**Final Paper**

**Putting it all Together:**

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Introduction

 In my teaching experience thus far, I have always been extremely passionate about incorporating technology in my math and science classes. New technologies that have come my way have always been accepted and explored in my classroom of diverse learners. Although I consider myself an experienced teacher using technology in my practice, I have come to learn new ideas in this course that will change how I incorporate technology in my classroom. In this reflection paper, I will focus on the following questions:

1. How will my pedagogy change? What am I going to do to help enhance the use of technology in my mathematics and science classes?
2. How will technology successfully support my learners?
3. How will I share what I know with other teachers?

How will my pedagogy change? What am I going to do to help enhance the use of technology in my mathematics and science classes?

From all the courses I have taken in the MET program so far, I have been reflecting upon how individuals learn and what needs to be in place to help them become successful. With an emphasis on personalized learning, students can actively engage in their learning, be provided with the right tools to succeed, be motivated, collaborate and share with a larger community. As an educator, I need to understand how each one of my learners learn and to consider the different approaches that will best meet the needs of my students for successful learning. If there is this focus on the needs of my students, I believe we will see an increase in student achievement, engagement and academic success. In addition, learning when and how to include technology in the classroom to help students achieve learning outcomes is essential to having a successful 21st century learning environment.

The most important element of teaching that I am going to consider to enhance the use of technology in my mathematics and science classes is the learning environment. Bransford, D., Brown, A.L., & Cocking, R. R. (2002), share a framework outlined to help one design and evaluate a learning environment that supports active learning.  This framework revolves around four essential attributes: Learner-Centered, Knowledge-Centered, Assessment-Centered and Community-Centered Learning. Understanding a learner, specifically his/her learning style and needs, helps one design for a learner- centered approach.   A learner-centered environment can be achieved by differentiating content, process, and product or by accommodating individual learning styles. By modifying a course to meet individual needs, the delivery of a course can engage learners and create an exciting learning process that will encourage better learning outcomes, including independent, determined and responsible learners.  It is important to differentiate content, process, product, or accommodate individual learning styles because there are many roads to learning. People bring different talents and styles of learning to a course.   Students need the opportunity to show their talents and learn in ways that work for them.

Knowledge-centered learning is another attribute one must consider in their learning environment. This attribute enables the learner to engage in real research through interviewing people, accessing real documents and using them to draw conclusions, and debate different perspectives (Riel, M. 2000).  According to the National Research Council (1999), a knowledge centered learning approach includes five characteristics: depth of knowledge, higher-order thinking, interaction, integrated metacognitive skills, and real world connectedness. The technological tools presented in this course by my group and other classmates focused on ways we can use technology effectively to nurture a knowledge-centered environment. For example, my group worked on a tutorial for teachers using the iPad in the mathematics and science classroom. Our section on resources not only shared various apps teachers can use in their classes, but also recognized that these apps fell into in the Bloom’s Taxonomy learning model which encouraged higher order thinking.

Community-Centered Learning is the third approach. In this environment, a common characteristic is teamwork.  Whether a group of people shares the same interest in a topic, or work together with a range of skills and abilities, it is a shared community of learning.  This kind of learning supports students in taking risks and working together to find answers.  It enables the learner to learn from his mistakes and challenge himself to think outside the box.  It is a community where one can express his learning and understanding of the world around him in ways that make sense and in ways that are meaningful.  “These communities can build a sense of comfort with questioning rather than knowing the answer and can develop a model of creating new ideas that build on the contributions of individual members” (National Research Council, 1999).

In an assessment-centered learning environment, one needs to understand the variability of how each learner learns, his or her strengths, challenges, aptitudes, talents and goals.  As learning environments are becoming more and more flexible and the demand to personalize learning for students is increasing, teachers are in a position to find ways to better assess their students in order to tailor to their individual learning needs.  Wang (2008) argues “since teachers have to deal with many learners at a time and are often pressured by teaching schedule and time, it is difficult for them to provide meaningful feedback while administering assessment (cited in Wang, Tzu-Hua, (2010), p.1062).  Although there are a wide array of assessment tools teachers are accessing and using, it is important to consider that the right online tools can lead to meaningful assessment, which can foster a personalized learning approach. With the right assessments in place, teachers are better able to support students at an accurate level, accelerate their learning and prepare them to become lifelong learners.  Assessments include both formative and summative and if used accordingly, both can help teachers personalize learning for their students.

Reading about Koehler and Mishra’s TPACK (Technology Pedagogy and Content Knowledge) framework (Bransford et al., 2012) had me thinking about the effective integration and attention to the relationship between all three components. It acknowledges teaching as an interaction between what teachers know and how they apply what they know in the contexts within their classrooms. When I think about what good teaching with technology looks like, it is about the understanding and reinforcing of relationships between all three elements as it can be easy to separate them into their own entities. Considering a model like this one has made me realize that it is not only about bringing in new technology into the classroom but considering what is best for my learners.

How will technology successfully support my learners?

Students come to school with an underlying conception of how they see the world (Bransford, D., Brown, A.L., & Cocking, R. R., 2002).  Learning is inspired through engaging in meaningful activities that connect ones experiences to real life situations and make learning authentic.  When teaching a diverse group of learners with many different learning styles, setting the foundation for rich learning experiences is an important aspect of design that I must consider in the planning process.  During the planning stage, I need to keep in mind the long-term desired outcomes, such as providing students with authentic learning experiences where they will engage in real research experiences independently, debate different perspectives with others, build knowledge through working with peers, be mindful of their own goals, and be able to revise and improve on their own thinking (Bransford et al., 2002).  These skills are a strong foundation to learning in the 21st century. Bransford et al., (2002) suggest five ways to ensure success in a technology supported learning environment. These are five ways I will follow closely in my math and science classroom so I can shift towards a constructivist-learning environment.

The first way is learning through real-world contexts. By providing students with authentic and real-world problems beyond the four walls of a classroom, student engagement and successes increase (p. 213). Many technologies enable learners to engage in advanced thinking and problem solving and the rise of simulations and computer-based models are extremely changing the nature of inquiry in mathematics and science. What stands out for me when thinking about this is the story of a fifth grade teacher that is told in this book *How People Learn.* This teacher always starts her year off asking her students two questions:

1. What do you want to learn about yourself?
2. What do you want to learn about the world?

The inquiry that unfolded through these two questions and the cross-connections this teacher made was amazing. The entire year revolved around these essential questions that were real and meaningful to the students. In my experience of using and inquiry model, I agree that student engagement and successes increase when they are faced with authentic and real-world problems. I intend on continuing to teach this way and to try to support my students in making as many connections to the real world as possible.

The second way is providing Scaffolds and Tools. When technology-based tools are integrated into the curriculum and are part of a cogent education approach, enhanced student performance is evident (p. 216). There are many technologies that function as scaffolds and tools that help students solve problems. For example, Khan Academy is a site designed for students to work on specific individual skills in math, science and other subjects at their own pace. Students involved get to explore and learn ideas but also have access to the guidance of a tutor. This tutor models the process for the student, coaches the student while they are working on a problem, and gets the student to explain what he/she is doing. The student can get different kinds of support at different times. I like that there are sites like this available to students; however, I take the integration of these tools into curriculum quite seriously. If I use such tools in my own classroom, I will ensure they are part of a coherent education approach used accordingly.

 The third way is providing feedback and revision. Classroom communication technologies are excellent tools for self-reflection and assessment if used appropriately.  The key to successful learning in using these technologies relies on asking good questions and engaging in meaningful discussions to support the process of knowledge building. Classroom communication technologies such as Classtalk and clickers can promote active learning in large classes and provide instant feedback (pg.219), and communal databases such as Knowledge Forum support the process of knowledge building through collaborative networks. In this course, peer revision and feedback was a large component of our successful projects. I really valued this procedure and gained a deeper appreciation for making this a larger part of classroom and project work. Whether this feedback is provided using technology or not, I feel it will have a powerful impact on my learners and tremendous growth can come out of both giving and receiving feedback. It forces the learner to become critical and aware of what the expectations are, it allows them to be reflective and work towards a higher standard. I teach younger grades and starting this form of evaluation at a young age will set them up for successful learning throughout their education and future careers.

The fourth way is connecting classrooms to community. Connecting classrooms to the greater community can provide numerous opportunities for authentic learning to happen and increases access to knowledge by connecting students with real-world experts.  Bringing in “experts” such as scientists, authors, and other practicing professionals make learning more authentic and real. Communication between home and school is also strengthened as the Internet allows for a direct link between the two. I had the opportunity to review another group’s tutorial about Virtual Field Trips (VFT). This was fascinating to me, as I did not know much about them. After reviewing the tutorial, I strongly considered the affordances of these VFT’s as a strong connection to community. It is not always easy to take a class on a field trip with all the organization involved and forms to fill out. This approach makes it easy for teachers to connect their students to the real world and not have to worry about all the details in planning an off-site trip.

 The fifth way is teacher learning. To successfully support learning, teachers need opportunities to apply new learning and skills and reflect and learn from the technologies they have implemented in their classrooms.  Being partners with all stakeholders from administration to parents and community is essential.  Most importantly, teachers and students need to be co-learners in the creation of knowledge. One discussion item that keeps reoccurring in all my MET classes is the lack of time teachers have in preparing for learning new technologies. Integrating technology can be an added stress on many educators and therefore, are less likely to adopt new technologies in their classroom without proper support.  Zhao & Frank (2003), state that, “the more contact two species have with one another the more they adapt to each other” (p.826).  Many formal learning interventions continue to be information-rich and interaction-poor, meaning the power of experiential and social learning is ignored.  Giving teachers the time to explore and interact with technology will support them in deciding whether or not a technology is appropriate to use or not, and become more comfortable in using such technologies in their classroom.

How will I share what I know with other teachers?

I feel I can support teachers in many ways to help promote the use of technology in teaching and learning. The first way is educate teachers in selecting appropriate technology that is relevant and connects to what is happening in the classroom. Just like I learned from the TPACK model, I feel all teachers need to have a clear vision from the start to ensure successful and effective learning takes places. This model should be part of UDL (Universal Design for Learning) template, as teachers can make a thoughtful connection between content and pedagogy knowledge.

 Secondly, I will encourage my entire staff to start taking advantage of being connected to various online networks. In today’s world, job-embedded professional development is now a norm and participating through informal learning networks offers various perspectives from multiple working contexts. Informal learning occurs during daily practice, and it is interaction with others that drives informal learning (cited in Sie et al., 2012, pg. 59). People who participate in PLN’s (Personal Learning Networks) share their knowledge and in return receive feedback or new knowledge from participants in the network. For example, CBE’s (Calgary Board of Education) ILT (Innovation and Learning Technology) team recently launched a Google+ Community for educators to share interests, passions, exchange news, ideas, and make new connections with other educators. Some of their recent discussions include topics around Google Apps For Education, Alberta Curriculum Development, and Digital Citizenship. Being a part of a network like has so many benefits, even if it only makes one try something new in his/her classroom that has never been tried before.

Lastly, teachers need time to learn new technologies. In our class discussion, one of my peers brought up the idea of TTT (Teachers Teaching Teachers) time. I know there are never enough minutes in the day, but selecting one or two lunch hours in a month for teachers to explore and learn about new technology and hear success stories from each other will be key in motivating teachers to move forward. Our last class project on creating an Educational Technology Tutorial for teachers really opened my eyes to the diverse group of learners that teachers are. It is easy for administration to purchase the “latest and greatest” for their schools and not fully consider both the time for professional development for teachers as well as the affordances of such technologies.  This lack of planning and oversight is what leads to technological determinism. Challenging teachers to think about the questions that face pedagogy and belief around how students are learning and how teachers are teaching is critical. Also, considering that the digital ecosystem is big, being aware of what to use and when to use it is essential.

Conclusion

ETEC 533 has opened my eyes to the theory and relevance behind my personal philosophy and how I intend to make my practice a stronger one. Keeping the four learning centers at the root of my classroom will be a focal point in the work I do with children everyday. This will ensure a strong balance for student learning which I believe will lead to a successful teaching and learning environment. The five ways to ensure success in a technology supported learning environment by Bransford et al., (2002) are ways I will follow closely in my math and science classroom so I can shift more towards a constructivist-learning environment. These ways make sense to me, as well as truly reflect how I can best support my learners. These are also ways I can share with my colleagues to help them make a shift in their own teaching and learning. I hope to move into a leadership position in the near future and supporting teachers to choose the right tools at the right time in their classrooms is important to me. The TPACK model is one that teachers can use to have a better vision from the start to ensure successful and effective learning takes place. I have really enjoyed this class and the way learning has evolved through class discussions and group projects. The best part about this work was the knowledge building that occurred through reflections and feedback. Thank you Marina!

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