devices, getting it to more informal learning opportunities, and using social media for learning. Do you think these approaches, according to all the research that you've done, could be effective?

Susan: I do but I think, in a lot of ways, this is not new. We're talking about performance support on mobile devices, but really what we're talking about is performance support, right?

Connie: Right.

Susan: The question about performance support versus formal training has been around for a long time. I think that what you have to do is really understand what is it that people need to do and what is it that people need to learn. Make sure that you are providing the right stuff at the right time. If people need a job aid, give them a job aid; don't give them a class. If they need a class, give them a class; don't just give them a job aid.

Certainly, whether you do this through something on their cell phone, or etcetera, that's very appropriate. Use whatever technology is there. I did some work for a client once who had job aids for surgeons. These were for residents before they went in to do a surgery; they could look at five important tips on doing this gallbladder surgery before you walk in the room. That actually disturbed me that they would but apparently that's real and they need that.

Yes, they've had training on how to do the gallbladder surgery but now they can get the performance aid on their cell phone as they're walking up the stairway to go do the surgery. I think the new technology can be extremely appropriate and I believe in using technology in whatever way you can. Don't do it if that's not the right method.

Connie: If that's not what it's called for. One thing you say in your book is that people respond more to anecdotes than to data. Why do you think this is?

Susan: I think it has to do mainly with stories. What we know is that people remember things better, learn things better, when it is in story form. The natural way of our brain to process information is in story format. Anecdotes, they're a story format. If you tell a story about the meeting you had with the customer, and by telling that story you are transmitting data and information, that's going to be more effective than just transmitting the data and information.

"Seventy percent of our clients, blah, blah, blah," versus, "I went and met with Mary, who is one of our customers and she said," then you give the anecdote. I think it's because we process information best in story form.

Connie: Yes. It sure sounds more interesting to me to hear a story than to just see screens filled with data.

Susan: Yes.

Connie: How do you think the aesthetics, or visual design, of training materials affects a learner's interest?

Susan: I think the visual design has a couple of purposes; it affects problems even. Definitely, it can be used to grab attention; that's important. If you have a picture of something, if you have a training manual that is colorful and is designed well, it will grab attention. It also conveys information, consciously, about whether the source is credible. When something looks well designed and it's colorful, our unconscious impression will be the training itself is well designed and that we can trust the source. There actually is some research on that.

I also think that if something is poorly designed, it can distract us. We get overwhelmed by too many different colors, too many different fonts and, if it is poorly designed, then, again, the corollary of what I just said, people might decided, well, this looks like someone just threw it together. This must not be very well done.

Connie: Right, that's why I love doing visual design workshops with training professionals because I know it's a way to spread the word that, yes, visual design is actually more important than you might think. Nowadays there are so many one-person training departments; where it used to be a team, now one person is responsible for everything. It can be tough to get the visual design right.

I'm glad you also think that it's so important. One of your *One Hundred* research facts that fascinated me was that people are addicted to seeking information. I never heard that before but I've certainly felt it within myself. How does that work?

Susan: It's actually from a brain chemical called dopamine. Dopamine is a neurochemical in your brain that, for years, we thought of it as the pleasure chemical; it's the chemical that's released when you're doing something pleasurable. That's true as well but now we realize that dopamine plays a lot of different roles. One of the most important things it does is, when dopamine is released in your brain, it actually makes you want to go seek out more information.

What happens is you look something up on the Internet and you find it, right?

Connie: Yes.

Susan: Oh, there's the information and a little bit of dopamine gets released because you found it. Now that makes you want to go look for something else. You look for something else and then you find that and then more dopamine gets released, this just kind of goes on and on. I talk in my books about getting caught in a dopamine loop where you can't stop looking for stuff because it keeps getting released.

This is a very good thing because this is why humans are so curious. We always want to know more, and more, and more. You can really use that, actually, to keep people motivated and interested.

Connie: That's where the whole idea of making your learners curious comes from.

Susan: Yes, one of the best things you can do in training is not just give them the answer to a question; not just feed them information. Give them a question and they have to go find the answer.

That'll get the dopamine going and that'll get them more and more interested and more and more curious.

Connie: Good idea. Susan, thank you so much for giving us your time, this was a fascinating conversation and one that I think will be very valuable to anyone who is in the learning profession.

Susan: Thanks for having me, Connie.

Connie: I had a great time speaking with Susan. I'd like to thank her again for all the knowledge she shared. I hope the interview changed your world, even if just a little bit in some way. As always, thanks for listening.

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