Problem of Practice
Tami Warner

Introduction

We have chosen to look at how technology relates to student achievement in math and science. Technology is a fairly new phenomenon in education and it is continuing to inch its way further and further into our schools. Some schools have more practice with technology and more technology resources than other schools so we wanted to take a look and see whether or not using technology truly enhances student achievement.

The United States is also generally behind many other countries in the areas of math and science so we decided to look at these particular subjects to see if technology can enhance the learning and get up student achievement in the USA. We want to look at whether or not technology does in fact increase achievement and if it does, what are the types of technology that are working and what technologies are not working. Many school districts will jump to conclusions and buy the latest and greatest technology before actually researching whether or not it improves student achievement. We hope with our problem of practice that we will be able to help districts when it comes to these important decisions.

There are multiple technology resources out there that are said to “improve student achievement” so we thought it would be insightful to find out if this is actually true. According to the Oxford Dictionary, “technology is machinery and equipment developed from the application of scientific knowledge.” Technology equipment in the classroom can vary greatly. Some of the most well-known technology tools include computers, iPads, laptops, tablets, iPods, listening stations, and an abundant amount of internet resources. We will be seeing these types of technology in action throughout our study.

Personal (or Professional) Interest

This topic is of interest to me because I teach all the subject areas (math, science, language arts and social studies). Through the use of online testing over the past few years I have been able to see that my students’ math and science scores are particularly low compared to averages across Ohio and across the United states. I think this Problem of Practice will help me to gain insight as to a way I might be able to help improve my students math and science capabilities. If technology does enhance student achievement, then I will be able to look at what types of technology are the best for this task and maybe in the future I could write a grant to gain access to those technologies in my classroom, thus resulting in more student achievement.

(Molly)

My professional interest in technology use for achievement in math and science is three fold. Last year I was a technology teacher and had students in grades K – 5. During this time I researched different grade level software that would provide math and science practice. I worked in this capacity for four years. Secondly I currently teach in a regular classroom and I see my students struggle with math assignments often. Math is a logical process which eludes some people. I would love to find the perfect hardware or software that would increase achievement so that my students and others would enjoy math and learning would become easier. Finally now
that I have a master’s in Instructional Technology it only makes sense that having proof that technology improves achievement in science and math would help my cause when trying to convince districts to spend their limited budgets on technology. With this research in this problem of practice I will have detailed information and proof or the lack of it to share with the administrations I may be employed by. Our district has had little success in the fifth grade with our OAA scores; I am hoping to find a way to enhance the pupils’ interest and learning; to increase our marks. (Tami)

**Research Plan**

To begin our research process we would first start thinking about the preliminary questions that would be the foundation for our study. Our questions would be: How does technology affect learning in math and science? What kinds of technology are effective in enhancing student achievement in math and science? What are the best teaching practices with technology to increase student achievement? How does access to technology resources effect student achievement in math and science?

Next we would need to start thinking about how we want to conduct our research project and who our participants would be. We have decided to make this a qualitative research study so we will not have a very large participation number. We decided since we are trying to figure out whether or not technology enhances student achievement in math and science that we would choose a district to work in (for our case we would choose Cuyahoga Falls City Schools). After choosing the district we would contact the superintendent, principals, and technology coordinators to discuss our study. With the help of these stakeholders we would select 12 teachers to participate in the study. We would want teacher who teach the same age and same subject so we can see the differences in student achievement. We would request that each of our participants has at least 5 years of experience and one teacher uses technology while the other does not. Here is the breakdown of our participants.

<table>
<thead>
<tr>
<th>Participant #</th>
<th>Grade</th>
<th>Subject</th>
<th>Uses Technology?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4th</td>
<td>Math</td>
<td>Yes</td>
</tr>
<tr>
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</tr>
<tr>
<td>3</td>
<td>5th</td>
<td>Science</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>5th</td>
<td>Science</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>7th</td>
<td>Math</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>7th</td>
<td>Math</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
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<td>Science</td>
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</tr>
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</tr>
<tr>
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<td>Math</td>
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</tr>
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</tr>
<tr>
<td>12</td>
<td>12th</td>
<td>Science</td>
<td>No</td>
</tr>
</tbody>
</table>

In order to conduct this case properly we want to do it in the natural setting, which would involve us going into the teachers’ classrooms. We want to do our study this way because we
want the teachers to feel comfortable and we don’t want them to change how they are teaching just because of this project. We want to make sure we can gain their point of view (the emic perspective) and we believe the best way of doing this is conducting the study in their environment.

Before we begin collecting our data we would make sure we gained permission from the schools and the teachers. We would explain our study to the teachers and have them sign a consent form. We would use multiple data collection methods for our study in order to achieve triangulation. Our first data collection method would be to have each teacher fill out a questionnaire form in the beginning of the school year stating where each of their students are academically in that particular subject. After the teachers have filled out this pertinent information we would begin classroom observations and personal interviews. During our observations we would take notes about what methods of teaching the teachers are using and how the students are responding to the different methods. We would observe teachers a couple times a week for 5 months. Once a month we would also conduct personal interviews with the teachers as sort of a check up to discuss how they are feeling about teaching with or without technology. We would discuss how they feel their students’ achievement is being affected and we would share some of our observation notes with them. After 5 months of observations and once a month personal interviews we would then have the teachers fill out the same questionnaire form about their students achievement levels.

We would analyze our data throughout the study and hopefully find some sort of great coding method. We might start by coding into themes of teachers using technology and teachers not using technology. Then dive further into what technologies were or were not working. We would look at the questionnaire forms to actually see the “data” in student achievement but we would also look at our observation and interview notes to see the different methods teachers used to teach and the different technologies used for the teachers using technology. At the end of our study we would have our participants be involved in member-checking so that we can add more validity to our study.

**Strengths and Limitations**

We believe that one of our strengths is that we will be able to easily have access to the natural environment. Since we are both already teachers we are familiar with schools, education, and student achievement. The environment will not only be the natural setting for our participants but for us as well! Being able to conduct our study in the natural environment will allow the teachers to be calmer and relaxed during their observations. Students would also be in a familiar setting which should provide realistic working conditions. Our visits would be best handled by the pupils if their setting was unchanged as well.

A second strength is that we will be collecting data in multiple ways which will also allow for ample analyzing. Collecting data in many ways allows our study to be more valid, have fewer errors and permit us to achieve triangulation.

A third strength in our study is the length of the study. We wanted to conduct our study for a lengthy amount of time to be able to determine whether or not technology does improve achievement in math and science. We believe that conducting the study for half of the school year will give us the results we need. When we have the results of our study the teachers can use our outcomes for the 2nd half of the year to improve their best teaching practices for student achievement.
One of our challenges may be the access our participants have to technology. Will our participants who will be using technology have access to it every day? Will they have 1:1 technology or just a minimal amount of technology? We think that this would be an important topic to discuss with the school district before beginning our study.

Another challenge for us may be the differences in the students of the classrooms. Although the students are not our direct participants they will still play a role in our study because we will be looking at their achievement levels. What if one class has a group of lower achieving students and another class has all the “higher” students? Or if some students in the class have special needs? I think we would have to make sure the classes are “evenly distributed” before we begin our study, or another strategy to solve this problem might be to establishing a growth measure before starting the study. Finding the perfect ratio of students per class could prove impossible.

**Implications**

This study could have a huge impact on our professional practice. We both teach math and science and we want to know if the tools we are using are in fact the best tools to be using. We have both been using smart boards to teach math and science but we might find out that iPads are better. Not only will we be impacted but so will all teachers teaching math and science. Our study will give our fellow educators insight as to whether or not technology really does improve student achievement and which technology tools are the best. This study will also impact technology coordinators because they may think twice about the technology equipment they buy and which software works best for improving math and science scores. This study will also save districts money in the long run if they are able to avoid making costly purchase mistakes.
References

Ally, M., & Samaka, M. (2013). Open education resources and mobile technology to narrow the learning divide. *International Review of Research in Open and Distance Learning, 14*(2), 14-27.


