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Technology in the Classroom and its Impacts on Student Achievement

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Identifying the Problem

In this paper, we will discuss the issue regarding student achievement at Frenchtown High School that I decided to research and remedy. In doing so, we will also discuss the research-based methods of intervention I chose to implement in my classroom in order to assist me with my research.

School Context

Frenchtown High School is a high school of approximately 400 students located in Frenchtown, Montana. It is a class A school with hundreds of students participating in all sorts of extra-curricular activities. It is also a school that has been in Frenchtown for decades, and many generations of families go through the FHS system. My paternal grandmother and grandfather both graduated from FHS, as well as my father and both of his siblings. Similarly, myself and my sister both graduated from FHS, and we had many extended relatives that went to school with us.

Your Role in the School Context

I have been assigned to student teach at Frenchtown High School in the mathematics department. I have been placed with my old math teachers who have given me so much insight into not only methods and procedures regarding teaching, but also how to keep my love of math alive and well. Sports, clubs, and other extracurricular activities are of high importance to the FHS community, with many students that I teach participating in such activities. One of my cooperating teachers is the Activities Director, so he also plays a large role in the facilitation of activities. Right now, I am the primary teacher of Honors Geometry, Dual Credit Statistics, and

Honors Algebra 2. I assist in co-teaching AP Calculus and DC Contemporary Math, and I assist in homework and questions for AP Pre-Calculus.

Student Achievement Issue

The problem regarding student achievement in Frenchtown High School that I chose to remedy was in the world of technology. I wanted to see if I could find a way to effectively incorporate the technology that had been given to us as teachers in a way that would boost student engagement and achievement, rather than allowing it to serve as a distraction.

Research Question

In particular, I was concerned with one thing: how do we use technology to maximize student learning and participation rather than allowing it to serve as background noise? I was drawn to remedy a problem in the world of technology for a number of reasons. I have always been a proponent of integrating technology into the classroom whenever possible, as I believe that there are many tools that lead to student success. However, at Frenchtown, I noticed that the teachers were not very adept to using the technological tools that they had been provided. One of my cooperating teachers had a new board installed at the beginning of the year and had next to no idea how to use it, and both of my cooperating teachers have iPads available to them in their classroom, but they aren't used for anything more than writing and displaying notes to the class as they teach. They also had TI-84 emulators installed on their computers for the purpose of having a calculator projected onto the board so students could follow along with their own TI-84s, but that software hardly ever worked. Having lots of technology in the classroom but very little effective integration of the technology led to lulls or breaks in the lessons as the teachers tried to get the tech to cooperate, and this made it easy for students to get off task. If the teacher is too busy fiddling with the board or the iPad to notice students playing on their phones or

talking to their friends, rest assured the students will take that opportunity. As such, I saw students asking questions about material that had been covered only moments before or neglect to follow instructions due to lack of attention.

Hypothesis

I hypothesized that methods such as guided notes, short mid-lesson independent work/quizzes, or simply a clear, explicitly stated expectation of notetaking be implemented within the classroom so as to help my students use active listening rather than passive listening. I also hypothesized that getting students involved with the use of technology would help them better pay attention and thus increase their learning outcomes.

Literature Review

In researching the literature, I wanted to find articles that studied the impact that educational technology has on teachers and students. Additionally, I also wanted to research how to best integrate technology in the classroom, and how students feel about such technologies. The below sections will summarize the articles and address their main points, highlight areas that I agreed with, and touch on areas that I disagreed with and/or found surprising.

Research that Addresses the Issue

Article one. Marte Blikstad-Balas & Kirsti Klette (2020) studied exactly how and why teachers use technology in their classrooms. They studied 178 video-recorded lessons from 47 lower-secondary classrooms with high technological infrastructure in Norway and found that even though teachers had access far and wide to all sorts of technology, the implementation was narrow and limited. The study found that “one teacher in five reports a strong need for more knowledge about how to integrate digital technology into their instruction—and most teachers

identify this as an area where they need further professional development" (Blikstad-Balas & Klette, 2020, p.57). Furthermore, many teachers across several countries reported that they did not feel that teacher training had prepared them to use technology in their classroom. I did not find this surprising, as I mentioned it did not seem that either of my cooperating teachers were very well-versed in the technology they had available. The study also observed that there were very few efforts to increase students' technological literacy within the classroom as well, which was consistent with what I saw in my classrooms; students who were put in front of a Chromebook would either do something totally off task or not be able to navigate the software they were asked to navigate. The article suggested a couple of intervention strategies to remedy the technological incompetence: one, it suggested that "teachers should work systematically at the local level to increase the repertoire—not the use itself—of digital technologies" (p. 63). This sort of surprised me, as I would think that most systems would jump to wanting to increase the use of technology in the classroom in this day and age. However, I do think it is important for teachers to have a vast toolbelt of resources at their disposal to implement as they become confident. The article suggests that when confidence comes, increased implementation will follow. The next intervention strategy is that the "repertoire of students' use of technology should be increased systematically in line with the research showing potential opportunities for [information and communications technology] in education" (p. 63). After reading this article, it became clear to me that it is important that teachers not simply use technology to make their own presentations and students be left to just take notes; students should be using technology as well.

Article two. Kevin Fuchs (2020) studied the usefulness of smartphones in the classroom; the researchers studied 290 survey responses to analyze how "perceived usefulness, perceived ease of use, subjective norm, and attitude influence behavioral intention toward the use of

smartphone technology" (Fuchs, 2020, p.01). This article piqued my interest as not only are students on their phones in class for non-educational purposes, but I found that both of my cooperating teachers accept homework via pictures uploaded to Google Classroom rather than handed in physically. I always thought that I would be a no-smartphone teacher, but it seems that when phones are coupled with active learning, they can be a particularly useful tool. The study found that there was a moderate to strong correlation between all five of the aforementioned factors and students' smartphone use in the classroom. According to the article, "educators need to ensure that particular activities involving smartphone technology are well-prepared and thoroughly explained to the students to increase understanding and usefulness" (p.06). I saw that this was an area that could use work in my classrooms, so it seemed to be to be a particularly useful intervention strategy. Another intervention strategy suggested is that "faculty management give an introduction course for students who lack the necessary skills and knowledge to utilize smartphone technology" (p. 06). This wasn't exactly a feasible strategy at my school, but it still interested me to think about how it might be implemented at a larger school, or a school with more technological resources.

Article three. Solomon Tesfamicael (2022) studied student cognitive engagement using apps like GeoGebra, Desmos, Google Docs, Google Sheets, and others. I was mostly interested to read about the article's opinion on GeoGebra and Desmos, as I am a big fan of using these two apps to teach. The article also dives into how the pandemic has guided changes in education practices and how it facilitated the need for using technology, and also covered online teaching; however, I was not interested in these questions for my own project. What did interest me were the results of students interacting with activities via GeoGebra and Desmos, and how this impacted their learning. Teachers can watch their students interact with the activities in real-

time, which is something I have always liked. The article praised the two apps and reported that "there is huge potential to engage students cognitively in real time: the use of the Class feature in GeoGebra and the Desmos Teacher feature" (Tesfamicael, 2022, p. 8). However, the article did address some drawbacks that I disagreed with. First, it was argued that "designing and preparing digital content that can engage students in real time is not an easy task in a very limited time" (p. 9). The intervention strategy suggested to remedy this was simply to put aside ample time and learn new skills in order to become proficient in the technology. But, what the article failed to address is that there are dozens of pre-designed activities on both Desmos and GeoGebra so that teachers don't necessarily need to start from scratch. There are also plenty of tutorials available in order to quickly catch teachers up to speed on how to create their own activities. Furthermore, since the study was conducted via observing virtual lessons, it was argued that "using the same content during in-person teaching would not be optimal" (p.10). I disagreed with this because I thought that there were plenty of ways to use GeoGebra and Desmos to combine self-guided learning with direct instruction in a way that increases student achievement. To combat this sub-optimal implementation, the article suggests that "support might be needed, for example in the form of job-embedded professional development to boost the teachers' knowledge" as an intervention strategy (p.10). Again, I wasn't sure if my school had the resources to implement such a strategy, but it was interesting to consider.

Article four. The research synthesized by Emily Kohler, Laura Elreda, and Kate Tindle (2023) was an interesting read for me; I initially chose it because I was curious to see what opinions I would agree with and what challenged my current view. The study outlined in the article was designed to identify how teachers define successful implementation of technology in the classroom, and how the definitions vary. The article begins by saying that "education

researchers primarily define and measure the success of edtech implementations with associations between the use of technology and students' learning" (Kohler, Elreda, & Tindle, 2023, p. 895). This assertion seemed to me like a no-brainer. But, they went on to say that because of this assertion, there was little data available explaining how teachers knew when they had successfully implemented technology in their classrooms. They explain that "we need to understand how teachers typically define edtech implementation success, so we can better structure their self-reporting of success and ensure their definitions align with edtech implementation best practices to support teaching and learning" (p. 896). I never thought of that before, but it makes perfect sense. They go on to detail the lack of evidence and research in this area and identify a few potential influences on definitions of success such as teachers' comfort levels with the technology, their perceived standard of the technology they are using, how much training they received in regards to using the technology, and their prior exposure to the technology. The actual study collected data from 1028 teachers from 39 schools over 2 years. According to the study, it seems as though a majority of teachers say that they have successfully implemented the technology if the technology "enhances student learning outcomes/achievement" (p. 904). Included in this category were also the sentiments of increasing student involvement and enhancing the learning process. What surprised me a bit was that a handful of teachers defined success as "when students initiate technology to further their own educational interests" (p. 904). I would typically assume that teachers do not appreciate when students initiate the use of technology without direct instruction; however, I was delighted to be mistaken. It made me reconsider how I would define my own definition of the successful implementation of technology in the classroom. To this end, the article suggests that "we need to support the validity of teachers' self-report about edtech implementation success and ensure that

teacher definitions of success align with established best practices," rather than simply going by the book and telling teachers exactly what success should mean (p. 909). This struck me as a powerful intervention strategy, and one that I ended up seeing in place at my school. The principle would send out Google Forms with polls asking teachers to report what curricula were working and what weren't; gathering teacher input in such a way could most definitely be expanded to the world of technology. Additionally, it is "critical for school and district leaders to align evaluation metrics with these definitions of success, rather than relying solely on frequency-oriented indicators" (p. 910). It was interesting to see intervention strategies suggested that placed the responsibility on the schools, rather than solely on the teachers.

Article five. Eda Yalçin-Incik and Tolga Incik (2022) report the results of a study done of 100 students across 9th, 10th, 11th, and 12th grades. The purpose of the study was to "[determine] the expectations of high school students about the use of technology in education and their views on whether these expectations were met or not" (Yalçin-Incik & Incik, 2022, p. 109). This study was done in the form of surveys, and the responses were synthesized to capture the main ideas from the students. Teachers at the school that was studied have "tablets given to them by the Ministry of Education…[and] each teacher has a USB to store data. There are smart boards in every classroom at school" (p. 114). But, even with access to technology, this article echoes the idea that teachers may not be equipped with the proper skills to effectively integrate such technologies into their lessons and classroom environments. Students are quoted as saying "our teachers don't know how to use technology" and "Sometimes, even if our teachers want to use it, the smart board is broken" (p. 115). A combination of inept teachers and malfunctioning technology causes nothing but distraction in the classroom. Furthermore, students do seem to benefit greatly when the technology is working properly, as "we learn faster and better with a

smart board…the information is more permanent because it is supported by visual" (p. 116). However, again the students know just as well as the professionals that teachers need adequate training to properly synthesize teaching and technology, as they say that "the teacher should tell the lesson, not [the] smart board" (p. 116). These quotes were my main takeaways from this article, as I fully agree that teachers should not lean on technology to do their job for them. It is clear through research and my own lived experience that technology can never stand in for a teacher; rather, the teacher must use technology to boost their lessons and student engagement. Otherwise, students will never get a quality education. One intervention method that the article suggests is that because "every hardware and software has a certain lifespan…it is important to constantly renew the equipment in the schools by following the current technologies" (p. 117-118). Another intervention method mentioned in the article is one that I found particularly interesting, as I wondered about the potential drawbacks. The students suggest that "interactive boards could be used without teacher control…since the students do not have tablets, they recommend using smart phones, another mobile device, in the teaching-learning process" (p. 119). It seemed encouraging to me that the students seem to want to have an active part in their own education, but I wonder how effective this method would really be in the long run. I feel as though somewhat strict rules would need to be in place so that students don't get too out of hand using their phones to control/take part in activities on the board.

Pre-Post Research Design

The Strategy or Intervention Implemented

Description of strategy or intervention. Based on my research, I decided to take the idea of creating well-prepared lessons that students needed technology to engage with and combine it with the idea of allowing students some control over the board and the activities in

order to create my strategy for improving student achievement. I knew I had to conduct a pre-test to see where my students were in terms of using technology for educational purposes, and I wanted to do so by my first independent lesson; that is, one I was teaching entirely by myself with little intervention from my cooperating teacher(s). So, I decided to use one of my favorite applications, Desmos Activity Builder, to craft interactive lessons. I could use the smart board to display the slides, I could use my iPad to control the pacing of the slides, and I could have the students use Chromebooks to follow along and complete activities when the lesson called for it. This way, I was ensuring that students pay attention as I taught while also implementing a style of guided notes. I could also see student responses in real-time, so I knew who was or was not paying attention or understanding, and I could also make sure that they weren't skipping ahead in the lesson since I controlled the pacing.

Rationale for strategy. I observed that students always had their smartphones on their desks and were familiar with getting lessons taught from the smart board, so it made sense to me to attempt to marry the two in a way that facilitated learning. I did not want their phones to serve as a distraction, nor did I want teachers' hiccups in operating the technology to derail the lesson and cause students to lose focus. I figured that if I could get students engaged with the lesson in a way that incorporated them using technology rather than just taking notes on paper, it would have a positive effect on their achievement

Pre- and Post-Assessment(s) Conducted

The pre-test mentioned above would give me information on how familiar students already were with using the Chromebooks, how well they could learn and navigate a new application, and how hybrid style lessons impacted how well they did on homework as well as in-class work. My post-test would be conducted during my last lesson before the unit test. This

would give me time to collect my results as well as have time to take a step back during my final days at the school. I had planned to conduct the post-test in a similar manner to my pre-test, and compare my data and observations between the pre and post tests.

Results

Pre-Test Results

The pre-test gave me a lot of valuable insight that I did not necessarily expect. I expected that students would have a tendency to get off track with a computer right in front of them and a new face teaching them, but it was to a level I was not prepared for. There were multiple groups of students playing games on their computer rather than paying attention, there were some students who were uninterested and disengaged, and even the students who were following along were still not fully present. This discouraged me, as I had planned to deliver a lot of my lessons via Desmos Activity Builder. But, the pre-test still did give me an important perspective and forced me to be flexible with my plans. It became clear to me that students needed to have their eyes up front to remain engaged, and I needed to ask more questions and deliver more instructions orally rather than through a screen. However, I also could tell that there was great potential behind using this technology in the classroom. The majority of the students did use their mouse to draw diagrams when it was required, they typed out their answers in the specified areas, it was just hard to keep them focused in between the parts of the lesson that required them to be active. This pre-test not only showed me where I needed to be when my post-test rolled around, but also showed me that I needed to adjust my method of delivering instruction while still incorporating the use of technology.

Post-Test Results

Instead of lessons where everyone has a Chromebook and is required to complete problems on the computer, I adapted my lessons to be me guiding the class through the Desmos slides on the big smart board and, when necessary, questions would be completed on paper and then shared out loud. My post-test results delighted me. Again, this was my last lesson before their unit test, and it was delivered by way of the entire class walking through Desmos slides on the board, rather than all of them being guided through the slides on individual devices. I noticed several improvements from the pre-test. First, as soon as I got the first slide up and ready to go, every student would take out their notebook in order to take notes. I was extremely happy that I had found a way to get my students to take notes during class without necessarily having to instruct them to do so every single time. I also liked how they were able to simply focus on having a single notebook on their desk as opposed to having their notebook and textbook out. This allowed their spaces to remain clear and free from the distraction of clutter-management. Furthermore, when they were completing review for their upcoming test, I observed all of them flipping back in their notebooks to refer to material they needed, rather than needing to hunt through their book. This was a huge step from the beginning of the year—students would often not even bother digging through the book to find answers to their questions, and would instead ask a teacher or remain confused. Of course, it is important for teachers to answer questions when students have them, but it is also important for students to learn to solve problems on their own. Another result I was able to glean from the post-test is that students learned to communicate in the language of the technology being used. They would ask questions specific to Desmos Activity Builder such as if I could reset the activity or model, and they learned how to access the slides later on their own once I uploaded them to Google Classroom. It was amazing

to see how far they had come in being able to navigate the tech in what seemed like such a short amount of time. These slides being interactive as well as comprehensive of the material allowed students to get a lot more out of a lesson that they missed than if they were just expected to read a PowerPoint or material out of the book. Finally, I saw their homework and test grades improve substantially once they got into the rhythm of the technology. Working in class, they were easily able to recall information that had been contained in previous activities and problems we had completed during the lessons, and it had a definite impact on their academic performance..

Effectiveness of the Strategy Implementation and Implications and Limitations

I was incredibly satisfied with the effectiveness of my integration of a new technology into the classroom; not only because my students' grades went up, but their motivation to learn, their engagement and participation, the complexity of the questions they asked, and their level of self-sufficiency all increased significantly. Of course, the limitations of this research includes the fact that I am only a student teacher, and I am not with these students the whole year. I could not implement as many new things as I might have if it were fully my own classroom. Additionally, of course students will start to get more comfortable and confident as they get to know the teacher, so increases in these areas are to be expected regardless of instructional method. However, I saw my students connect with me at a speed and level I completely attribute to my unique method of instruction. I also had very little behavioral issues during instructional time, and that is something that doesn't necessarily go away with time but rather with procedures and practice. I learned how to get my kids back on track immediately whenever they started to get distracted, and when I said "eyes up front" they knew exactly where they should be looking.

Reflective and Critical Conclusion

Moving forward with my teaching career, it is clear that the use of technology in the classroom will be at the forefront of my procedure. As I mentioned above, I would like to incorporate the use of more applications and devices as I transition into commanding my own classroom, and I will have a clear set of procedures and guidelines for students to follow as it pertains to using such technology. I would also like to make my lessons a little bit more fleshed out, as sometimes I found myself not filling the time. That is something that comes with practice and time. Altogether, the use of technology in the classroom not only improved my students' achievements, but it also taught me about my own teaching style and how I can better myself as a teacher in the future.

Appendix A

If you wish to include Appendices (containing assessments, for example), feel free to do so. Each Appendix starts on a new page.

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