

Integrating digital technology with inquiry based learning

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Abstract

The overall topic for this research manuscript aims to understand how to best incorporate the use of digital technology into inquiry projects with the goal to create more authentic learning experiences for students. Moreover, what types of digital technology are available in order to support and enhance student learning and understanding and how can we best prepare teachers in order for them to feel comfortable using these forms of technology in the classroom. In order to answer this complex question, I surveyed my fellow teacher candidates using Google forms in order to better understand their experiences with digital technology and inquiry based learning. I also looked to two practicing teachers in very different schools and was curious as to what their experiences have been with the success of digital technology and inquiry. This research is very valuable because the amount of digital technology that is rapidly increasing and the paradigm of education is also shifting too. Learning is becoming much more learner centered than teacher centered as a result of inquiry based learning. Therefore, pairing the these two together, I believe can provide a much more rich, engaging and authentic learning experience if done properly.

However, my research did indicate inquiry based learning is still a fairly new approach and teachers and pre-service teachers are learning themselves how to implicate this practice with their own teaching philosophy and practice. I also found that digital technology can enhance can significantly student learning and growth yet it can also act as a divider among students and different schools.

Introduction

I have grown up as a student in the 21st century and am transitioning into the role of an Educator, I find that I am very "old school" in terms of technology. Therefore my goal with my research is to learn about different mediums to technology that not only enhance my teaching but also help enrich student learning in order to create a more authentic understand. In terms of my past educational experience with technology I have been privileged to use a variety of different mediums such as laptops, Smartboards, and Iclickers. Yet I feel that the technology was just “there” and it serves as a point of delivery for information. Whereas now from a future teacher’s perspective, there is so many ways that the technology noted above could have been used to deliver a more rich understanding of learning. The purpose of this research project is to discover effective ways to integrate digital technology into science classrooms in order to enhance inquiry projects and student learning. Therefore, I am hoping to learn about different mediums of technology that not only will enhance my teaching but also help enrich student learning in order to create a more authentic understanding but also any limitations that it may have . I am passionate about this topic because I have a love for the subject of science and am very interested in inquiry based learning and hope to one day adopt the practice into my own classroom. I believe that inquiry based learning helps to give students a deeper understanding of learning but also helps to give authenticity to the subject material by connected what is being

taught to their prior knowledge and real life experiences. However I believe that although technology can greatly enhance education, it is not a substitute for good teaching. Thus I think that it is important to find a balance between instruction and the use of digital technology. Furthermore, I truly believe that digital technology, can help to create a more authentic learning experience. By the end of my study, I am hoping to learn what some successful mediums of digital technology are that I can bring into a classroom in order to launch inquiry projects and deeper levels of thinking among my students. This is an important topic to me because I believe in learning through "doing" and I also believe in authenticity. In my personal opinion, students each have their own meaning of what learning is to them and within this meaning they each have developed an idea of what is important to them and what they want to learn. I believe that through inquiry learning both of these principles can be achieved. Inquiry allows students to not only learn curriculum objects but it applies them to real life situation thus creating authenticity. Inquiry also allows students to branch off curricular outcomes into topics that are meaningful to each individual.

In order to successfully answer my question, I have broken my research into three different questions. The first question is do we incorporate inquiry projects into classrooms. Second, what types of digital technology are available in order to support and enhance student learning and understanding? And lastly, how do we effectively integrate the use of technology throughout science inquiry projects in order to scaffold student learning. Many are skeptical about the use of technology in classrooms due to the fact that teachers may become reliant on the technology. Therefore in terms of my own teaching practice, I want to learn to best strategies in order to have technology assist my teaching.

Background

In order to further investigate my topic, I examined the work of others who are far more experience in the fields of inquiry and digital technology than I am. To explore modes and methods of digital technology, I looked at the work of Kim, Hannafin, & Bryan (2007). These authors share the idea digital tools that have been effective in enhance students understanding of key concepts with the assistance of digital technology. Some tools include three-dimensional animations and modeling tools that have permitted students visualize abstract scientific concepts thus creating a more enriched and deeper understanding.

Furthermore, Rappolt-Schlichtmann, Daley, Lim, Lapinski, Robinson, and Johnson (2013) discuss how web based notebooks can be an effective resource in a science class. As traditional lab books play a crucial role in inquiry based learning, the Universal Design Web notebook helps to eliminate some of the barriers that are associated with keeping a lab book. The UDSN was designed with an intentional focus on lowering barriers to science learning. The web-based notebook provides students with a place to collect, organize, and display observations. Using this program, students then are able reflect and make sense of inquiry experience. Yet, arguably one of the UDSN's most attractive features is that it has the option for teachers to access student's notebooks and give them formative feedback throughout a project. The study that was discussed in the paper stated that when the use of a web based notebook and other digital technology is paired with good teaching strategies, the results are impeccable and offer exceptional support to students who are developing science inquiry skills. Yet web based notebooks are not without their flaws. Some schools do not have enough computers for all students and broadband Internet makes it challenging for all students to be online at once.

Similarly Teck (2013) discusses how much like digital notebooks can be a very effective

tool in order to deepen student understanding and learning so can interactive whiteboards. Interactive whiteboards are seemingly become a useful tool in elementary. IWB's help to promote authenticity, engagement, collaboration and inclusive education by help to accommodate a variety of learners. They are especially useful teaching tools in science classrooms as they can show students models and 3d representations when explaining complex scientific concepts and ideas. IWB's can also enhance student learning when paired with online resources such as Google sites and Youtube.

As Teck (2013) stated technology can be especially useful when paired with other online resources. Furthermore, Sawmiller discusses how blogging can be an excellent scaffolding tool within a science classroom. When used correctly, a blog can act as a showcase to students' inquiry projects. By publishing their work, it allows other students to see their work and helps to add authenticity to students' projects. It also allows learning to happen outside of the classroom and encourages parents to be evolved with their child's learning. Lastly, a weblog can be used by all students to meet all learning need.

By conducting extensive research, I am know more familiar with different digital tools and how they can help to enhance student learning and understanding. Yet, Niess (2005) stresses the importance of educating teachers and pre-service teachers not only methods to introduce digital technology into the class room but also the importance of knowing and understanding the tools themselves. Often when the use technology is unsuccessful it is due to not knowing how to properly use the technology.

Research Context

The majority of my research context was collected from surveys I created and sent out through Google Forms. This survey was sent out to fellow Mount Royal University pre-service teachers as well as Mount Royal Education Professors, where they were asked a series of

questions involving their experience with digital technology and inquiry based learning. The surveys were anonymous and the participants were under no obligation to participate. Prior to sending out these surveys I completed my TCPS 2: Core- Ethical Conduct for Research Involving Humans Course on Research Ethics which was designed by the government of Canada to ensure ethical research. The data from these surveys was gathered into a spreadsheet online through Google surveys that allowed for easier analysis. Along with the survey, I series of different questions were sent to local teachers who were experts in the field of inquiry. The context of my surveys was to gain a better understanding of teacher's experience and their knowledge of digital technology and its applications in an inquiry based classroom.

Methods of Investigation

In order to conduct my research, I used mainly online surveys via Google Forms. This way my participants could answer at their leisure and I have a digital record of their responses to ensure accuracy and authenticity of responses. I also conducted interviews via email with some experts in the field. By doing so, it gave me more in depth information and it also was convenient for both parties involved. Lastly, I consulted several peer-reviewed journal articles written by experts in the field of inquiry and digital technology in order to compare their findings to the data that I have collected from my surveys and interviews. From all the data and information that I have collected, I have been comparing their responses to what I have been seeing in my field experience placement in order to gain a student's perspective on the issue. In order to keep all of my data organized I have used a spreadsheet in order to keep track of my data collected from my survey in order to compare and contrast my data.

Findings

When I received the survey responses I began to organize my data into categories on a Google document according to similarities in responses. Multiple choice and select all questions

were organized into graphs so they can be read and quickly glanced at with ease. The majority of my survey questions were short answer responses. I organized the responses from my fellow teacher candidates into charts which displays a variety of responses. I also got the opportunity to gain some expert insight about inquiry based learning and the use of digital technology from educators in the field through online interviews. My findings are as followed:

How successful are your students in using digital technology for inquiry based projects

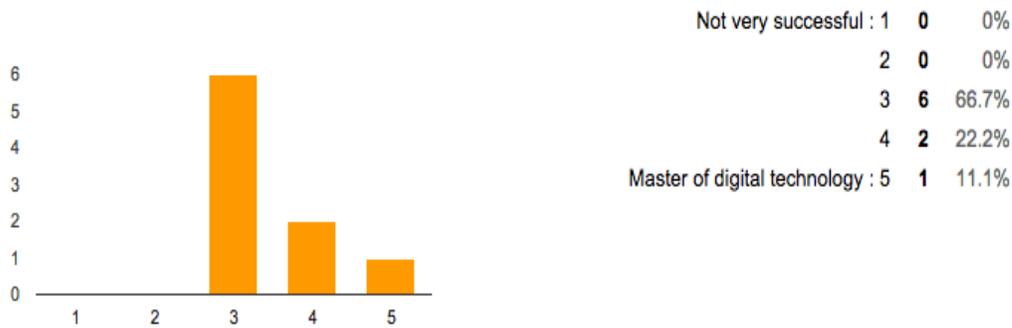


Figure 1: Student success using digital technology for inquiry based projects

The figure above indicates that the majority of survey candidates feel their skill level with technology to be mediocre to some degree, with none of the candidate feeling unsuccessful.

Which of the following technologies as a pre service/classroom teacher do you feel comfortable using in the classroom to help aid science learning

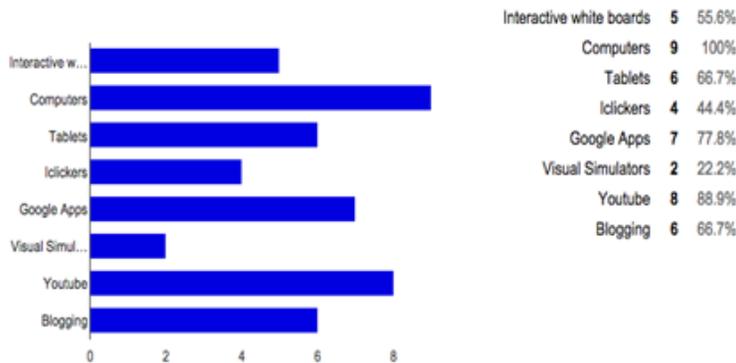


Figure 2: Types of digital technology those teachers are most comfortable using.

This figure indicates what types of digital technology pre service teachers feel most comfortable with in the classroom. If of eight technologies, the top three most popular forms were 1) Computers, 2) YouTube and 3) Google Apps.

Table 1.

Pre-service teacher responses when asked the question, “What is your experience with digital technology?”

What is your experience with digital technology?
Technology has been integrated in school since I was in grade 1
Very little. I use a laptop and Smartphone for school and personal communication. I have used a SmartBoard and document camera once in field experience.
Ipads - Laptops - Cellphones - A little with smartboards
I use digital technology to complete assignments for my university courses. I have mainly used Google based programs in my post secondary course.
Cell phone technology that continues to change, laptops and computers using simple tools. Smartboards were introduced in my Jr. High classes.
I know basic concepts
I use digital technology in my everyday life. My computer and phone are often with me. I also use a computer at my job. I think digital technology can be very useful when used appropriately.

Table 2.

Pre-Service teacher responses when asked the question, “What does inquiry learning mean to you?”

What does inquiry based learning mean to you?
It means a project that can develop over a long period of time that touches on many aspects and many disciplines.
Inquiry based learning means not just a yes or no answer it is as important how you got to the answer as to if it is correct.
Finding topics that are of interest to you, and with teacher guidance explore and research

the topic further to gain the most expertise on it.
To me, inquiry learning is hands-on and students learn through research and exploration.
It means that the students do a majority of the learning based off of a guided question. It also means that students will conduct research to find answers to the guiding questions.
Clear explanations of proper use, making sure they know the risks of technology, monitoring to make sure it's being used properly.
More open options for creativity

Table 3:

Pre-Service teacher responses when asked the question, "How can we make students more successful at using technology for inquiry based learning?"

How can we make our students more successful at using technology for their inquiry projects?
Teaching students how to use technology appropriately and by providing students with various resources.
Teach the students how to properly search on the internet, that way students can gain more focused results.
Better knowledge as a teacher about technology. Make it fun!
Teaching a student how to properly use digital technology can help them become more engaged.
Provide tutorials for ALL teachers, parents, and students
introducing technologies that are being used at their homes so they are more familiar with them
Empower and engage our students in meaningful and authentic projects!!

I received some very valuable information from my fellow pre service teachers. Yet I thought that it was crucial to gain the insight from the people that are on the forefront of education and actually in the classroom setting on a day to day basis. An email interview with a

former MRU student who is currently teaching at Connect Charter School provided me this lots of insight for research. This particular school is centered around inquiry based learning and technology plays a big role in teaching and learning by giving endless possibilities to both teachers and students. Not only does inquiry based learning allow students to go more in depth with their learning but it promotes the integration of different disciplines. Inquiry based learning shifts the focus from a teacher centered classroom to a student centered classroom. Information is no longer a transfer from the teacher to the student but instead, through the process of inquiry, students construct much of their understanding.. Inquiry is not so much seeking the right answer -- because often there isn't one -- but rather seeking appropriate resolutions to questions and issues. For educators, inquiry implies emphasis on the development of inquiry skills and the nurturing of inquiring attitudes or habits of mind that will enable individuals to continue the quest for knowledge throughout life. When inquiry based learning is paired with the use of digital technology allows students to “flourish” by adding richness and authenticity to student learning. She shared that it is really awesome so see how excited the students are about learning and such a high level of engagement (personal correspondence, 2015). Students pride themselves on the high quality of work that they are producing. At Connect Charter School the students are exposed to a variety of different types of technology. This involves each student having their own device. Younger students are given an ipad and older students are given laptops. There devices follow them throughout their years spent at Connect and give them access to Google apps, their individual blogs, and other educational resources. She shared that they rarely use pencil and paper but instead the majority of classroom work is done electronically. By doing so, it invites students to be a lot more creative and to think outside the box. By each student having their own computer, it allows teachers to monitor the growth of each student not

only throughout the school year but also as they continue onto higher grades (personal correspondence, 2015). One of the biggest differences between Connect and other public schools is that it “invests” in its teachers states Ms. Brittney Glinsbockel in a personal correspondence (2015), meaning that Connect encourages and educates their teachers on the latest types of different technology and resources and how to implement them into their classroom success.

This was arguably the biggest variable that I found into my research. During a conversation with my mentor teacher this semester at Altadore School, she stated that although digital technology can be valuable, she feels that her knowledge and ability in terms of digital technology is average. She also stated that they lack the resources to provide each student with their own device and so often technology can act as a divider between students. In terms of inquiry, she shared that although she is a huge fan of the process, and a part of the school's motto is to “encourage students to take control of their own learning”, she confuses that it can be quite challenge to implement inquiry based learning into the classroom that is completely student driven because of the diverse classroom of learners that she has.

Overall, the information that I have gathered from two very different practicing teachers suggest that technology use in the classroom can provide many opportunities but it can vary from school to school and the knowledge of the teacher can very much influence the success of its integration. Technology can provide students with many more opportunities in terms of inquiry based learning by providing the tools and resources needed to “dig” deeper. Yet inquiry based learning is largely a new process and teachers are still learning on how to incorporate the practice into their classrooms. However after completing my research, I argue that in light of this research has proved that technology is a step in the right direction to help get other teachers on

board with IBL in schools. Everyone surveyed can see the benefits of IBL and technology in a positive way, now we just need to make the switch to ease the fear and make it happen in the school system.

Conclusions and Recommendations

Overall, this research has helped me to understand some of issues that pre-service teachers and practicing teachers are having in regards to the implementation digital technology with inquiry based learning. Through my student surveys and teacher interviews I was able to see that many do not feel confident in their abilities to use digital technologies within a classroom and many feel that in order for their students to be successful with technology they feel that they need to be more prepared and educated on how to use the technology. Inquiry based learning in itself is also a fairly new process and teachers are still learning how to shift from the traditional teaching model that is very teacher centered to a new mode that is very much student centered. And therefore, awareness of IBL is improving but many are still confused with what IBL actually is and how to best integrate it into their own teaching philosophies therefore, they do not feel comfortable with implementing it into your own classroom.

In terms of my future practice and further research, I hope to implement inquiry based learning into my own classroom and I think that digital technology can help to enhance a student learning and understanding as well as to create a more authentic learning experience. As part of my pedagogy, my goal is to help create lifelong learners who think critically about the world around them and use education as a way to make meaning of what they see, hear and think. Ultimately, I believe that inquiry based learning is the key to accomplishing my goals and helping student to becoming autonomous learners. Research supports these notions and research also links the success of inquiry when paired with the use of digital technology. Yet, in order for me to implement inquiry into my own classroom, I feel that I need to gain a better understanding

as to how to do so. This research has also made me ponder as to how to scaffold inquiry based learning into a classroom for students whom has never had any experience with it and are used to a teacher centered model of learning. As a result inquiry based learning may cause some students to experience disequilibrium. And so, although I do believe that inquiry based learning can provide a richer learning experience, it may in fact hinder a student's learning.

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