

Creating, Constructing and Coding

A Synthesis Essay
By Laurie Fernandez

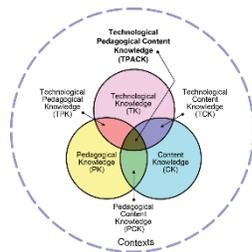
My husband cringes when I turn to him and say, “I was thinking”. It always means that I have an idea for a project around the house. That’s because I am always striving to make things better at home and in my life. The same holds true with my classroom. I am always striving to make things better. I am constantly learning and evolving as I teach year after year. It is the reason I started taking classes in the Masters of Art in Educational Technology (MAET) program and Michigan State University. Now, at the end of the program, I am looking back at what I learned and how it has changed or will change what I do in the classroom. Am I more able to integrate technology into my curriculum? How will the MAET degree make me a better teacher?

Unpacking TPACK

The primary reason I pursued a master’s degree in educational technology was not just to learn new technology but to learn how to teach with technology. At the beginning, I thought I would be given the step-by-step guidelines for integrating technology into my classroom. Steps such as:

1. Learn a new technology.
2. Learn how to replace a learning activity with one that involves technology.

As with everything in life, it just isn’t that simple. In almost every course I took, beginning with the course Teaching School Subject Matter with Technology (TE 831), I learned that replacing a non-technical activity with a technical activity will not bring about the revolutionary change I expected. For instance, using technology to replace pen and paper does not change how the content is taught nor the way a student learns. A better way to integrate technology is by understanding TPACK or Technological Pedagogical Content Knowledge. TPACK is an extension of PCK or Pedagogy and Content Knowledge and was first introduced by Punya Mishra and Matthew Koehler (2006).



TPACK is a framework for describing the essential knowledge needed for teaching effectively with technology. Accomplished teachers know the content they teach and the way to teach that content to promote student learning. To teach with technology, teachers also need to know how to teach their content with technology and how the content changes with the addition of technology. Consequently, I learned that it isn’t enough to learn about new and exciting technology. To make a real difference, I need to re-think my lesson plans to

ensure they meet the goals I set for my students and then find ways that technology can do these things.

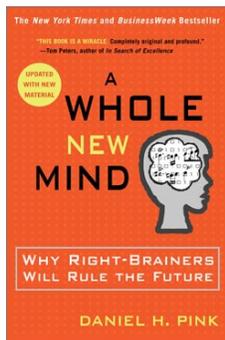
The Classroom Shuffle

One of the first things I did when I started teaching at Kent Career Tech Center was re-design my classroom space. I needed to make it work for my teaching style. After attending MAET classes, I find that I would like to re-design it again; but how? In Applying Educational Technology to Issues of Practice (CEP 812) we explored important considerations in designing a learning space. First, I must remember

to match the environment to my teaching and learning goals. In my classroom, I want students to find their passions. They may enjoy writing code. On the other hand, they may also find that they want to express their creativity by making video games, or the artwork that goes into a game, or even designing websites. This means that I must provide an environment that encourages exploration to help them find their passion.

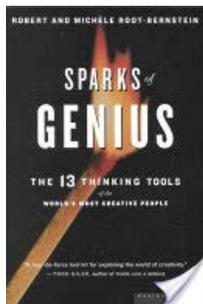
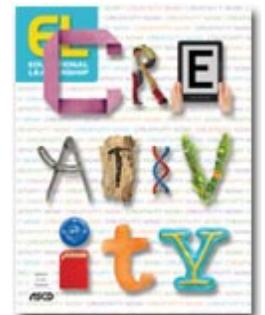
In *Creativity in Teaching and Learning* (CEP 818) I explored this topic from a creative standpoint. From my experience, I know that a creative inspiration can come from anywhere and I welcome my student's creative ideas. I want my students to have a place to be able to put their creative inspiration into action. I would like an area to explore and create with other programming related technology such as Raspberry Pi's and a NAO robot. Additionally, my classroom must be easily adaptable to future technologies.

Aesthetic Logic



Students today face a very different working world than even ten years ago. Employers are looking for workers who are problem solvers, innovators and global communicators. Daniel Pink, a writer and thinker of motivation and creativity writes, "The future belongs to a different kind of person with a different kind of mind: artists, inventors, storytellers-creative and holistic "right brain" thinkers whose abilities mark the fault line between who gets ahead and who doesn't" (2006).

I have been creative since I was young. I value creativity, both in my life and in my classroom and I was pleased to explore the role of creativity in education. In *Technology and Leadership* (CEP 815) we discussed an article by Danah Henriksen and Punya Mishra called *Learning from Creative Teachers*. The authors uncovered five common traits of teachers who skillfully integrated creativity into the classrooms. I learned that creative teachers often incorporate their hobbies into the classroom and, more importantly, they are willing to take intellectual risks. They aren't afraid to try new things.

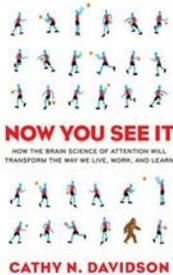


I have always considered computer programming to be a creative activity. In *Creativity in Teaching and Learning* (CEP 818) we read the *book Sparks of Genius by Robert and Michele Root-Bernstein (2001)*. The authors of the book explored thirteen tools often used in creative endeavors such as perception, patterns, and abstraction. By exploring these tools of creative thinkers, I learned how to help my students better understand computer programming concepts. For example, I developed an idea for teaching iterative loops by printing patterns of star shapes. I have already incorporated this lesson in my class.

It's important to notice that teaching with creativity does not change what is taught but how it is taught. It emphasizes experiential learning where students learn the concepts deeper. In *Adapting Innovative Technologies in Education* (CEP 811), we had a chance to experience a Maker Faire. A Maker Faire is a gathering of innovative and creative projects made by people who had a great idea for something and used their knowledge, skills and persistence to make it. In education, Maker Faires show students how to repurpose things around them, creating new things. It's a constructivist approach to teaching and learning. It teaches students to be innovators and problem solvers in the 21st Century.

Just the Facts, Ma'am

One of my biggest complaints about students is their inability to think. I believe that the industrial model of education in the United States is turning our students into mindless zombies: a model where teachers provide answers and reward students for remembering them. In *Psychology of Learning in Schools and Other Settings* (CEP 800), we discussed the implications of teaching for knowledge (remembering a collection of facts) instead of teaching for understanding (knowing the meaning of facts). When schools stress the importance of covering a large amount of material, teachers have too little time to teach a deeper understanding of the material and instead settle for teaching a bunch of disconnected facts. Students do not learn how the facts are connected and are unable to transfer the knowledge to different situations.



In *Teaching School Subject Matter with Technology* (TE 831) we discussed the book *Now You See It: How the Brain Science of Attention Will Transform the Way We Live, Work, and Learn* by Cathy N. Davidson (2011). In it, she writes, "until we are distracted into seeing what we are missing, we literally cannot see it". It is a statement about how today's students are so absorbed in memorizing facts that they fail to see the big picture including the understanding of how, why, when and where to use these facts. To prepare students to be problem solvers of tomorrow, I need to "distract" students to achieve a deeper understanding of computer programming.

Several MAET classes explored ways that I could "distract" my students. For example, in *Psychology of Learning in Schools and Other Settings* (CEP 800), I learned that an authentic experience can provide a better understanding of material and may even help modify misconceptions. I also learned that I can "distract" my students by making ideas sticky, a concept described in the book *Teaching That Sticks* (2007) by Dan and Chip Heath. I learned that in order for students to learn, the concepts must be memorable and interesting, in other words, sticky.



Students cannot be distracted if they aren't motivated to do so. In *Psychology of Learning in Schools and Other Settings* (CEP 800) I also learned that students learn better when they are motivated with an internal locus of control or have intrinsic motivation. They need to feel that success is the result of effort and hard work. They need to know that they are in control of their own learning. I can help my students develop an internal locus of control by guiding their focus on their potential to learn, teaching them to enjoy the challenge and showing them that learning computer programming is hard work and takes effort but is achievable and fun.

Teaching and Learning

At the very heart of what I want for my students is that they learn. In both *Teaching for Understanding with Technology* (CEP 810) and *InTechnology and Leadership* (CEP 815), I re-examined the different learning theories including Behaviorism, Cognitivism, and Sociocultural/Situative. The cognitive learning perspective focuses on the inner workings of the mind of the learner. For example, when a learner is confronted with new sensory input, the information must be transformed into something that will fit in with the learners existing framework.

Cognitive theorists consider learning to be a constructive process, building on what students already know. This has important implications for me because each student comes to school with a unique set of beliefs and interpretations of the world. It is important to assess their prior knowledge, especially for possible misconceptions, before teaching new material. One way to do this is by making the students' thinking visible to help them recognize where problems exist. Helping students to think about their own learning, known as metacognition, can also help them become self-sustaining, lifelong learners.

Cognitivists also tell us that attention is crucial due to the limited processing abilities of the brain. Building a deeper understanding of computer programming requires my students to actively listen to and engage in my lessons. Unfortunately, it is possible that they mindlessly copy code from my demonstrations or from someone else without paying attention to the explanation. As a result, students who don't attend to the explanation may not understand what they were typing. It's similar to knowing how to spell a word but not know the meaning of it or how to use it in a sentence. In my classroom, it means that they know the syntax of C# but cannot create programs with it.

Conclusion

So, what did I learn about teaching technology with technology? I learned I could integrate technology if I first consider my goals for my students. I can offer new ways of learning and help keep students engaged in the material. I learned how to provide my students with a better understanding of computer programming and better prepare them for future careers, no matter what they may be. All of this will make a big impact on my teaching and my students learning.

The real value of adding technology to improve instruction is to start with the big ideas of computer programming. What is it that I actually want to them to know? Ok, I know they need to learn syntax and variables and conditionals and looping. But more importantly, computer programming gives students a process that allows them to think of complex problems in a way that can be resolved by a computer. It teaches them to think. It shows them that they have the power to create. It's a problem solving approach that they can bring to any field they choose to go into.

References

Davidson, Cathy (2011). *Now You See It: How the Brain Science of Attention will Transform the Way We Live, Work, and Learn*. New York: Viking.

Heath, C., & Heath, D. (2010, July 5). *Teaching that Sticks*. Retrieved March 18, 2017, from <http://heathbrothers.com/download/mts-teaching-that-sticks.pdf>

Henriksen, D., & Mishra, P. (2013). Learning from creative teachers. *Educational Leadership*, 70(5). Retrieved from <http://www.ascd.org/publications/educational-leadership/feb13/vol70/num05/Learning-from-Creative-Teachers.aspx>

Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054. doi: 10.1111/j.1467-9620.2006.00684.x.

Pink, D. H. (2012). *A whole new mind: why right-brainers will rule the future*. London: MC, Marshall Cavendish.

Root-Bernstein, R. S., & Root-Bernstein, M. (2001). *Sparks of genius: the thirteen thinking tools of the world's most creative people*. Boston: Houghton Mifflin Company.