Before starting Michigan State’s online master’s program I had given myself several pats on the back for integrating technology into my teaching practice. My students had used an online graph generator for their data analysis projects, I had used online animations to demonstrate science concepts, and I had published student drawings and writing pieces to a class webpage. I considered myself one tech-savvy teacher after learning Dreamweaver and Photoshop basics and publishing an online portfolio for the pilot course “Teaching and Learning with Technology.” When I chose the “Technology and Learning” concentration for my master’s program plan, I was already effectively using the latest technologies in my classroom…or so I thought.

There were computers in the classrooms and in the lab, and my students were using them to complete educational tasks, so what was the problem? As Clayton Christensen, Michael Horn, and Curtis Johnson state in *Disrupting Class*, simply putting computers in the back of a classroom does not constitute “integrating technology in schools.” Many schools have increased the number of computers in the classrooms, with the average ratio of students per computer with Internet access falling from 12 in 1998 to nearly 4 in 2003. Yet, we do not see a significant increase in student performance on standardized tests or graduation rates during this same time. Computers do not hold teaching certificates and cannot be a solution by themselves. We will only see meaningful improvements in student learning when education professionals use an open mind and critical thought to determine how and why technology should be used in K-12 education.

Applying thoughtful reflection and critical analysis is exactly what my master’s courses had me practice. I was often asked to reflect on my own beliefs and search for research-based evidence to support claims. In the technology-focused courses there were several recurring themes that led to critical thinking:

- How does this technology fit in with existing standards and teaching methods?
- What is the pedagogical reason for using a particular technology application?
- What unique advantage will the student, teacher, administrator or parent experience because this technology is being used?
- What educational problem or challenge can be addressed by this technology?

These themes continue to guide my thinking about educational technology, as do particular readings, discussions, and projects from my master’s courses.
Educational Games

In the course “Teaching Subject Matter with Technology,” Dr. Sandra Crespo included a reading by Jean Paul Gee that has stuck with me. Gee’s writing has influenced how I view electronic games and their application for teaching. I am fascinated by the idea of taking the electronic game, which has huge appeal for children, and instead of simply advocating the use of video games to teach content, Gee takes the idea a step further. He suggests that we look at why video games are something that children will devote so much time and energy to, and try to apply these principles to school instruction. He talks about a player taking on a different role within the game and doing things he would not do in his non-game world roles. I am intrigued by the idea of transferring this principle to the classroom. If we can get students to identify with the role of “mathematician” or “scientist,” they will feel comfortable doing the actions of these roles.

I have also been inspired by the interactive gaming system, the Nintendo Wii, especially the program EASPORTS Active. In *Wii Have Only Just Begun,* I imagine an interactive, individualized learning experience:

It is Monday morning and Johnny’s mother tells him it is time for school. Instead of boarding the bus, he powers up his video game console and loads his personal learning profile. An animated figure (who looks uncannily similar to Johnny himself) appears on the TV screen, greets Johnny, gives him specific feedback about his academic accomplishments last week, and then explains what is on the agenda for today’s lessons. An interactive daily planner pops onto the screen and Johnny is off. The learning software already knows Johnny’s preferred learning styles, his strengths and interests, and his current level in each subject. It uses this information to modify activities for his level and learning style. Since Johnny does well with kinesthetic learning, many of his lessons involve a motion-sensing controller that has him move his body to manipulate images on the screen and interact with the lesson at his own pace. Other times he uses a wireless writing tablet and pen to highlight, take notes, and select answers on the screen. Because Johnny is very interested in animals, his lessons often feature texts about different animals and when he scores at least 80% on an assessment, a short Animal Planet video will play.

Learning From Technology vs. Learning With Technology

In “Teaching Subject Matter with Technology” we also examined the difference between learning from technology and learning with technology. Learning from technology could include watching an educational video, while learning from technology could include working in a group to produce an educational video. A major difference between the two is that the learner’s mental state is much more active in the latter. She is using higher order thinking skills, solving complex problems, and collaborating with peers to produce a valuable product.
I was able to experience the benefits of learning with technology firsthand during the course “CEP 817: Learning Technology Through Design,” taught by Dr. Punya Mishra. The big project for this course was designing and publishing an original educational website. While we did complete some readings and discussions, it was through the actual design process that I gained the most insight into design ideas. When students are learning with technology, they must organize information in a way that makes sense to them. In other words, they are constructing their own meaning and connections for the content being learned. It is possible to encourage constructivist learning in any setting, but web and computer technologies offer many options for enhancing this type of learning. For specific ideas on this topic, please refer to my professional development slideshow: eTools & Beyond: Promoting Constructivist Learning in the Virtual Environment.

What Can Technology Do For Me and My Students?

In “CEP 805: Learning Math with Technology,” the instructor, Ralph Putnam, introduced a useful framework for evaluating technology in math instruction. The framework of technology affordances is shown below and is generally applicable to non-math technologies as well.

- Providing access to information (which is either unavailable otherwise or hard/time-consuming to find)
- Automating, simplifying, and transforming tasks
- Representing knowledge and thinking
- Communicating and collaborating

Using this framework, my group mates and I discussed and evaluated applets, games, virtual manipulatives, online math lessons, and video math problems. Along with the technology affordances framework, we used the NCTM’s content standards as a tool for categorizing and evaluating math resources. For the final project I developed an Online Math Resources Library using Google Sites. My resources were targeted at supporting upper elementary to middle school math students, because that is who I was primarily teaching at the time. I used Professor Putnam’s framework and NCTM content standards to organize and evaluate high quality online math resources.

The Online Math Resource Library remained useful and relevant after CEP 805. I shared the site with my students, their parents, and other teachers at my school. I have referred back to the resource library when designing lessons, activities, and instructional interventions for my math students. I also continue to use the evaluation methods from this course when encountering a new educational technology or thinking about a new application for an existing technology. Anyone can Google “fractions” and click on links they find, but students are best served by high quality online resources that have been carefully selected and evaluated by an education professional.
You Have a Problem? Technology Has the Answer.

The possibilities for using technology in K-12 education are too numerous to list in one place. The way we use technology will vary depending on grade level, school set-up, teacher abilities, student abilities, and access to resources. For now, here is a list of ways that technology can help solve common educational problems and increase student achievement.

- Provide instant feedback to multiple students, saving time for the teacher and the students
- Provide appropriate instruction for students who are in the same grade, but on varying levels of proficiency.
- Increase engagement and motivation with instruction tailored to student interests and abilities.
- Give more frequent, computer-graded assessments which provide more data for teachers and administrators to monitor progress and make adjustments.
- Generate an organized papertrail for parent/teacher communication, student writing samples, and teacher feedback.
- Provide a central location for collecting student work and creating a portfolio.
- Increase access to resources, like virtual guest speakers, virtual field trips, video clips, and newspaper articles.
- Access to viewpoints otherwise unavailable, like a “keypal” from another state or country.
- Provide support for special learning needs (i.e. text-to-speech and speech-to-text software) that frees up time for the teacher or parent.
- Encourage more independent work, with less need to “ask the teacher” (SpellCheck, Help Menus, Internet searches)
- Add variety to topics explored (no longer limited to teacher’s knowledge or available books in the library)

Lessons from Online Learning

The experience of taking seven online classes has helped me think critically about the factors that make or break an online course experience. This perspective has helped me improve my own virtual teaching practice and I carry these lessons forward into future positions. As online learning at the post-secondary and graduate level continues to be improved, those in K-12 education should be taking note. By studying online teaching best practices they can then build on what higher education has pioneered and apply this knowledge at the K-12 level.

The ideal online course is highly organized, with a weekly lesson layout, clear due dates and detailed assignment expectations. While the instructor’s expectations must be clear, there should be a lot of room for creativity. In addition, the assignments should result in work that remains useful beyond the class. There must be a high degree of communication among classmates as well as between instructor and students. In the
online setting, collaboration—taking advantage of classmates’ knowledge and prior experiences, sharing the workload, and provoking thoughtful discussion—is an important part of making the class feel like a learning community. Free technologies like GoogleDocs and Wikispaces make collaboration simple and efficient, and these types of tools are essential for online group work. Group collaboration “in the cloud,” as Professor Patrick Dickson would call it, is something that bricks-and-mortar classes can use as well. They encourage collaboration outside the classroom and allow the finished product to be published and shared with a large, authentic audience.

Perhaps it is not surprising that I have found the qualities that make a great online instructor are very similar to the qualities of any great instructor. Students need an instructor who expresses care for her students’ success, establishes a connection with individual students, and facilitates meaningful interaction among course participants. Instructors should provide prompt responses to questions or issues and prompt feedback on assignments. In the online environment this is essential, because students cannot simply stay after class or stop in to office hours.

A great online instructor will take advantage of the web-based nature of the course, instead of simply putting a previously in-person class into digital form. This means incorporating video, wikis, blogs, PowerPoints, discussion boards, and outside websites. Students should be doing a lot of exploring on their own because of the self-paced and individual nature of the online set-up. Online courses teach content, but they should also impart skills, tools, and habits of mind for online learning beyond the course or degree.

**Free Stuff**

I refuse to accept the idea that schools cannot afford to implement technology. My experience as a teacher and in my master’s courses has shown that there are thousands of high quality educational resources available online, for FREE. If I got together with a few other tech-savvy elementary teachers, we could create a high quality, technology-rich, standards-based curriculum for a minimal cost. I see this type of resourcefulness becoming commonplace in the next ten years. A key ingredient to our free curriculum would be open source software. We could put our courses online in a course management system using Moodle. In addition we could create our own social networking on Ning.com where students would create profiles, share ideas and resources, and learn about online etiquette. We could then join communities like Slideshare, YouTube, and Wikimedia to borrow lesson plans, as well as post those we create ourselves for other educators to use. We could use sites like aaamath.com, mathplayground.com, and starfall.com to provide supplemental games and practice for students. Students would type papers or create slideshows using Google Docs or Open Office software. The best part? All of these resources would be available to students at any computer (or smartphone) with Internet access. This is obviously an extreme example of cost-cutting for schools and would probably not be approved by a school board, but it raises the question: How much money could schools save by exploring free and open-source options?
**Time to Get on Board**

I have always been a fan of technology, perhaps because I am a Digital Native. I would have to think back to kindergarten for a time when I was not using a computer for one purpose or another. In elementary school I progressed from “Number Munchers” and “Oregon Trail” to typing stories. From there my experience with and reliance on computer and Internet technologies has grown exponentially. Today I am an online student, a virtual teacher, a creator of websites, a reader of blogs, a Facebook regular, and a Googler extraordinaire.

I realize that not all educators share my comfort with and enthusiasm for technology. In my courses I have had classmates who were more skeptical of integrating technology than I am. I have picked up on a fear among teachers that they could be replaced by a computer. While I advocate for increased reliance on technology to make learning more efficient, individualized and enjoyable, I know that high quality teachers must accompany this shift. The teacher role will most likely change, but I believe, for the better. When technology is used to take over a lot of the administrative, time-consuming, non-teaching aspects of school, teachers are actually allowed more time to focus on teaching content, modifying instruction, and interacting with students.

Technology continues to transform many industries, like retail, higher education, and medicine. It is time that K-12 education provides its clients (students, parents, and society) with access to the latest technology advances as well. This can be done in a cost-conscious, student-focused way, and I am excited to be a part of this positive change for our schools and our society.