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Traditional or technology: A new twist to learning mathematics

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Link to Digital Story

Abstract

Technology is now heavily being used in the classrooms of many schools and they are now finding their way into the lessons plans of many educators. My research manuscript examines the following question, “Integrating technology in Mathematics allows students to have many engaging virtual experiences. But can this lead to students preferring the virtual experience than the authentic hands on (live) experience?” I used *Google forms* to create a survey and gather information about my topic. I received many mixed responses regarding my topic in study. Overall the participants in my survey believed that technology can have a positive role in a student's learning if used appropriately, and that as educators it is important that we find a balance between using technology and traditional methods in our teaching. This research project has helped me identify as a teacher what methods I would like to use and this assignment has given me an opportunity to reflect back on my teaching philosophy.

Introduction

Technology has been evolving over the years and it has now become an essential factor in our day to day lives. Technology is now being integrated in our education system and it has changed how we are teach our students, and how we create our lesson plans. There has and still is debate whether technology is beneficial or a barrier in student learning. There are now many interactive online programs that support students' in learning the subject. For my research project I am going to explore whether technology is leading students to prefer the virtual mathematical experience over the authentic live mathematical experience.

This topic is important to me because I enjoy learning about different mathematical concepts and solving them. I remember as a student I learned Math through traditional methods. As a class we solved mathematical questions using pencil to paper and we did many worksheets. But now I have seen that Mathematics is being taught online using games, puzzles, simulations etc. I found this very surprising because I wasn't entirely taught in this type of format. I would like to explore this new dimension and learn new methods for the future students that I will be teaching. I also chose this topic because my minor is in Elementary Mathematics. Having this extended knowledge will assist me in the math courses that I take in Mount Royal University.

Background

Technology is a fast growing phenomenon it is becoming widely used resource in many classrooms. There have been many studies regarding the integration of technology in teaching mathematical over the years. I have collected a variety of resources which look at the whether technology is benefiting or hindering students learning in mathematics and if students are becoming attracted towards the virtual experience of learning.

Cicconi (2014) describes the transformation of teaching mathematics from a teacher-

student relationship to a Web based - student relationship. The author analyzes Vygotsky's theory of zone of proximal development (ZDP) and support scaffolding teacher versus the support of Web 1.0 / Web 2.0. Cicconi (2014) discusses the power the Web has over educators in today's society.

Flores (2002) discusses about the importance of integrating technology into mathematics curriculum in classrooms in. The author addresses the importance of educators understanding how to use new technology and software. Flores (2002) discusses the issue that technology is sometimes not being used due to the educators lack of knowledge of how to use the device.

Polly (2014) describes a study conducted over the period of a year in three different schools on how educators integrate technology into mathematical activities. The author analyzes the different mathematical concepts and how it was combined with a variety technological devices. Polly (2014) discusses the obstacles educators face on how to effectively use technology in the classroom.

Shin, Sutherland, Norris, & Soloway (2012) analyzes an experiment conducted over 5 weeks between a group of students who were given a mathematical game based on technology and another group of students were given a paper based math activity. The authors compare the mathematical scores, mathematical skills and attitudes between both student groups.

Yang, & Yi (2010) developed an experiment with a controlled group of students who learned mathematics using traditional methods and a experimental group of students who learn mathematics using technology. The authors analyzed the results of both groups and how they influence student motivation in learning mathematics.

All these sources gave me a better understanding of some of the benefits and drawbacks in integrating technology into learning mathematics. I hope to find more information about my

question to expand my knowledge on this topic. There have been questions that keep coming up and I am looking forward to exploring about it.

Research Context

For this research project I primarily gathered my data from the resources provided by Mount Royal University. I used the Mount Royal Library Database and I got assistance from the SMART Coordinators. The participants in my study are professors who teach at Mount Royal University, my field experience mentor teacher and the staff from that school, as well as students in the Education Program. I also had an opportunity to interview Mrs. Pamini Thangarajah who is a Mathematics professor at Mount Royal University. I have completed an research ethics course and I have successfully received a certificate of completion. Here is the link to my certificate. With respect to the participants privacy, all results are confidential and follow the research ethics guidelines. I also used my experience from my workplace (Kumon) and knowledge gained from my school placements over the years.

Methods of Investigation

To obtain data for my research project I created my own online survey using *Google Forms*. In the survey a series of multiple choice and short answer questions were asked. I interviewed my mentor teacher in person, and the students enrolled in the Bachelor of Education program. I also collected articles using the Mount Royal Library Online Database and used library books. Thanks to my insightful education courses, I have been able to use the notes and discussions from these courses to support my research. I also used the observations and notes that I collected from my placement schools. I analyzed my data using *Google Spreadsheets*, where I had a total of 12 participants who completed the survey; all participants are students enrolled in the Education program. The results of my survey are neatly laid out using tables,

charts and graphs.

Findings

In this section I analyzed the results of my survey. I would like to first discuss about my interview with Mrs. Pamini Thangarajah, who is a professor at Mount Royal University. When I asked the professor about her opinion on using technology to teach mathematics she stated, "Technology should be used as a tool not something that students depend on." She said that technology can provide engagement but it can be concerning when students do not really understand the core of a mathematical concept. Mrs. Thangarajah said as a parent she thinks that integrating technology into teaching mathematics is too early at the elementary level. She said that students may conceptualize that to solve a question you just need to press buttons x,y, and z to get an answer. During our interview the professor showed me some programs that she uses when teaching higher level math. She uses programs like MAPLE, MATLAB, and R-minitab. When I asked how she integrated these programs into her activities/lessons she said that when teaching statistics or geometry technology can help students visualize mathematical problems and solutions. Mrs. Thangarajah also stated that she first makes sure that her students understand the concept and the calculations first without the use of technology; but as we know statistics comes with a large quantity of data and complex computing. Mrs. Thangarajah said that she also uses technology when teaching statistics because it can cut down the time spent on long calculations. This interview with Mrs. Thangarajah was very insightful and her responses can help me further investigate this topic. The next set of questions that I asked were focused around the opinion of the participants on teaching mathematics with technology. My data is organized using tables, charts and graphs. I had a total of 12 participants complete my survey, with respect to the participants' privacy; all results are confidential and follow the research ethics guidelines.

My first question asked participants to identify what role applies to them. As a researcher this allows me to have a better understanding of what demographic my results are coming from. Moreover having this information will allow me to assess how credible the results are.

Figure 1. Participants identify what current role applies to them.

As you can see in *Figure 1*. all the participants are Teacher Candidates enrolled in the Education program. Due to the time constraint I was not able to obtain a variety of participants to complete my survey. It would have been more insightful if I had University Professors, Parents, and Teachers currently in the field complete my survey.

In *Figure 2.* I wanted to get a better understanding if my participants have ever used technology to learn or better understand mathematical concepts.

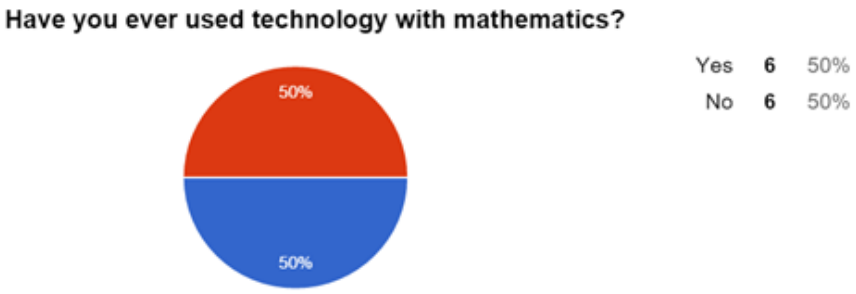

Figure 2. Participants experience using technology for mathematics

The diagram above shows that 50% of the participants have used technology to learn or better understand mathematics. It also shows that 50% of the participants have not used

technology with mathematics. These results help me keep in mind that technology is not always used to teach mathematics and to be considerate of the individuals who not have been exposed to this experience.

The next question asked in my survey is short answer. Figure *3*.'s response is an extension to question 2 in the survey. Here are some of the responses vocalized by the participants.

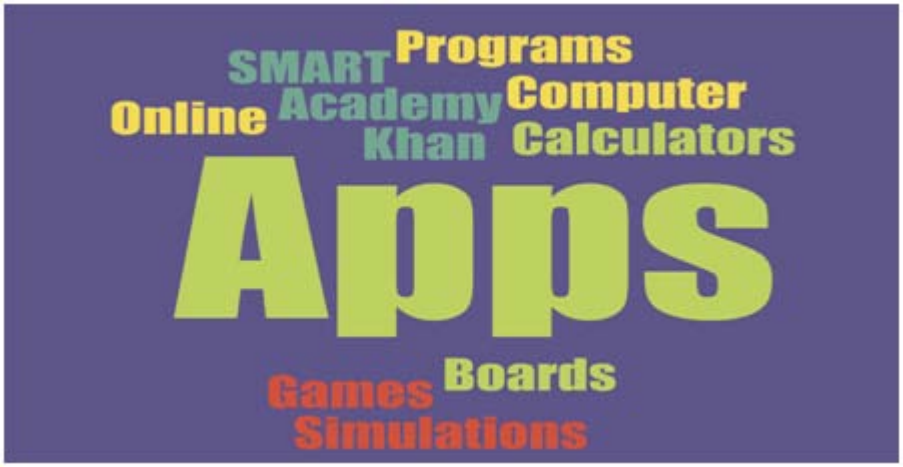

Figure 3. Wordle

Figure 3 is the extension to the multiple choice question, "Have you ever used technology with mathematics". If participants said yes to question 2, I asked them to elaborate on their response. The extension question was, "If you answered yes to the question above please specify what programs you have used and your experience with the program." Many of the programs used by the participants were SMARTboards, calculators, online math games and software.

My fourth question focuses on gathering the opinion of the participants and if they think technology enables students in have a better understanding of mathematical concepts. The results are seen in *Figure 4*.

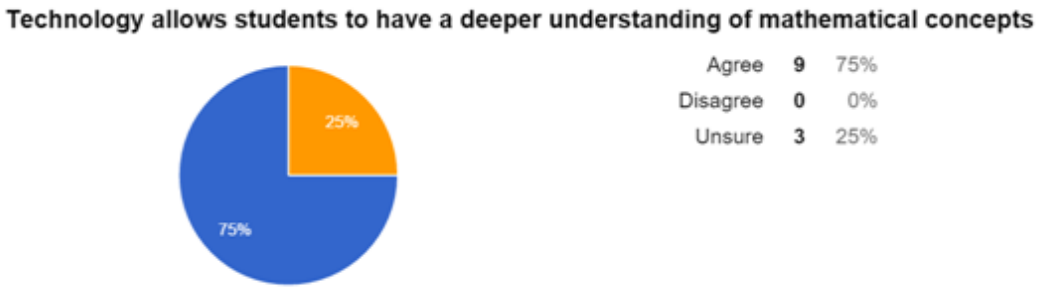

Figure 4. Participants opinion in using technology to understanding mathematical concepts

In Figure 4, 75 % of the participants believe that technology can be used to grasp a deeper understanding of mathematics, and 25% of the participants are unsure. These results allow me consider the benefits that technology can bring to the classroom and to the multiple learners. Doing worksheets continuously may not be the best way to learn; many mathematical programs can help students visualize and manipulate mathematical variables/concepts. But the remaining 25% gets me to think if technology is actually helpful or is it just a distraction in the classroom.

Figure 5 looks at whether technology can be used as a tool to enhance a student's attitude towards learning mathematics. The results are seen below.

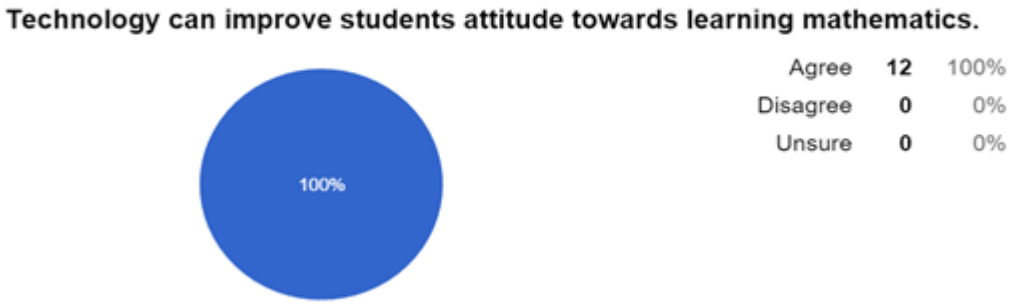

Figure 5. Participants opinion if technology can be used as a motivator to learn mathematics

In Figure 5 all the participants agreed that technology can improve a student's attitude towards mathematics. The lack of variety in my responses and the fact that some of my participants haven't been exposed to learning mathematics using technology, allows me question how reliable these responses are and to keep an open mind regarding this topic.

Table 1.

Results of Question 6.

How would you define your technology skills?
1) Basic - (2) 2) Learner - (1) 3) Proficient- (8) 4) Advanced - (1)

In Table 1 most participants defined their technological skills as Proficient. This question was asked so that as a researcher I can get a sense of how technologically aware my participants are; and if this lack/proficiency of knowledge influenced how they responded.

In question number 7 in the survey asks if worksheets should be incorporated into the classroom and when learning mathematics. The following figure represents the responses given by participants.

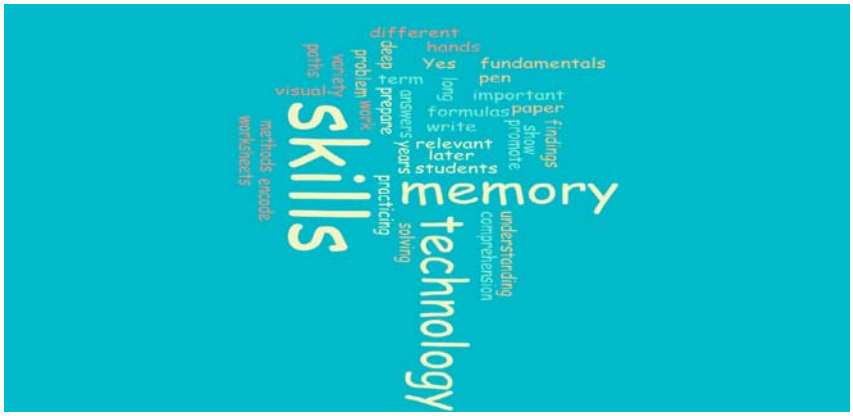

Figure 7. The responses of participants when asked for their opinion on traditional or technology based learning

In question 7 participants were asked to answer the following question, “Should worksheets still be used to in the classroom to teach mathematics?” Many participants believed that educators should find ways to incorporate both worksheets and technology when teaching a mathematical concept. One participant stated that, “Yes. It is important for kids to show their work & their findings because you can search an answer to the problem without figuring the problem out.” Another participant added, “...it is important for the students to actually be able to write the formulas and answers in order to promote long term memory skills and comprehension.” As an educator it is important that we identify the needs of our students and provide them with an ample amount of resources to support their learning needs.

In question number 8, participants are asked to reflect on what type of learner they are and what technological based tool would have been an aide in their learning. The following table illustrates a few of the responses.

Table 2.

Results for question 8

SMART boards would have been useful in that the teacher could have made math more interesting by showing videos, online examples, etc.	I can remember very little about grade 4 to be honest, however, I think some forms of technology would have been very helpful like Khan Academy. I am not too familiar with technology to enrich mathematics but would be very interested to learn more.	Computer & tablets	SmartBoards (digital manipulatives) would have been handy. I think having access to a calculator would have been detrimental as I would not have had to learn how to do the concepts myself.

The following was asked in question 8, "Lets travel back in time and you are in grade 4. What forms of present day technology would have helped or hindered your ability to understand certain mathematical concepts?" Many participants said that they would have liked to have had SMART boards, computers, games and videos to aide them in their learning of mathematics. But many of them did also add that learning through the traditional methods helped them solidify the concepts. The responses I received from my survey has given me lots to think about, it has also steamed a lot of questions that I will further analyze in the conclusion portion of my research manuscript.

Conclusions and Recommendations

As a teacher this study was so vital in helping me get a better understanding of how to use technology appropriately when teaching mathematical concepts. When I was analyzing my results I realized that not everyone has had the same experience of learning mathematics with technology. The results of my survey also got me to think about both the benefits and the

drawbacks of integrating technology in teaching mathematics. When I look back at my personal learning experience with mathematics, incorporating technology seemed liked not so good idea. But as I started to research I found that there are benefits if technology is used appropriately. As a future teacher I would like to find a balance between using technology and traditional teaching methods. I think it is important to incorporate both aspects because students need to be exposed to the multiple methods/technique of learning. Also as future teacher who is minoring in elementary mathematics it is important that I am aware of the various resources, and provide them for my students.

Some questions that came up as I was putting together this research project was, "How often should technology be used to teach mathematics?" Technology is sometimes not the most effective tool to use, and as educators we should not solely depend on it. Another question that I started to ask myself is, "How do I can I find a balance between technology and other means of teaching mathematics?" I know there won't be a perfect 50/50 split between using technology and other methods. It probably depends on the class and the students you have in your classroom; I know that I will gain better insight regarding this question as I progress in my degree. Technology does come with it's benefits and drawbacks; and I hope that throughout my educational journey at Mount Royal University I collect experiences and activities that will make me a strong teacher!

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